ANNUAL REPORTS

OF THE

FRUIT GROWERS' ASSOCIATION

FRUIT BRANCH

AND

ENTOMOLOGICAL SOCIETY

OF ONTARIO

1908

FORTIETH ANNUAL REPORT

OF THE

Fruit Growers' Association

OF

Ontario

1908

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TORONTO.

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

May it Please Your Honour:

I have the honour to present the Fortieth Annual Report of the Fruit Growers' Association of Ontario.

Respectfully submitted,

James S. Duff,

Minister of Agriculture.

Department of Agriculture,
Toronto, 1909.

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Fruit Growers' Association of Ontario.

OFFICERS FOR 1909:

President ..... E. D. SMITH, Winona.
Vice-President ..... JAS. E. JOHNSON, Simcoe.
Secretary-Treasurer ..... P. W. HODGETTS, Parliament Buildings, Toronto.

DIRECTORS:

Division No. 1.—R. B. WHYTE, Ottawa.
" 2.—HAROLD JONES, Maitland.
" 3.—F. S. WALLBRIDGE, Belleville.
" 4.—W. H. GIBSON, Newcastle.
" 5.—R. W. GRIERSON, Oshawa.
" 6.—A. W. PEART, Burlington.
" 7.—E. D. SMITH, Winona.
" 8.—G. A. ROBERTSON, St. Catharines.
" 9.—J. E. JOHNSON, Simcoe.
" 10.—D. JOHNSON, Forest.
" 11.—F. METCALF, Blyth.
" 12.—C. W. GURNEY, Paris.
" 13.—C. L. STEPHENS, Orillia.

Ontario Agricultural College: Prof. H. L. HUTT, Guelph.

Honorary Directors: THOS. BEALL, Lindsay; A. M. SMITH, St. Catharines; W. T. MACOUN, Ottawa.

Auditor: J. M. DUFF, Guelph.

REPRESENTATIVES TO FAIR BOARDS AND CONVENTIONS:

London: D. JOHNSON, Forest; C. W. GURNEY, Paris.

Ottawa: R. B. WHYTE, Ottawa; HAROLD JONES, Maitland.

Toronto: W. H. BUNTING, St. Catharines; P. W. HODGETTS, Toronto.

Ontario Horticultural Exhibition: W. H. BUNTING, St. Catharines; D. JOHNSON, Forest; E. LICK, Oshawa; P. W. HODGETTS, Toronto.

COMMITTEES:

Executive: President, Vice-President and Secretary, with A. W. PEART, Burlington, and R. W. GRIERSON, Oshawa.

Transportation: W. H. BUNTING, St. Catharines; J. L. HAMILTON, Clarkson; R. W. GRIERSON, Oshawa; E. D. SMITH, Winona; R. J. GRAHAM, Belleville; WM. RANDALL, Grimsby; J. L. HILBORN, Leamington; J. E. JOHNSON, Simcoe, and the Secretary.

Co-operation: JAS. E. JOHNSON, Simcoe; ELMER LICK, Oshawa; ROBT. THOMPSON, St. Catharines; C. L. STEPHENS, Orillia; A. E. SHERRINGTON, Walkerton, and D. JOHNSON, Forest.

New Fruits: Prof. H. L. HUTT, Guelph; W. T. MACOUN, Ottawa; J. W. CROW, Guelph, and H. S. PEART, Jordan Harbor.

Historical: A. MCNEILL, Ottawa; L. WOOLVERTON, Grimsby; HAROLD JONES, Maitland; W. T. MACOUN, Ottawa; W. DEMPSEY, Trenton; A. M. SMITH, Pt. Dalhousie.

Pomological Society: President, Vice-President and Secretary, with A. W. PEART, Burlington; R. B. WHYTE, Ottawa; G. A. ROBERTSON, St. Catharines, and H. L. HUTT, Guelph.

CONSTITUTION AND BY-LAWS.

Preamble.

The objects of the Fruit Growers' Association of Ontario shall be the advancement of the science and art of horticulture in all its branches.

(*a*) By holding an Annual Convention for the consideration of questions relating thereto.

(*b*) By co-operating in every possible way with district and local fruit growers' associations and horticultural societies hereinafter mentioned.

(*c*) By collecting, arranging and disseminating useful information.

(*d*) By co-operating with the Ontario Department of Agriculture in all matters pertaining to the advancement of horticulture.

(*e*) By holding an annual exhibition of fruit and other horticultural products and awarding premiums in connection with the same.

(*f*) And by such other means as may from time to time seem desirable.

Name.

1. This Association shall be called the Fruit Growers' Association of Ontario, and hereafter in this Constitution shall be referred to as the Ontario Association.

Membership.

2. Any person interested in horticulture may become a member by payment of one dollar per annum in advance to the general secretary, or by paying the necessary fee to the secretary of any district or local association in affiliation with the Ontario Association. A single payment of $10.00 to the general secretary shall constitute a member for life.

3. Members of the Ontario Association in good standing shall be entitled to receive regularly the official organ of the Association, a copy of the Annual Report, such other literature as may be sent out by the Association from time to time and any other privileges that may be provided or arranged for by the Association.

4. The Association financial year shall end on the 31st of December.

Annual Meeting.

5. The Annual Meeting shall be held at such time and place as may be designated by the Ontario Association.

Officers.

6. A President, Vice-President, Secretary-Treasurer and Directors only shall be the duly qualified officers of the Ontario Association.

7. The Directors shall be elected by ballot at the morning session of the last day of the Annual Meeting, and shall be thirteen in number, representing the thirteen Horticultural Divisions as set forth in Schedule A of this Constitution. The newly elected Board of Directors shall not take office till the second Tuesday in January of the year following, when the report of the retiring Executive and the Treasurer shall be received. No Director shall hold office for more than three consecutive years. Retiring Directors shall, however, be eligible for re-election at the end of one year.

8. The newly elected Directors shall at their first meeting appoint from among their number a President and a Vice-President, and also from among themselves or otherwise, a Secretary-Treasurer.

9. The President, Vice-President, Secretary-Treasurer and two other members appointed by the Directors shall constitute the Executive Committee of the Ontario Association.

Duties of Officers.

10. It shall be the duty of the President to preside at all meetings of the Ontario Association, decide all questions of order, and make any suggestions he may deem necessary in the interests of the Association. He shall be, *ex-officio*, a member of all committees appointed.

11. In the absence of the President, the powers and duties of his office shall devolve upon the Vice-President.

12. It shall be the duty of the Secretary-Treasurer to attend all meetings of the Ontario Association, the officers and the Executive, and keep correct minutes of the same; conduct all correspondence and issue all press and other reports; prepare the report of the Executive Committee for the Annual Meeting; forward the list of representatives to the Secretaries of Fair Associations, also prepare for publication the Annual Report. As Treasurer, he shall receive and account for all moneys belonging to the Association, pay such bills and accounts as have been approved by the Executive. He shall have the power of Managing Director acting under the control and with the approval of the Executive.

13. By virtue of his office he shall be a member of each committee appointed.

14. Before entering upon the duties of his office, he shall enter into a bond, with security when required, which shall be approved of by the Directors.

15. The accounts of the Ontario Association shall be audited by an expert auditor or accountant appointed by the Executive Committee, and approved by the Minister of Agriculture for Ontario.

16. At each Annual Meeting, the retiring executive officers shall present a full report of their proceedings to the Ontario Association. A detailed statement of the receipts and expenditures for the previous year, and of assets and liabilities, a list of members and such information on matters of special interest to this Association as the officers may have been able to obtain, shall be sent to the Minister of Agriculture for Ontario within forty days after the holding of such Annual Meeting.

17. The Executive Committee shall carry into effect the plan of work decided upon by the officers, and shall arrange the details of the same.

18. The officers, or the members of the Executive, or of any Committee may conduct by correspondence, the duties assigned to said officers, Executive or Committee, by the Constitution and By-laws, or by the Association, when such a course is deemed advisable by said officers, Executive or Committee.

19. In case a vacancy occurs in the officers or directorate, the Executive Committee may fill said vacancy forthwith.

Committees.

20. The Association may appoint such committees from time to time as may be deemed expedient, and the first person named thereon shall be declared chairman of each committee.

21.—(*a*) The actual and reasonable expenses of officers and members of committees when attending meetings in the interests of the Association shall be defrayed out of the funds of the Association.

(*b*) The railway fare only of the Directors in attending the Annual Meeting shall be paid by the Ontario Association.

Notice of Meeting.

22.—(*a*) At least two weeks' notice shall be given of each annual and general meeting, naming time and place of meeting. Notice may be given through the public press and by circular letter mailed to each member.

(*b*) An officers' meeting shall be called by mailing at least ten days before date of meeting to each officer, a notice of meeting as above provided.

(*c*) Similar notice shall be given to each member of the Executive before the Executive meeting is held.

(*d*) An Executive meeting may be held on shorter notice, provided each officer is otherwise notified and consents thereto.

Quorum.

23.—(*a*) Not less than ten members shall be a quorum to transact business for the Association; not less than five members shall be a quorum at an officers' meeting; and not less than three members shall be a quorum at an Executive meeting.

(*b*) Any member of the Directorate or Executive not present at a meeting, if he sends his views in writing, shall be considered as present.

Affiliated Associations.

24. Fruit growers in any section of Ontario may form a local Association when it has a membership of ten or over, upon the payment to the Treasurer of the Ontario Association of $5.00 for the first twenty-five members or fraction thereof above nine, and twenty-five cents per member for every additional member, which payment shall entitle the members to all the privileges and advantages of membership in the Ontario Association.

25. It shall be the duty of the officers and directors of the Ontario Association to encourage the formation of such local Associations.

26. Fruit growers who are members of two or more local Associations shall be accepted as members of the Ontario Association from that affiliated Association only which is the first to forward the membership fee to the Secretary-Treasurer of the Ontario Association.

27. Such affiliated Associations may appoint one delegate to the Annual Meeting of the Ontario Association for the first twenty-five members or fraction thereof, and an additional delegate for every twenty-five members or major portion thereof above the first twenty-five. The actual railway fare of said delegate in attending the Annual Meeting shall be paid by the Ontario Association.

Change of Constitution.

28. The constitution and by-laws may be amended by a majority of members present at an Annual Meeting or a special meeting called for the purpose of considering the same, and of which two weeks' notice shall be given.

Schedule A.—Horticultural Divisions.

1. Counties of Renfrew, Lanark, Carleton, Russell and Prescott.
2. Counties of Glengarry, Stormont, Dundas, Grenville, Leeds and Frontenac.
3. Counties of Lennox and Addington, Hastings and Prince Edward.
4. Counties of Northumberland, Durham, Peterboro' and Victoria.
5. Counties of Ontario and York.
6. Counties of Peel and Halton.
7. County of Wentworth.
8. County of Lincoln.
9. Counties of Welland, Haldimand, Norfolk and Elgin.
10. Counties of Kent, Essex and Lambton.
11. Counties of Middlesex, Huron and Bruce.
12. Counties of Brant, Oxford, Perth, Waterloo, Wellington and Dufferin.
13. Counties of Grey, Simcoe, Muskoka, Parry Sound, Nipissing, Algoma and Manitoulin.

Fruit Growers' Association of Ontario.

ANNUAL MEETING.

The forty-ninth annual meeting of the Fruit Growers' Association of Ontario was held in British Welcome League Hall, Toronto, on the 10th and 11th of November, 1908.

REPORT OF EXECUTIVE FOR 1908.

MEMBERSHIP. Your Executive beg to report that the membership in the Association has increased to a considerable extent during the year. The total number was 718, of which 632 came in from affiliated societies, as follows:—

Oshawa F.G.A., 60 members; Kingsville F.G.A., 27 members; Norfolk F.G.A., 152 members; Chatham F.G.A., 27 members; Burlington F.G.A., 40 members; Dunnville F.G.A., 41 members; Niagara Pen. F.G.A., 100 members; Arkona F.G.A., 18 members; St. Catharines Cold Storage and Forwarding Co., 103 members; Forest F.G.A., 23 members; Clarkson F.G.A., 41 members. Total, 632.

By Divisions this was as follows:

Division 1— 3.	Division 8—204.
Division 2— 4.	Division 9—200.
Division 3— 5.	Division 10—101.
Division 4— 7.	Division 11— 8.
Division 5—69.	Division 12— 14.
Division 6—84.	Division 13— 10.
Division 7— 4.	

Eight members living in B.C., Quebec, etc.

COMMITTEES. Your committees have been active during the year, and considerable was accomplished through their efforts. The committee appointed at the annual meeting in 1907 to look after the question of improving the market in Toronto, was able to induce the Grand Trunk Railway to put a new roof on the old market and generally to so improve it as to do temporarily for the purpose for which it was intended. Now that the Railway Commission has definitely settled the water front problem in Toronto by ordering the construction of a viaduct, there will be more chance of our getting this question settled than there was a year ago.

CO-OPERATIVE COMMITTEE. The co-operative committee during the year issued a special circular giving the names of the various associations in the Province, with the kinds of fruit that they packed, and the estimated crop for 1908. This was widely circulated, especially in the west. This committee also issued in the spring a circular giving price lists for spraying materials, pumps, hose, etc.

Transportation Committee. The transportation committee has been working quietly at the express rates and other matters in connection with the transportation of fruit by express, and expect at the first favorable opportunity to make an appeal to the Railway Commission. As the Commission is now considering this matter, it is likely that something will have to be done in the near future.

Horticultural Exhibition. This Exhibition is growing steadily in all mattters connected with it. In 1906 there was a deficit of $600; in 1907, $400, while in 1908 this was reduced to something like $275. The arrears the past year were made up by paying 85 per cent. of the prizes. This is not likely to assist the show, especially among fruit growers, and we think that the arrears of 15 per cent. should be paid by our Association.

Another matter in connection with the Exhibition which requires attention is that of the scheme for county prizes. This was started four years ago, and for the first two years the scheme seemed to be quite successful in some of the counties, while in others there was practically no competition. The last year Huron County enlarged on the former plan and made a special exhibit of the various fruits raised in the county. This was very successful, and drew considerable attention. In 1908 Norfolk County followed the same plan, but improved wonderfully on it, with the result that their exhibit was larger and better than all of the other counties combined. The exhibits from other counties have been, with a few exceptions, getting poorer year by year, despite the utmost endeavors to bring the scheme to the attention of the fruit growers in the respective counties. For instance, this year, the number of parties making entries in the individual counties were as follows:—Brant, 2; Halton, 5; Huron, 6; Lambton, 0; Leeds and Grenville, 6; Lincoln, 3; Northumberland and Durham, 5; Ontario, 6; Prince Edward, 2; Stormont, Dundas and Glengarry, 5; Victoria, 6; York, 7; Oxford, 5.

You will note that from Lambton there were no entries whatever, and the amount voted by the county was returned to the Treasurer intact. If it were possible to induce one-half of the number of counties who have hitherto taken part in this prize scheme to put up exhibits on the same plan as that of Norfolk, this year, we would have a very much larger display.

In connection with this Exhibition, the committee appointed at these meetings to represent our association should be authorized to go carefully over the prize list, cutting out such sections as do not make a sufficient display for the money offered. The committee should also endeavor to get as many specials as possible for the fruit section. Your Executive have already received an offer from Mr. Ruddick, of Ottawa, to give $10 for a special prize for a single apple of any one standard variety.

American Pomological Society. Owing to the length of the programme at the annual meeting, the matter of the entertainment of the delegates to the above meeting was not discussed. This matter will have to be definitely decided at this meeting. It has been suggested that a special committee of this association should be appointed to look after this work. We have already received the suggestions of Prof. Craig, and have on our Board of Directors, two members of this Society. We would suggest that this Association should offer some special prizes at the Niagara District Horticultural Exhibition, which will be held at the time of the Pomological meeting.

Legislation. It was suggested at the November meeting of our Association that legislation should be asked for or added to in respect to the codling moth and little peach. As this matter requires some care in the preparation of the same, and has to be brought to the attention of the Department of Agriculture, we would suggest that a special committee be appointed for this purpose. This same committee should also bring to the attention of the Department the proposed legislation in respect to nursery control.

SPRAYING. In connection with the work of the Executive last year, there was sent out a small pamphlet on the spraying of orchards for the codling moth. This proved to be very acceptable, and the methods outlined therein were tried by a considerable number of growers. We would suggest that this work be continued, and that every effort be made to bring before the fruit growers of the Province the necessity for, and value of spraying, in connection with the fight against the codling moth.

ANNUAL MEETING. The annual meeting, held in the British Welcome League Hall, proved to be one of the best that has been held for a long time. A large number of representatives from the various associations throughout the Province were in attendance, while the speakers who were brought in from outside proved to be of great service through their addresses. A number of matters of importance were discussed, including legislation respecting the control of the codling moth and a disease of peaches known as little peach. A satisfactory change was made in the constitution in reference to the length of service of directors, which should definitely settle the difficulty which arose the present year.

FIFTIETH ANNIVERSARY OF THE ASSOCIATION. The first meeting of this Association was held in January, 1858, and this year is therefore the fiftieth anniversary of the organization of the Association. We would call this to the attention of the Directors, and would suggest that in addition to the meeting of the Pomological Society at St. Catharines, some sort of special celebration should be held at the time of the show and annual meeting in November. An effort should be made to get together for our programme the very best speakers in horticulture to be found on the continent. Extra prizes might also be offered by this association at the show, so as to bring out a very large display of our best fruit. There should also be some sort of re-union of the old officers and members of the association.

TREASURER'S REPORT. The Treasurer's statement shows a balance on hand of $1,690.63. This is the largest amount that we have ever been able to report, but your Executive has tried to be as economical during the year as possible, so as to have plenty on hand for the entertainment of the Pomological Society and the celebration of our fiftieth anniversary. The Treasurer's statement is as follows:—

TREASURER'S REPORT, 1908.

Receipts.			*Expenditures.*		
Balance on hand		$1,074 07	Show:		
Members' fees		215 75	Cash for prizes	$451 35	
Show:			Refunds fruit sold	433 80	
Sale of fruit	$984 60		Labor	67 00	
Entry fees	109 70		Transportation	80 25	
		1,094 30	Office expenses	129 72	
County Council grants		50 00	Judges' expenses	30 75	
Legislative grant		1,700 00			$1,192 87
Interest		39 28	Periodicals for members		377 55
Incidentals		9 50	Hort. Pub. Co., 5th and 6th calls on stock		200 00
			Annual meeting		270 20
			Committees		212 30
			Postage		31 25
			Audit		6 75
			Printing		135 55
			Incidentals		65 80
			Balance on hand		1,690 63
		$4,182 90			$4,182 90

TREASURER'S REPORT, 1908.—*Concluded.*

Show: Cash for prizes	$451 35	
Refunds for fruit sold, 1907.—R. J. Graham, $16.25; Frank Dempsey, $12.65; Chatham F. G. A., $4.85; W. H. Bunting, $7.00	40 75	
Refunds for fruit sold, 1908.—F. S. Wallbridge, $4.00; D. Whyte, $10.50; N. A. Brown, $4.00; W. McGregor, $2.00; R. C. Fowler, $4.00; W. G. Watson, $2.00; W. C. Oughtred, $8.00; A. A. Armstrong, $6.00; Brown Bros., $29.00; W. C. Parker, $48.00;; Norfolk F. G. A., $103.00; Oshawa F. G. A., $49.00; Chatham F. G. A., $26.00; A. D. Harkness, $7.00; T. G. Bunting, $12.00; J. B. Guthrie, $51.00; C. L. Stephens, $14.00; Mrs. Delworth, $2.40; R. Thompson, $9.15; C. Harris, $2.00	393 05	
Labor.—W. F. Kydd, $30.00; R. A. Boddy, $3.00; B. Hoy, $4.00; H. K. Revell, $8.00; H. N. Knauss, $4.00; R. C. Pickard, $4.00; Wm. L. Bengough, $4.00; M. S. Middleton, $10.00	67 00	
Transportation.—Canadian Express Co., $33.52; Dominion Express Co., $16.11; G. T. R., freight, $21.52; A. S. Brandon, cartage, $2.25; D. Muir, cartage, $1.75; Wm. McIlroy, $4.25; Grand Trunk, freight, 65c.; Toronto and York Radial Co., 20c.	80 25	
Office Expenses.—W. T. Reid, $125.00; Bell Telephone Co., 40c.; Incidentals, $4.32	129 72	
Judges' Expenses.—E. M. Ferguson, $3.15; J. Hamilton, $2.15; P. J. Carey, $5.00; M. Pettit, $5.15; J. C. Smith, $5.15; W. F. W. Fisher, $5.15; H. W. Dawson, $5.00	30 75	
		$1,192 87
Horticulturist: Periodicals, $377.55; stock, $200.00		577 55
Annual Meeting: Reporting meeting, 1908, $50.00; Wm. Clements, 1907, travelling expenses, $1.60; 1908, M. B. Waite, $45.00; W. Lochhead, $29.00; T. A. Lampman, $6.85; A. Lawrie, $4.40; T. Eaton, decorating, $15.00; British Welcome League Hall, $20.00; Chas. Potter, $7.00; A. W. Peart, $7.80; G. A. Robertson, $2.50; C. L. Stephens, $2.75; A. D. Harkness, $9.45; Jas. E. Johnson, $2.85; D. Johnson, $4.75; R. W. Grierson, $1.45; J. R. Hancock, $2.40; L. H. Weaver, $2.40; R. R. Waddell, $15.40; W. H. Stainton, $1.15; C. W. Gurney, $2.25; Caretaker British Welcome League Hall, $2.00; L. C. Palmer, $6.40; J. Gilbertson, $2.90; W. F. Olds, $2.90; W. C. McCalla, $2.55; R. Thompson, $2.80; W. E. A. Peer, $1.10; H. St. C. Fisher, $3.30; J. H. Broderick, $2.55; E. Boughner, $2.70; A. Onslow, $3.15; Jas. Symington, $2.75; H. T. Foster, $1.10		270 20
Committees: E. Lick, $10.80; A. W. Peart, $7.60; Jas. E. Johnson, $13.60; R. J. Graham, $15.15; C. L. Stephens, $9.60; H. St. C. Fisher, $12.90; R. B. Whyte, $18.85; A. D. Harkness, $16.90; F. S. Wallbridge, $8.90; H. Jones, $15.05; Wm. Rickard, $6.70; R. W. Grierson, $2.75; C. W. Gurney, $5.10; G. A. Robertson, $6.50; H. L. Hutt, $3.25; A. E. Sherrington, $7.65; W. H. Bunting, $43.70; C. L. Stephens, $6.00		212 30
Postage: Mrs. Hubertus, $30.00; postage from cash, $1.25		31 25
Audit: J. M. Duff		6 75
Printing: Methodist Book Room, letterheads and envelopes, $23.25; spraying circular, $21.75; ballots, post cards, co-operative circular, programmes, stationery, $47.50; placards, $1.25; Might Directories, circular and county prizes, $6.80; Brown Bros., entry and judges' books, $35.00		135 55
Incidentals: Dominion of Canada Guarantee Co., treasurer's bond, $10.00; A. McNeill, livery, expenses of meeting, $5.10; Bank of Commerce, $1.90; P. W. Hodgetts, express, etc., $9.45; Dominion Express Co., $1.10; Toronto Stamp and Stencil Co., $2.50; Canada Stamp and Stencil Co., 75c.; Advertising, *Weekly Fruit Grower*, $5.00; *Canadian Horticulturist*, $18.00; Horticultural Exhibition Prize list, $12.00		65 80

PRESIDENT'S ADDRESS.

By A. W. Peart, Burlington.

As President of the Ontario Fruit Growers' Association I wish to extend to you a cordial welcome to our Convention, and hope that the conclusions reached by your discussions may be of a character to advance the best interests of the fruit industry. I also wish to thank the members for the honor done me in the election to the chief executive office of the Association.

In the death of Dr. Fletcher, Entomologist and Botanist of the Experimental Farm, Ottawa, the fruit growers of Ontario have lost a genial, earnest and sympathetic friend and co-worker, and the country a large and able and distinguished scientist.

I congratulate you upon your increased membership—an increase during the past year of 206. This means greater influence and power for good. The work of the executive during the past year need only be referred to by me very briefly, as a full statement will appear in the annual report of the association. Suffice it to say that your executive were very strongly impressed that something further should be done to check the ravages of the Codling Moth. With that end in view, hundred of circulars were issued to fruit growers. These contained formulas used by successful sprayers and urged the necessity of giving the directions a fair trial. I am pleased to state that many availed themselves of this information with satisfactory results, and that the idea is gaining ground that the moth can be controlled by proper spraying.

Last winter the Department of Agriculture of this Province organized a series of Fruit Institutes, which were held at different points. These meetings were a new educational departure along practical lines. The programmes were skilfully arranged, the best available fruit experts were secured as speakers, and the results were highly satisfactory and much appreciated.

I need only refer to the excellent exhibit of fruits at the Horticultural Exhibition, and trust that all present will take advantage of this splendid opportunity for practical as well as academical education.

During the year, the Department of Agriculture has made large exhibits of fruit at Winnipeg, the Anglo-Franco Exposition, in the G. T. Railway Building, and also at the Canadian National Exhibition. A very large exhibit of apples is now on the way to the Royal Horticultural Exhibition in London, England. It is also the intention to send the latter exhibit to the smaller towns as well. These exhibits will advertise our capabilities and the excellence of our fruits.

The various committees appointed by the Association will report in due course.

In some respects, the record of the fruit industry for 1908 has been an exceptional one. Bloom was early and profuse. The rainfall until the latter part of August was unusually heavy. This was succeeded by a searching drought which remains practically unbroken even now, November 10th. Subsequent to August, apples and pears grew but very little. With the dry period came fine, sunny weather which hastened maturity. The conditions were particularly favorable to the Codling Moth. Probably its work was never before so severely felt in unsprayed and uncared for orchards. In some places some varieties were almost completely riddled with worm holes. On the other hand, the same conditions appeared to be rather unfavorable to fungous growth. Apples and pears were fairly free of the spot. A not-

able exception occurred in the Greening which developed a whitish mould adjacent to the skin, making it almost worthless save for evaporating.

Apples were a light crop; plums, cherries and small fruits an average, while pears, peaches and grapes were heavy. Prices generally ruled low, in part, due to the financial depression and consequent lack of ability to purchase. As fruit growers, it becomes us to adapt ourselves to the depressed condition, and curtail our expenditures to that minimum commensurate with the economic management of our business.

In glancing over the progress of the fruit industry in this Province during the last seventeen years, we are led to the conclusion that its growth has not been of a fitful, sporadic character, but has been based on one sure foundation. From 1891 to 1901, the gross quantity of fruit increased about 100 per cent. During the past seven years the advance has been about 2 per cent. per annum. The expansion of the industry necessarily depends upon profitable markets. Taking the world markets of to-day and the near future, it would appear as if there were room for a large expansion along the apple line in those districts of the Province naturally suited for growing good staple varieties. Our apple area is practically unlimited, and our northerly latitude and abundant sunshine give Ontario fruit that distinctive quality which makes it noted in foreign markets.

Fruit growing in this province is in an experimental stage. Many pressing problems confront us, such as the most suitable soil for a given kind of fruit; the sort of fruit best adapted to a certain soil and climate; variations in soil for different varieties of the same kind; care of orchards and plantations in their manifold details; the food elements required by different fruits; various methods of pruning; the destruction of injurious insects and fungi; co-operation, or reaping the maximum amount of profit; grading, packing and marketing. Few, if any, of these questions have reached their final solution, and the conclusions formed to-day are subject to revision as our knowledge increases.

Still, on several of these problems have been thrown search-lights which enabled us to make a material advance, so that we have reason to feel hopeful for the future. The standing of the industry in time to come will be an evolution from its past, and will in no small degree depend upon the character of the men engaged in it during its formative stages.

As fruit growers, our ideals should be based upon integrity, intelligence and industry, linked together by the all potent force of unity. Upon these pillars, the moral, the mental and the physical—rest the whole fabric of successful fruit growing.

COMMITTEES.

The following committees were appointed:

NOMINATIONS: Messrs. E. D. Smith, D. Johnson, Elmer Lick, Robert Thompson.

RESOLUTIONS: Messrs. M. Pettit, Wm. Armstrong, C. L. Stephens, Geo. Robertson.

REPORT ON NEW FRUITS.

By W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

A few weeks after the last annual meeting of the Ontario Fruit Growers' Association the writer prepared a circular letter which was sent to a large number of newspapers and periodicals in Canada. The circular read as follows:—

"During the past three hundred years many varieties of fruits have originated in Canada, some of which are of great merit. The Dominion and Provincial Governments through their official publications, have recorded a large number of those originated, but up to the present time no complete list of Canadian fruits has been published. In view of the fact that many new varieties are being originated every year, it seems desirable, before the task becomes too great, to prepare as complete a list as possible, so that in future all that it will be necessary to do, will be to add to it the new ones.

The Horticulturist of the Central Experimental Farm requests, therefore, that the secretaries and members of fruit growers' associations, horticultural societies, and farmers' institutes, assist in preparing this list by sending to him the names of any seedling or cross-bred fruits of Canadian origin which they think should be recorded. It is especially desired to get information regarding local or unnamed seedlings of merit. Please send, if possible, the originator's name, the date of origin, the name of the place where originated, a description of the fruit, and any other information regarding it. Any or all of these particulars would be appreciated. Even if the name and address only of the originator were sent it would enable us to correspond with him and get further information.

The Horticulturist will be glad to examine and report on the merits of any new fruits which may be sent to him. Letters and mail parcels under five pounds in weight may be sent free of postage.

(Signed) W. T. Macoun, Horticulturist."

In response to this request, quite a number of varieties of fruit were sent in for examination, both during last winter and during the past summer. A few of these were quite promising, and descriptions of them follow:—

Apples.

Seedling from A. E. Bellman, Bowmanville, Ontario. Fruit medium size; roundish, slightly oblong; cavity deep, medium width; stem short, slender; basin medium depth; calyx open; color, yellow, almost entirely covered with deep crimson; dots moderately numerous, yellow; distinct; skin moderately thick, moderately tender; flesh white, with traces of red, tender, juicy; core medium; subacid, pleasant flavor; quality good to very good; season evidently through January.

This is a handsome apple of good quality of the Fameuse type. The specimens sent came from a warm room. Quite promising. Will be very promising if a better keeper than McIntosh. Said to be in bearing four or five years. January 8th, 1908.

Seedling from Wm. Chambers, Carnarvon, Ontario. Fruit large; oblate; cavity deep, open; stem short, stout; basin deep, open; slightly wrinkled; calyx partly open; color yellow well splashed and streaked with bright, purplish red; dots obscure; skin moderately thick, tender; flesh dull white, crisp, tender; core medium; subacid, sprightly, pleasant flavor; quality good; season apparently through January, or later. Thought to be equal to Duchess in hardiness, and said to seldom have an off year in bearing. Mr. Chambers got scions from Thomas C. Robson, Allsaw, Ont. (now of Alberta). Has been growing 14 years and fruiting 8 years. Five barrels in 1907. A very promising seedling if as hardy as is said. Resembles a Duchess in outward appearance, but is larger. Flesh and flavor somewhat like Gravenstein. January 8th, 1908.

Golden Crown. Above medium size; roundish, almost oblong, somewhat flattened on ends, slightly angular; cavity medium depth and width; stem short, stout; basin deep, open, slightly wrinkled; calyx open; color yellow with traces of pinkish red on sunny side; dots obscure; skin moderately thick, tender; flesh white, tender, breaking, juicy; core medium; subacid, pleasant flavor; quality good; season evidently December and later. Said to be a seedling of a large imported apple. Seed planted about 1880. Apple grown by Adonijah Marks, Clifton, P.E.I. Said to bear better than Yellow Transparent. The original tree is growing on a hill exposed to the Northwest and is said to be "as hardy as an oak." Resembles Grimes Golden very much. December 23rd, 1907.

Henry White. Medium size; form oblate to roundish; cavity medium depth, rather open; stem broken, probably slender; basin medium depth and width, smooth; calyx open; color pale yellow washed with reddish pink on sunny side; dots obscure; skin moderately thick, tough; flesh white, tender, juicy; core medium to small; subacid, pleasant, good flavor; quality good to very good; season evidently mid to late winter. A promising apple from R. Schwerdtfeyer, Morrisburg, Ontario, somewhat resembling Princess Louise in appearance and flesh and flavor. February 2nd, 1908.

Jacob Red. Medium size; form roundish, flattened a little at ends, slightly angular; cavity medium depth and width, russeted; stem short, stout; basin medium depth and width, smooth; calyx open; color pale yellow washed and splashed with crimson; dots moderately numerous, grey, distinct; skin moderately thick, tender; flesh yellowish, firm, juicy; core medium; subacid, pleasant flavor; quality good; season evidently mid to late winter, A promising winter apple of attractive apearance. February 2nd, 1908. Specimens received from R. Schwerdtfeger, Morrisburg, Ontario.

Plums.

Joseph. Seedling from Joseph Rowley, Sr., Cummings Bridge Ontario. Form oval, flattened; very large; cavity shallow, medium width; suture a distinct line, not depressed; apex rounded, almost pointed; color yellow, more or less washed and mottled with attractive red; dots numerous, yellow, distinct, bloom medium; skin moderately thick, moderately tender; flesh yellow, juicy; stone above medium size, oval, almost free; flavor sweet, rich, good, quality very good for one of this type. An American plum of the largest size. Attractive in appearance and one of the best in quality. Very promising. Came up in Mr. Rowley's garden in 1904. Bore in 1907 one plum. In 1908 2 dozen plums. Tree measures 4½ inches around base 1908. No American plum trees near, but may have grown from a pit of one of these plums accidentally dropped there. September 24th, 1908.

Seedling plum from Wm. Judge, Orangeville, Ontario. Form, goose egg shape; medium to above in size, 2 by 1⅝ inches; cavity shallow, medium width; suture a distinct line, not depressed; apex rounded; color yellow tinged with green; dots numerous, small, indistinct; pale yellow; bloom whitish; skin moderately thick, tough; flesh greenish yellow, juicy; stone medium size, long, cling; sweet, rich flavor, quality good. A plum somewhat between Yellow Egg and Coe's Golden Drop in shape. Promising. September 21st, 1908.

Seedling plum from Wm. Judge, Orangeville, Ontario. Form oval, slightly flattened at ends. Size medium, about size of Lombard, 1½ bv 1 5-9 inches; cavity medium depth and width; suture a distinct line, very slightly

depressed; apex slightly indented; color dark purplish violet; dots yellow, numerous, prominent; bluish bloom; skin thin but tough; flesh yellowish, moderately juicy, rather firm; stone medium size, roundish, cling; sweet, rich flavor. Quality good. Much like Lombard in outward appearance, but darker in color and is of better flavor than Lombard. A promising plum if better than Lombard. Domestica group. September 21st, 1908.

Plum seedling from Jas. Tarry, Tarry's, B.C. Form oval, slightly longer on one side than the other; szie above medium to large, $1\frac{1}{2}$ by 2 inches; cavity medium depth and width; stem medium length, slender; suture a distinct line, slightly depressed; apex flattened, slightly indented; color dark purple almost black with a blue bloom; dots few, grey, indistinct; blue bloom medium to heavy; skin thin, tough; flesh greenish yellow, juicy; stone above medium size, oval, cling; sweet, good flavor; quality good. A promising plum; not very rich, but of good quality and of good size. Domestica group. October 7th, 1908.

Cherries.

Cherry seedling from Emil Anstad, Trail, B.C. Fruit, large; heart shaped; cavity medium depth and width; stem long, $1\frac{3}{4}$ to 2 inches, slender; apex indented; suture an indistinct line; color dark red or blackish showing brighter red through; dots obscure; skin moderately thick, tender; flesh dull red, meaty, juicy; stone medium size, cling; sweet, pleasant flavor; quality good; season evidently late July. Seed planted in 1898 by A. P. Anstad, Trail, B.C. A good cherry; evidently a Bigarreau. July 29th, 1908.

In addition to the above it is desirable to mention the receipt of 17 new seedling currants from Mr. C. L. Stephens, Orillia, Ontario, and 10 new seedling gooseberries from Mr. P. Barrett, Truro, N.S. Among these were some which if they prove sufficiently productive may take their place among commercial varieties later on.

We should like to draw the attention of Canadian nurserymen to the importance of having a larger list of the Americana plums. There is an immense tract of country through central and eastern Ontario, Quebec, and New Brunswick where the European sorts do not succeed and where the American plums can be grown successfully. Some of the most promising sorts not now found in the catalogues of Canadian nurserymen are: Bixby, Mankato, Admiral Schley, Brackett, and Oren.

We should like to take this opportunity of again saying something of the work we are endeavoring to do at the Central Experimental Farm in originating new varieties of fruits, and apples especially.

While the trees which have resulted from hand pollination, and of which there are quite a number now at Ottawa, are approaching bearing age we have had the advantage of having a large number of seedlings fruit which were from apples crossed naturally in the orchard, seedlings from such apples as McIntosh, Fameuse, Northern Spy, Wealthy, Swayzie Pomme Grise, Salome, Golden Russet, Gano, and others. There are about 2,000 of these in the orchard, of which 434 have fruited. This year 411 seedling trees were in bearing, of which 249 were fruiting for the first time. New cross-bred and seedling trees will be planted from year to year.

Some very promising apples have already been obtained, and it is expected that among them will be at least a few which will prove better than those already on the market. Following are the names which have been given. Des-

criptions of these varieties will be found in the annual reports of the Experimental Farms:

Sonora: Langford Beauty seedling.
Congo: Lawver seedling.
Thurso: Northern Spy seedling.
Bruno: Scott Winter seedling.
Ottawa: Swayzie seedling.
Navan: Swayzie seedling.
Severn: Swayzie seedling.
Radnor: Swayzie seedling.
Galetta: Wealthy seedling.
Mendel: Wealthy seedling.
Clive: Wealthy seedling.
Medford: Wealthy seedling.
Crusoe: Wealthy seedling.
Adonis: Wealthy seedling.
Noel: Wealthy seedling.
Pinto: Wealthy seedling.
Linton: Winter St. Lawrence seedling.
Melba: McIntosh seedling.

Eighteen in all. These are being grafted with the idea of learning how they do as grafted trees. In addition to the work being carried on by the Horticultural Division, there is the work being done by Dr. Saunders in originating apples suitable for the Northwest, with which this Association is familiar.

New plums, pears, grapes, and strawberries are also being originated at the Central Experimental Farm, but in smaller numbers than apples.

Several promising new black currants originated by Dr. Saunders have recently been introduced.

Mr. COCKBURN thought that the growers should turn their attention to the American plum rather than to European varieties for the north.

Mr. DEMPSEY: In regard to plums in the east, we have experimented with Wolfe, Hawkeye and Stoddart, among American varieties, but found them so astringent as to be of little use. I also planted Weaver, Forest City and Cheney, obtained from the Renfrew Nurseries. I would not give them room on my farm. The Weaver very much resembles the old fashioned Niagara. A plum called Raines has been growing on Montreal Island for a number of years. I have four trees coming into bearing. The flesh is firm and sweet, of fairly good flavor. Even in 1903 and 1904 the tree showed no signs of winter killing, whereas the Lombard was winter killed.

REPORT OF COMMITTEE ON NURSERY CONTROL.

ROBERT THOMPSON, ST. CATHARINES, CHAIRMAN.

Your committee respectfully submits the following draft of an Act to Regulate the Sale of Nursery Stock:

AN ACT TO REGULATE THE SALE OF NURSERY STOCK.

1. This Act may be cited as the "Nursery Control Act."

2. In this Act the words "nursery stock" shall mean any fruit-bearing trees, vines, shrubs or plants, or any part of such fruit-bearing trees, vines, shrubs or plants.

3. No person, firm or corporation shall engage or continue in the business of growing and selling nursery stock, or act as selling agent, solicitor or otherwise within the Province or shall import nursery stock into the Province for sale without first having obtained a license to carry on such business in the Province, as in this Act provided.

4. All nursery stock sold within the Province shall be labelled with the true name of the varieties, and if imported, so labelled.

5. No person, firm or corporation, or agent of such person, firm or corporation, engaged in the sale of nursery stock, shall substitute other varieties for those ordered without having first obtained the written consent of the purchaser.

6. Any nurseryman or agent of any nurseryman shall be liable for damages in the common courts of the Province within twelve months after the trees come into bearing, where fraud can be shown in the substitution of varieties or sale of stock untrue to name.

7. No contract shall be made by any nurseryman or agent of any nurseryman containing provisions contrary to any sections of this Act.

8. The Department of Agriculture for Ontario shall publish yearly a complete list of the persons, firms and corporations engaged in any way in the nursery business, such list to state clearly whether the parties are *bona fide* growers of stock or agents only.

9. Licenses shall be issued from the Department of Agriculture for Ontario on application, and shall be good for one year from date of issue. Such licenses may be suspended or cancelled by the Department of Agriculture upon evidence satisfactory to the Department that the holder of the license has sold nursery stock contrary to any sections of this Act.

10. Any person neglecting to carry out the provisions of this Act shall upon summary conviction be liable to a fine of not less than $5.00, and not more than $20.00, 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 days, and not more than days.

Mr. WALBRIDGE: With reference to section 6, how are you going to prove fraud on the part of a nurseryman in the substitution of varieties?

Mr. MCNEILL: The measure will not be worth the paper it is written on if the prosecutor must prove fraud.

Mr. THOMPSON: Our committee was a joint one of nurserymen and fruit growers. While our report may not cover all the points we fruit growers wish to cover, I would ask that you allow it to go through. If it is found that any clause requires amending, it can be dealt with later, when we see how it works out.

The PRESIDENT: You will remember that at the last meeting of this Association, two committee were appointed, one of fruit growers and one of nurserymen. These men have had the matter under consideration during the past year and have agreed upon the report they have presented. It is a new departure and may be found to be defective in some respects. I may say, however, that the spirit of both the committees has been conciliatory and magnanimous, and this report has been mutually agreed upon as a result.

On motion of Mr. R. THOMPSON, seconded by Mr. GEO. ROBERTSON, the report was declared adopted.

REPORT OF COMMITTEE ON CO-OPERATION.

JAMES E. JOHNSON, SIMCOE, CHAIRMAN.

The co-operative committee met in Guelph, on February 6th, and again in Toronto, on Feruary 20th. The spring work consisted particularly in getting together of a circular giving a full list of firms handling such supplies as spraying materials, pumps, hose, chemicals, etc., together with wholesale prices for the same. All of the Associations in the Province were sent copies of this circular and also instructions in reference to the purchasing of any of the goods.

In connection with the spraying regulations carried out by the Department of Agriculture, your committee assisted Mr. Hodgetts in drawing up a set of rules for this work which we believed would be in advance of those in 1907. The grants were to be made payable on the basis both of acreage sprayed and the efficiency of the spraying.

Your committee also investigated various systems of bookkeeping for co-operative associations, looking particularly into that of Copeland-Chatterson Co., which was explained to this Association at their last annual meet-

ing. It was found that the cost of these business systems as used in ordinary commercial work was too great to allow of their being used generally by the Associations.

During the summer a pamphlet was issued giving the names of co-operative shipping associations in the Province and their secretaries and the probable output for 1908. This pamphlet was circulated largely at the Winnipeg Exposition and to various fruit dealers and other parties applying for the same in Ontario. The pamphlet contained also information in reference to the general work of these associations.

A recommendation was further made to the Department of Agriculture that an instructor in barrel packing be appointed to visit the various associations. This recommendation was adopted, and Mr. Backus, of St. Catharines, looked after this work.

REPORT OF THE COMMITTEE ON TRANSPORTATION.

W. H. Bunting, St. Catharines, Chairman.

So far as this year's work is concerned, your committee has nothing very definite to report. Circumstances have been of such a character that we have been unable to carry out the program outlined. In the first place, the Railway Commission became somewhat disorganized owing to the death of the chairman. It was sometime before a new chairman was appointed. Since then the busy season has been on us and we have been unable to arrange to present our own case. Then, too, owing to the exceptional prices of fruit in 1907, we were not able to bring the same arguments to bear as we might have done the year previous, or could do for the present year.

Your committee has been gradually assembling data, and, during the coming year, will be in a better position than ever to present the facts as to the very great handicap under which we are laboring, more particularly in regard to express rates.

One of the questions brought up a year ago was the necessity for better accommodation for fruit at the shipping stations. I understand that since that time the railway companies have provided at a number of points better facilities for the reception and handling of fruit. And then request was made that shippers should be accorded the privilege of sorting up cars at divisional points on payment of a stop-over fee. This has finally been granted, and shippers are now able to assemble cars at such points and sort them up in accordance with the demand.

The greatest hardship felt during the past year was in connection with the distribution of our goods to the smaller places. Owing to the heavy crop and comparatively low prices that prevailed, the question of express charges became a very serious item. I think this Association should urge the committee for the ensuing year to press very strongly for relief in connection with the exorbitant charges in that connection. The majority of us in St. Catharines were forced to abandon the express business and ship entirely in car load lots to the larger markets, which is detrimental to the smaller consuming points.

E. D. Smith, Winona: With regard to express rates, it was found when the season opened that the express companies had raised their rates by charging the weight of a basket of fruit at 17 lbs., six baskets making 102 lbs., instead of 100 lbs as formerly. This in the aggregate meant a very large amount of money to the growers of the Niagara district. It was a long struggle before we succeeded in getting the original rate restored. These

companies should not be allowed to change their rates as they see fit without first obtaining the sanction of the commission. Because of the high express rates, particularly to distant points, our growers are losing a large share of the markets for Canadian fruit. If we are to compete with Californian tender fruits and get possession of the northwest market, we must either get a lower express rate or else higher tariff. Without one or the other of these things, we cannot meet Californian peaches and plums in that market. Californian peaches were laid down in that market at a dollar, and even as low as 75c. a case in some instances, a case being larger than the ordinary peach basket. When we have to pay an express rate of $2.40 per hundred, car load lots, it is absurd for us to think of competing with this. In other fruits, which we can ship by freight, we can compete.

Wm. Armstrong, Queenston: There are a number of fruit growers who invest capital in the forcing of vegetables during the winter months, and with reasonable transportation, they could do so with benefit to themselves and to the consumer. I made a shipment of six baskets last winter, and as the carrying charges appeared to be exorbitant, I wrote to the commission house to know if they were correct. They replied that the shipment weighed 100 lbs., and that the charges were 70 cents to Hamilton and 30 cents from Hamilton to Toronto, making a charge of $1.00 for a distance of forty miles.

A Member: I think we should give credit where it is due. Last year I voiced the complaint of the growers as to the treatment received from the Grand Trunk in connection with the express business. As a result a great many of our grievances have been swept away. The service is not perfect yet, but a vast improvement on what it was before. Among other things, they gave us a car for our late fruit and vegetables, which was placed on our siding three times a week, and we were allowed to load into it. We paid freight charges on it, and thus secured what was practically express service at a very low rate. This, I think, could be obtained by some of the other associations. This year we have had a new difficulty to face, namely, the charge for delivering the fruit in the city of Toronto made by the local commission merchants. The growers in our Association have felt this very keenly.

Mr. Onslow, Niagara-on-the-Lake: This year after the boats stopped, the express companies put up the rate from 30 to 60 cents.

Mr. Bunting: It is only within the past few months that the express companies were placed under the jurisdiction of the Railway Commission. No doubt the same rule will hold that now applies to railways namely, that the schedule of rates cannot be changed without consultation with the commission.

As to winter and summer rates, the rates should be the same all the year round, and should not be raised as soon as the transportation by boats ceases. I assume that this was the reason of the change to which Mr. Onslow refers.

The Chairman: Every fruit grower who is being imposed upon in regard to rates, should acquaint the committee with the facts, and thus strengthen their hands.

REPORT OF COMMITTEE ON FRUIT MARKET IN TORONTO.

H. St. C. Fisher, Queenston, Chairman.

For the past few years the fruit growers of Ontario have been shipping their fruit to Toronto under very unfavorable market conditions until this year when the facilities for handling it have been greatly improved.

One year ago your convention assembled, took the matter up with the City Council, and in consequence a committee of fruit growers was appointed to confer with the Council to see if something could be done for them in this respect, whereupon, the City Council appointed a committee to meet the Fruit Growers' committee and a committee representing the Commission men of the city. It was also decided to call in the transportation companies interested, and deal with the matter in a business-like way.

The committees met at the City Hall from time to time to discuss ways and means for procuring for the city a much-needed fruit market. I have much pleasure in stating that the meetings were of a very profitable nature in that the whole matter was sifted down in such a way that we have now a greatly improved market. The Grand Trunk Railway deserve much credit for the way in which they have improved the facilities in Toronto. It seems that the City Council are inclined to wait until the water front question is settled before they undertake to build a fruit market to which all the transportation companies will have access on equal terms, and I would like to suggest right here that this Convention appoint and retain a representative market committee until such has been accomplished.

For the information of those who are not familiar with what has been done by the Grand Trunk Railway to better the conditions that existed one year ago, I might say that the old Great Western Station at the foot of Scott St. (now known as the Scott St. Fruit Market) where nearly all the fruit that has come into this city for several years past has been handled by the commission men, has been renovated in such a way that we have now probably four times the floor space that we had a year ago; a new floor has been put down, the roof has been repaired, electric lights have been installed and the whole interior has been whitewashed, so that, all things considered, we have a much better place to which we can ship our fruit than we have ever had before, so our efforts along this line have met with a fair measure of success. I understand that it cost the G.T.R. something like $4,000 to make the necessary repairs, and thanks are due them that we have had even a shelter for our fruit for some years past.

I am not one of the kind who is content with the conditions that even now exist. I believe the fruit growing industry is second to none in this country, and we should not rest until we have built in this city one of the finest fruit market buildings on this continent. Toronto is worthy of such a market, and I make this statement without fear of contradiction, that Toronto has the best market for choice fruits in Canada, and probably on this continent. This is readily explained. We all know that the population of this great city is comprised largely of genuine Canadians, who love things Canadian, and who are willing and able to pay a high price for a first-class article put up in first-class shape so as not to excite suspicion, for none of us would like to buy some of the packages of fruit that are sent to this market by some fruit growers who are not present here to-day. I would urge upon every fruit grower in this country to aim toward a high standard of perfection in every detail, quality before quantity, every package of fruit *honestly* packed, your name

on the package, and I can assure you the price will take care of itself. All these things go toward bettering our market conditions.

The St. Lawrence Market, where all the farmers' products are handled in this city, is a market that the farmers should be proud of and I believe they are proud of it. Why should the Fruit Growers take a back seat? We do not have to, so I think we should extend our efforts until we get exactly what we want in the shape of a fruit market. I am sure the City Council are willing to do their part in this very important matter.

In submitting this report on behalf of your committee, I do so feeling that we have done our duty, and have only to say that if this Convention sees fit to appoint a standing Fruit Market Committee, it should do its best during the coming years to show the City Council that if they wish to hold the fruit trade, they must as soon as possible build a suitable market to which all the transportation companies will have access on equal terms.

Before leaving this matter with you, I would like to say a few words in reference to the transportation companies, speaking only of course, from experience. The Canadian Express Co., working in conjunction with the Michigan Central and Grand Trunk Railways has, the past season done much toward landing the fruit shipped from Queenston station in the market without delay and in a good marketable condition. They are to be congratulated on having a superintendent here in Toronto who is thoroughly familiar with the conditions as they exist with us all along the line, and we thank him for procuring for us better shipping facilities this year than we have ever had before, and he can if he will, do much more for us in the future than he has in the past which would certainly guarantee more business for them.

The Dominion Express Co., working in conjunction with the Niagara Navigation Co., did their part at our end of the line, but when the fruit landed in Toronto, there was absolutely no decent place on the wharf for the company's men to handle it, so that it had to be loaded from the fruit trucks to waggons or drays, carted across the railway tracks to the Fruit Market and then unloaded into the market. The same is true of the fruit that is shipped from St. Catharines and vicinity to Toronto, and we as fruit growers know that the oftener our fruit is handled before the market is reached the less it is worth. So all these things go to show that the fruit market conditions in the City of Toronto can yet be greatly improved upon.

Mr. Bunting: In recommending the adoption of this report, I wish to say that I think this Association owes its thanks to the Mayor and the Property Commissioner and members of the Council who have interested themselves in the matter, as it was largely through their efforts that the railway company consented to make the improvements referred to.

REPORT OF COMMITTEE ON REVISION OF THE CONSTITUTION.

A. D. Harkness: This year a difficulty has arisen in regard to the clause in the constitution which provides that each year the four directors who have served longest on the board shall resign. This year there are three who would be retired on this account, but when it comes to the fourth, we find that there are three who have been on the board for the same length of time, and no way is provided for determining which of them shall make the fourth retiring director. To overcome this, the suggestion is made to follow the plan of electing school trustees, by grouping the thirteen districts into three divisions. Division No. 1 will elect its directors for one year; Division No. 2 for two

years; Division No. 3 for three years; after which the plan will be reversed, Division No. 1 electing its directors for three years, and so on. I beg to move the adoption of this system.

Robert Thompson, St. Catharines: The original idea of the framers of the present constitution was to introduce new blood on the directorate. I move in amendment that the plan originally proposed at the time the constitution was framed be adopted, namely, that a director shall not hold office for more than four years. That is to say, strike out the clause as it now stands, and substitute the words, "no director shall hold office for more than four years; directors to be eligible for re-election after one year's retirement."

Mr. Robertson, St. Catharines, seconded the resolution, but said he thought that three years would be better.

Mr. Thompson concurred in this, and changed his amendment accordingly. The amendment was then voted upon and declared carried.

THE COMMERCIAL SPRAYING OF APPLE ORCHARDS.

The Chairman: Up to the present there has been a great deal of scepticism in regard to the value of spraying for the Codling Moth. I have had some doubts on the subject, but this year I used the methods employed by the Simcoe and Forest Associations with very satisfactory results. It has been said that there are two broods in some districts, but I am convinced that the moths hatch out continuously through the season. To find out how long it took for the pupæ to mature, I banded a tree on Tuesday and removed the band the following Monday, and in that time the worm had gone through its transformation and only the shell was left.

Mr. Maxwell Smith, Burlington: My business is that of an apple buyer. My object has always been to try to buy the best apples by going into the sections where I knew the best apples were to be had. I have always been a keen observer of spraying. The first time it was brought to my attention was in 1889, when the Government was doing some spraying near Dutton, in Elgin County. I bought the two sprayed orchards, and obtained better fruit and fewer culls from those orchards than any I bought that fall. Since then, my observations have convinced me that the time has arrived in this country when fruit growers must spray if they expect to grow good fruit. There was a time when we could depend on good crops without spraying. The last year we had a uniformly good apple crop was in 1896. Since that time they have been gradually getting worse, until for the last two or three years it has been almost impossible to find any quantity of good apples. This is due chiefly to the Codling Moth. This is due partly to the carelessness of the farmers and partly to the foolishness of the apple buyers. These men start out in July and worry the farmers until they sell their apples. The farmer sells to the highest bidder, and after that he does not care whether the apples are good or not. I do not blame the farmer; I blame the buyer. There are in Ontario more irresponsible men in the business of apple buying than in any other business in this country. This last year, however, the Liverpool, London and Glasgow houses have shut down on these men to a large extent by limiting their capital. It will be a good thing if they shut down still further, as they will then buy fewer and better apples. This will make it an object to the farmer to grow better apples.

It has always seemed strange to me that a farmer will call in a veterinary surgeon and spend money to cure a sick cow, and yet he will allow pests to eat

up his orchard, which should be worth four or five hundred dollars to him. I believe that one acre of good apples, properly looked after, will produce as much as any other ten acres of the farm. A good apple orchard, one year with another, can be made to pay three or four hundred dollars with very little care.

In my section, the four great pests are San José Scale, Codling Moth, Oyster-Shell Bark-Louse, and fungus. The greatest of these by far, I consider to be the Codling Moth. My experience has led me to believe that it is the easiest pest of the lot to handle. I quite agree with what Mr. Peart has said. I have heard many men say that if you catch the first brood you have it practically coralled for the season. Others say there are two broods; others that there are three broods. My observation is that the Codling Moth hatches as regularly as the day comes. No doubt it hatches in greater quantities in the early part of the season, but I believe that it hatches regularly throughout the season. I banded the trees in my own orchard and took off the bands every ten days or two weeks. I have killed as high as sixty in a band, and every week right through the season until now, you will find them in the bands as in the first instance.

Q.—Do you advocate spraying in the fall after the leaves are off?

A.—Not for Codling Moth; the leaves and apples are off and they are not eating then. I listened to a lecture by Mr. Johnson, of Simcoe, with very great interest. I consider him to be a very practical man. He convinced me that he had obtained results from spraying. While I have always been an advocate of spraying, I never got so much technical knowledge of spraying as I did from his address. I had sprayed in a kind of a way, that is to say, I hired a man who did commercial spraying, allowed him to do it as he saw fit, and paid him what he asked; consequently, I did not get satisfactory results. After listening to Mr. Johnson, I determined to give it a thorough practical test for two sprayings and look after it myself. Mr. Johnson advocates three sprayings. I omitted the early spraying because of the condition of my land. The orchard referred to, I acquired in 1905. The first year I forwarded all the apples to the evaporator. In 1906, I packed of Ribston apples, 44 per cent. No. 1's, 35 per cent. No. 2's and 19 per cent. culls—I did not pack any No. 3's that year. In 1907, we packed 20 per cent. No. 1's, 24 per cent. No. 2's, and 37 per cent. No. 3's, and had 10 per cent. culls. This was the result from commercial spraying. In 1908, the year I sprayed thoroughly, we packed 80 per cent. No. 1's, 20 per cent. No. 2's, and there were not half a dozen barrels of apples that would not go into those classes. I may add that it was the finest car of Ribstons I ever packed—the most uniform, the best sized and best colored. Besides this, the fruit hung on the trees better, and the foliage stayed better. The purchaser said they were the best Ribstons he had ever seen.

Mr. PEART: I can bear Mr. Smith out in what he says about the fruit.

Mr. SMITH: I am obliged to differ a little from Mr. Johnson in his theory of spraying. He advocates three sprayings, using an excess of lime and an excess of bluestone for the early sprayings for fungus, and then adds in the later spraying Paris green or white arsenic for insects. He gives two sprayings previous to blossoming, and states that a third spraying as the blossoms fall will coral the Codling Moth. With my Ribstons, which are an early variety, it practically did so. But with Spy, Baldwin, and Greening I had a lot of moth on September 1st, when the other apples were fit. I conclude therefore that to successfully handle the moth, a later spraying is necessary. A more powerful insecticide than Paris Green is necessary. I find Paris Green very irregular and uncertain, and there is always the danger

of burning the foliage with Paris Green. This year I went through New York State looking for good apples. There they use practically nothing but arsenate of lead. This sticks well even in the event of a slight rainstorm, and even later in the season, they had very few wormy apples. Next year I shall spray at least four times, probably five.

Q.—How will you distribute these sprayings?

A.—I would spray as Mr. Johnson recommends, the first time for fungus and scale before the buds open, while the tree is bare—that is, any time in the winter. I would spray a second time just as the buds were about to open; a third time when the blossoms are dropping and the calyx is quite open, so that the calyx can be filled with the spray mixture. The Codling Moth enters the apple at that time through the calyx. The worm enters the apple easily there, and if the calyx is full of poison, it will kill it. This will successfully handle the first brood, which is the largest.

Q.—Where does the second brood come from if you destroy the first?

A.—No matter how well you spray, you cannot destroy them all. I will spray the fourth time when the fruit is about the size of marbles. If the season is favorable to Codling Moth, I will spray even later. I shall use arsenate of lead.

Q.—Any danger of stinging the apple?

A.—It is absolutely harmless, whereas Paris Green is not.

Q.—What quantity will you use?

A.—About four pounds to a hundred gallons, I think.

Q.—Do you put the arsenate of lead in the water?

A.—Yes.

Q.—Do you use any lime?

A.—There is a difference of opinion as to the best fungicide. Bordeaux mixture is a fungicide, so is lime and sulphur. Certainly I would always use lime. Bordeaux mixture or lime and sulphur with the arsenate added. Another thing in its favor is that once dissolved it will remain in suspension and not settle.

Q.—Do you use the same formula for all the sprayings?

A.—You cannot use as strong a mixture of Bordeaux or lime and sulphur after the foliage is out.

Mr. Pattison, Grimsby: It makes a great deal of difference where you are as to the number of broods of the Codling Moth. Below the mountain it is very much worse than above, and probably much worse than with Mr. Johnson at Simcoe. I was there at apple picking time, and do not think that five per cent. of the apples was affected.

Mr. Smith: I think there is very little difference in this respect between the Niagara District and Halton, Wentworth, or Elgin. Yet Mr. Johnson relies on one spraying after the blossoms fall.

A.—That spraying would doubtless kill a large percentage of them.

Mr. D. Johnson, Forest: It is not necessary for me to enter into any lengthy argument to prove the necessity for spraying; it has already been demonstrated. A man may cultivate his orchard as much as is necessary, fertilize it as much as is necessary, and properly prune it, but if he does not spray his trees, I cannot see how he can be successful as a fruit grower. Evidence of this is everywhere apparent. Orchards that once brought forth beautiful fruit are to-day deserted because of the ravages of insect pests. The farmer may do all that is necessary, but if he does not spray, his work is of no avail. It is some fifteen years since I started to spray, and I did not like the work at all: I thought it the most detestable job that anyone could engage in. My father, who had read a great deal, was convinced there

was something in it, and kept us at it in spite of everything. The first few years we did our work as carelessly as we possibly could, because I had no faith in it. But by and by we began to see some results, and finally I developed into the crank I am now. By spraying we increased the production of our orchards by fifteen hundred or two thousand barrels a year of apples of the finest quality. You may say that this was due to additional care, but such was not the case. We cultivated just as well and fertilized just as well before as we do now. Our method is this: we use a gasoline power-sprayer with 175 pounds pressure; two lines of hose with bamboo extension rods, one of which is handled by the man on the platform fourteen or fifteen feet from the ground; the other by the man on the ground. Both men cover everything in sight and spray thoroughly. I have no confidence in spraying unless it is thoroughly done. The reason men do not get better results is because of haphazard methods. We use the regular Bordeaux formula— 4 lbs. of sulphate of copper, 4 to 6 lbs. of stone lime and 4 oz. of Paris Green, dissolved in 40 gallons of water.

The night before we commence the spraying we mix a stock solution by taking three barrels three parts full of water, and suspending in each a coarse sack containing sixteen pounds of sulphate of copper. In the morning this is dissolved. Then we take fresh lime and slake it very carefully, dilute it to milk of lime and stir it into the tank. Then fill the tank almost full of water, put in the Paris green in the form of a paste, add the copper solution and thoroughly agitate.

The first spraying is given before the leaves open, and we do not use Paris green in this application. The second spraying is just before the blossoms open, and the third just as soon as the blossom has fallen. The fourth application is two weeks later. The mixture and system has given wonderful results. I could cite many orchards that produced nothing but wormy, scabby fruit, which are to-day producing beautiful fruit as a result of this treatment. We have very little scab, and very little worm where the spraying is properly done.

I believe in spraying with the wind. If the wind is blowing from the north, we spray that side of the trees only, and when it changes, we spray the south side. Stop at least three times on each side of the tree, and spray everything in sight. You cannot get satisfactory results by stopping only once at a tree.

There is a good deal of difference of opinion as to nozzles. We read a good deal about fine mist-like spray. That may be all right for the small grower, but I am speaking to commercial growers, and for our purpose I believe in a nozzle that will send a spray out with force. We used the "Friend" last year, and it comes the closest to my ideal. I know there are some who disagree on this point, but I am speaking of the result of my experience.

We always leave certain check trees in the centre of our orchard to continually prove to ourselves the benefit of spraying—spraying one side of them only. We find almost every year that the sprayed side produces beautiful foliage and beautiful fruit, while the unsprayed side produces no fruit.

This spray can be applied with success not only to the apple, but to the pear for scab and to the plum. While we do not use as strong a mixture on the tender kinds, we get just as good results. Some years ago we had an orchard that was producing nice crops of plums. One year the rot set in and we lost practically the entire crop. Next year we sprayed, and while the season promised no better than the season before, we had a crop of about 2,000 bushels. Ever since that, we have sprayed the plums.

The question of the mixture used by Mr. J. E. Johnson, of Simcoe, came up for discussion. While we do not use exactly the same mixture, we always argue on this subject. We at Forest always use the regular Bordeaux formula. He uses another formula, and applies it only three times. This year we made a trial of his mixture on ten acres of orchard, spraying three times. The result was very satisfactory indeed, in fact I think we liked it better than our own, and next year I think we shall use it entirely.

James E. Johnson, Simcoe: Since I came to this meeting I have received several testimonials similar to the one voiced by the previous speaker in regard to our mixture. I know it is a difficult matter to get growers to spray. It is dirty work, and they will not take hold of it themselves, but leave a great deal of it to their help, and the help does not care for that kind of work. Before undertaking to spray, you should ascertain what insects and fungous diseases you are going to fight and then study how to control them. When you spray, spray thoroughly and at the right time. The time to spray is one of the greatest secrets of success. I know that in spraying for the codling moth a few days delay may ruin the whole crop. A good many have large orchards, and having only one spraying outfit, they cannot spray the whole orchard at the right time. You should not attempt to spray more than ten or twelve acres with a hand outfit. With a power sprayer, where you can run it satisfactorily, probably you can spray fifteen acres, although with our hand outfit we are able to put out six hundred to eight hundred gallons per day, and that is about as much as a power outfit can do. The outfit used by the Norfolk Association is on exhibition at the show now being held. It is simple and one man can do the pumping. The gasoline outfits at the present time are not always sure; that is the great objection to them. In spraying apples, I spray first for fungous diseases, and, second, for the bud moth, and third, for the codling moth. I refer to the county of Norfolk; other counties may have to spray for other insects and diseases. We have to add another spraying now for the Tussock moth. Last year was the first time we had any trouble with this pest. Two of our orchards were damaged 50 per cent by it. Last year was our first experience with this pest, so that I have not had much opportunity for studying it. It begins by eating the young foliage and follows the leaves right up. It also eats into the apple. Most of the apples will heal over and form a slight scab; others will show quite a disfigurement. Every grower in our section should spray next season for the Tussock moth. I have made a trip to New York State every year for twenty years. In many orchards this fall I saw them spraying for the Tussock moth. It is a pest that is going to be very hard to fight, in my opinion.

Q.—What is the proper time to spray for it?

A.—I should think about two or three weeks after the blossoms fall. Probably Professor Lochhead could give some idea of that.

Prof. Lochhead:—It hatches out of the egg mass sometime in May, varying in different localities—from the middle of May till the 15th of July. It is then a caterpillar and feeds on the leaves, and then is the proper time to spray for it.

Q.—Did you ever try picking the cocoons off in the winter?

Mr. Johnson: This is our first experience with it.

Mr. Tweddle: We spray for them about the 11th of June. The greater portion are hatched by that time with us, and we destroy them in that way.

Mr. JOHNSON: The formula of the spraying solution we are using is as follows: 250 imperial gallons of water, 1 lb. white arsenic, 3 lbs sal soda, 1 lb. Paris green. With the first spraying we use 20 lbs. of copper sulphate and 70 lbs. of stone lime. In regard to the lime, only the lumps should be used, avoiding the air-slacked lime. We prepare the arsenic by boiling it for 45 minutes with the sal soda. We buy the granulated vitriol (copper sulphate) and place it on a hopper made to fit over the manhole in the tank. We then pump 150 gallons of water through the hopper, which will dissolve the blue stone.

As to lime, we have a box that holds about 70 gallons. In this box we place 70 lbs. of lime and slake it, being careful not to burn it. Make it into milk of lime and then add it to the vitriol solution in the tank, having a man agitate thoroughly all the time the lime is being poured in. Also agitate while the arsenic and Paris green is being put in, and keep the mixture well stirred.

Q.—What is the object of Paris green and arsenic both?

A.—It is an additional precaution. I got the formula from New York State, and it gave such good results that I did not care to change it.

Q.—Do you use arsenic and Paris green with every spraying?

A.—No, only for the second and third.

Q.—What is the idea of boiling the white arsenic with the sal soda.

A.—It is not sufficiently soluble to dissolve in the water. (Arsenite of soda is formed.) Now, as to the codling moth, it is one of the hardest insects we have to fight. This year we tried to use one outfit on too much orchard. One of our orchards we sprayed as soon as the blossoms fell. When we came to the second orchard the weather was bad, and one thing and another delayed until a week passed before we got it sprayed. In this orchard 75 per cent. of the fruit was affected by the codling worm. In the orchard sprayed one week earlier, not two per cent. was affected. If a second spraying did any good for the codling moth, we should have got some good from the later spraying.

Mr. TWEDDLE: Do you agree with the statement that the codling moth nearly always goes in at the blossom end?

Mr. JOHNSON: Yes, that is correct.

Mr. TWEDDLE: Then you have a different one to what we have.

Mr. JOHNSON: I understand that you have a continuous brood; we do, too, unless we spray thoroughly, and get the calyx full of the mixture. I should like to know how many of the members have used our mixture. (About a dozen persons stood up).

Mr. GRIERSON, Oshawa: There are a number of others who have used practically the same mixture with more lime and no Paris green.

Q.—We use the mixture, but do not kill the second brood?

Mr. JOHNSON: Do you give a third spraying immediately the blossoms fall?

A.—Yes, I do.

Q.—Is it possible that our trees may be reinfested from neighboring unsprayed orchards?

Mr. JOHNSON: I do not think so—not that season; they might be the next season.

Q.—Don't you think it would answer to use white arsenic without Paris green? We did so this year and killed almost everything.

A.—It might do just as well.

Q.—Would it not do to use Paris green and no arsenic?

A.—It might, but if the Paris green happens to be bad, you are taking great chances.

Q.—Have you tried arsenate of lead?

A.—Yes, but only in a small way.

Q.—A good many claim that it is better than Paris green or white arsenic.

Q.—Do you consider that spraying later than the one given at the time the blossoms fall will kill any codling moth?

A.—How late?

Q.—This year the moth was active with us in September.

A.—You might kill a small percentage. I heard Prof. Powell, of New York, make this statement: "Whatever you do, kill all the first brood, and the second brood will take care of itself."

Q.—Don't you think it would be desirable to spray later than the blossom falling period, if not for the moth then for fungus?

A.—No doubt it would have a good effect on fungus diseases. This season, particularly, it would have been beneficial, as we have had nearly two seasons for fungus growth during the past season.

J. C. Harris, Ingersol: My system of spraying differs quite materially from the systems advocated by the gentlemen who have spoken. First, we have no scale in our district. During the last four seasons no one in our district sprayed till the 1st of June when the blosoms had about fallen. I sprayed about sixty acres. I go over the trees as quickly as possible when the blossom is half off. Then I turn round and go over them again as quickly as possible. About three weeks after this, we give a third application. I use practically the same mixture as Mr. Johnson. We have had just as good results spraying after the blossoms fall as spraying before they open. For ten years I have sprayed previous to blossoming. During the last four seasons I have sprayed only after blossoming and have had just as good results.

Mr. Caston, Craighurst: The oyster shell bark louse is very bad. I should like to ask whether the treatment for San Jose scale is equally effective for oyster shell bark louse. This pest does more damage in most parts than many people are aware of. I am thinking of using lime and sulphur, and would like to know what effect it has on oyster shell.

Mr. Johnson: We had this pest very bad in our section, but find that the excess of lime used in our Bordeaux mixture has killed it out almost completely. Three years ago my orchard was very bad, and now it is completely cleaned out.

A. N. Brown, Middleport, N. Y.: I will confine my remarks on commercial spraying to one sentence: Commercial orcharding depends entirely on commercial spraying. Now, as to oyster shell: I should recommend treatment at the time the brood is hatching. In Delaware, which is my home State, it hatches about the middle of June. At that time you can almost kill it with cold water. Mr. Johnson spoke of his formula killing it. It will do so effectively at that time, as it is then very delicate. They will all hatch in from twenty-four to thirty-six hours, and for some time they will hang around the shell as though too delicate to get away from it. The lime sulphur wash will destroy the oyster shell scale when the trees are dormant. When you spray for San Jose scale, if the mixture is properly prepared and properly applied, you destroy not only the San Jose but all these other scales. At the same time you have a fungicide just as valuable as Bordeaux for apple scab and apple fungus, the spores of which are carried over from the preceding season.

I must differ from some of the remarks of previous speakers. This spraying proposition has been my life study. In Western New York this year, the orchards that were sprayed only once for the codling moth were not contracted for by buyers until quite recently. One spraying did not control the second brood. Where you spray your trees properly at the time the calyx is open, you will probably get 90 per cent. of the codling moth, but you cannot control the moth on the outlying trees of your neighbor who has not sprayed properly, and consequently you have a second infestation.

The orchards that were sprayed three times in New York State were contracted for as rapidly as the buyers could contract for them at $2 and $2.25 a barrel. One of the largest buyers told me that they would not contract even at $1.50 a barrel for orchards that had not been sprayed three times, and that the difference was 40 per cent. between two and three sprayings for codling moth. We in Delaware have to spray three times; in California and in some of the Western States they have to spray five and six times.

I would recommend the use of arsenate of lead to the exclusion of everything else. If you have no law to compel the standardizing of Paris green, you do not know what you are getting. Much of the Paris green as sold in the States before the passing of the law was not worth the containers in which it was packed. We hope to secure the passage of a bill at the next session of Congress to compel the standardizing of all sorts of spraying material.

Arsenious oxide is the poisonous agent in Paris green; it washes off very easily. White arsenic or arsenite of soda is the cheapest form of arsenite, but it is also the most dangerous form. In arsenate of lead you have a combination in which there are no dangerous acids. It will go into suspension readily (none of these preparations go into solution—they are held in suspension.)

Q.—What formula do you use with arsenate of lead?

A.—Four pounds to the hundred gallons of Bordeaux mixture or to the water alone. You do not need to use lime with arsenate of lead properly prepared. As regards the tussock moth, if you control the codling moth you will control the tussock moth absolutely.

Prof. Lochhead, Macdonald Agricultural College, Quebec: In spite of what has been said about several broods of codling moth, there is only one brood as entomologists understand it. The codling moth comes out unevenly from its winter quarters. The first eggs hatch about July first with us. But the hatching is delayed in many instances, and the result is that there is a continuous escape of the adult fly from the pupa right through the season, which makes what is apparently a continuous succession of flies. The progression from egg to caterpillar, from caterpillar to chrysalis, and from chrysalis to moth takes place only once each season.

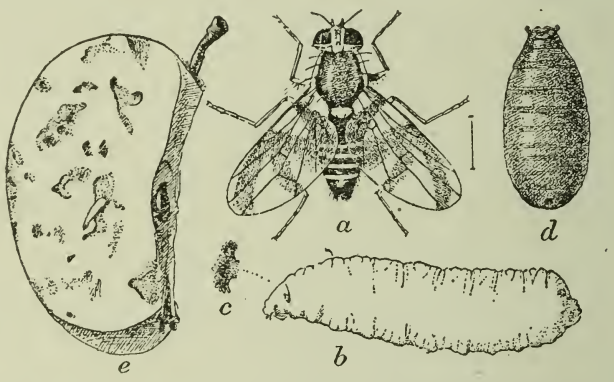
Prof. M. B. Waite, Pathologist, United States Department of Agriculture: Prof. Quaintance made the discovery that what is supposed to be the later brood of codling moth is in reality another insect altogether—the plum moth. The insect that gnaws into the side of the apple, making a hole that resembles that made by the codling worm, but not entering the apple, is not the larva of the codling moth but of the plum moth. This has given rise to a good deal of confusion.

THE APPLE MAGGOT, APPLE TREE CANKER, AND THE APPLE LEAF BLISTER-MITE.

By Professor Wm. Lochhead, Macdonald College, Quebec.

The Apple-Maggot.

The Apple-Maggot, often called the Railroad Worm, is a native of this continent, and had the hawthorn as its food-plant before the introduction of the apple. One would think that the insect would be wide-spread on account of the wide distribution of the host plant, but strange to say, it has not been observed from many parts of the continent where the haw is found. Prof. Quaintance, of Washington, is of the opinion, therefore, that its present distribution has been brought about by the dissemination of infested apples from infested localities. A peculiar characteristic of the habits of the apple-maggot is that its operations are quite local, and that it spreads from orchard to orchard somewhat slowly. This habit excites surprise when it is known that the adult is a two-winged fly which can



Apple maggot (*Rhagoletis pomonella*): *a*, Adult; *b*, larva or maggot; *c*, funnel of cephalic spiracle; *d*, puparium; *e*, portion of apple showing injury by maggots, *a*, *b* and *d*, enlarged; *c*, still more enlarged; *e*, reduced. (After Quaintance.)

aparently fly well. Quaintance records its occurrence in Illinois, New York, Connecticut, Massachusetts, Maine, Wisconsin, Michigan, Vermont, New Jersey, North Carolina, Ohio, Minnesota and Pennsylvania. I have observed it in Prince Edward County, and at Como and Ste. Anne's, Quebec, and Dr. Fletcher has seen it also at St. Hilaire, Que. It will be seen that it is peculiarly an insect of the Northern tier of States, and the adjacent portions of the Provinces of Quebec and Ontario.

Prof. Walsh, of Illinois, bred it from haws in Illinois in 1867, and described it in the *American Journal of Horticulture* for December, 1867.

There is but one brood or generation in a year. The adult flies make their appearance about July first, but they continue to appear throughout the summer, giving the impression that there are more than two broods. Eggs are therefore deposited in the apples from early summer to late fall. A female is capable of producing from 300 to 400 eggs during her life time, which may last a month or more. Maggots hatch from these eggs four or five days after deposition in the flesh of the apple and begin imme-

diately to burrow in the pulp. Characteristic channels are formed through the apple, which are detected by the brown pulp left by the maggot after rasping the pulp to extract the juices. The maggot dos not mature until the fruit is mature, which simply means that the early flies attack the early apples and the later appearing flies the late apples. It does not leave the apple to change to a pupa until the apple falls to the ground or is taken from the tree. When the apple falls the maggot bores a hole through the skin and buries itself just beneath the surface of the ground, or sometimes at the roots of grasses. When the fruit is packed in barrels or in storehouses the pupæ are found at the bottom. The pupæ remain as such until the following summer, when the adult flies emerge.

The eggs are light yellow in color and spindle-shaped. The maggots are footless, and are also of a yellowish white color. When full grown it is about one-third of an inch in length. The body is narrow at the head end, but broadens gradually to the tail end. The pupæ are pale yellow-brown, barrel-shaped bodies about one-fifth of an inch in length. The adults are two-winged flies, smaller than the common house flies. They are of a "general black color, with yellowish head and legs, greenish eyes and dark feet. In the male there are three, and in the female four white bands across the abdomen. Across the wings of both sexes are four black bands."

Preventive Measures. The best preventive measures for the control of insects are those that call into operation cultural methods, such as good cultivation, drainage, timely plowing, etc., etc., as opposed to artificial methods, such as spraying, etc. A thorough knowledge of the life-history of the insect is required in order to deal effectively with it. In the case of the apple-maggot spraying is of little avail, as the larvæ work within the fruit, the eggs are deposited within the skin, and the pupæ lie hidden beneath the surface of the ground. Cultural methods, therefore, are the only ones that can be adopted. There are two or three vulnerable points in its life-history in which it can be attacked successfully. The first is: the maggot leaves the fruit after it has fallen to the ground or has been packed. Prompt gathering and the destruction of all fallen apples before the maggots leave them is perhaps the best way to destroy the apple maggot. If this method were carried out carefully and co-operatively, there is reason to believe that the pest would cease to be troublesome. It is clear that if the wormy fruit is allowed to lie on the ground every facility is allowed the insect to increase.

It should not be a difficult matter to find ways and means of disposing of the fallen infested fruit. Hogs and cattle when allowed to feed in the orchard are effective agents of destruction of windfalls. When pasturing is impracticable for one reason or another the windfalls should be promptly collected and destroyed.

Another cultural method, which is possible and is worthy of trial, is the plowing and cultivation of the orchard for the destruction of the pupæ. As a result of some experiments by Professor Card of Rhode Island on the effect of plowing on the pupæ, it was concluded that while spring plowing had very little effect on the pupæ, frequent cultivation in the early summer resulted in their destruction. It would appear, therefore, that in those orchards where surface cultivation is practised until July first, danger from the apple worm is reduced to a minimum.

Another preventive measure is to attend carefully to the destruction of the refuse of barrels and storehouses in which apples have been stored.

The New York Apple Tree Canker.

From many sections of the country come alarming reports of the effects of canker on apple trees. An examination of some of the orchards reveals the presence of the New York Apple-tree Canker. The cause of this canker is the "Black Rot" fungus, which is commonly found on apples. Prof. Paddock of the New York Experiment Station, Geneva, demonstrated satisfactorily by inoculation experiments that the Black Rot fungus is the cause of the cankers so common on the branches of the trees. The first effect of the canker, after the infection occurs in the spring, is a discolored area of outer bark. These areas soon enlarge, and sometimes encircle the branches. The inner bark is killed, and there is noticeable a definite boundary to the diseased areas. After the disease has made considerable headway the bark loosens and peels off, exposing the bare wood. Of course when complete girdling occurs, the portion of the branch beyond the canker dies. Prof. Paddock believes that the fungus effects an entrance through wounds or cracks. It is very probable also that inoculation occurs very frequently through the agency of sucking insects, as I have frequently observed the infection to begin from punctures in the bark, which were probably made by sucking insects. Professors Parrott and Stewart, of Geneva, have very cleverly shown that the Snowy Tree-Cricket (*Œcanthus niveus*) may be the unconscious agent of the inoculation of twigs by canker.

New York Apple-tree Canker is found more frequently on the larger limbs of well-grown trees than on the smaller and younger limbs of young trees. Moreover, thrifty trees are more resistant than weak and neglected ones. On the bark killed by this canker spore bodies termed *pycnidia* are frequently observed in autumn and winter. The mycelium of germinating spores from these *pycnidia* cannot effect an entrance to the cambium through the living tissue, but can find an entrance through wounds. Paddock believes that in some cases the mycelium may live over winter in the bark, for he cannot otherwise account for the formation of the largest cankers.

Paddock recommends in the line of prevention of canker that trees should not be crowded, and that they be pruned so as to admit sunshine and air.

To sun-scald and sun-burn were previously ascribed such injuries to twigs. It is very likely, however, that the injuries due to sun-scald have been exaggerated, although it is undoubtedly true that trees suffer from this cause to some extent. The sun-scald areas are usually quite characteristic. They run longitudinally, and are usually found on the south and southwest sides of the limbs.

The treatment which has been recommended for the control of this canker is:

(1) To collect and destroy diseased fruit which usually accumulates in orchards on the trees. These, however, often contain the spores of the Black Rot fungus, by means of which the cankers are inoculated in the spring. The destruction of such diseased fruits will greatly diminish the liability of infection of the limbs;

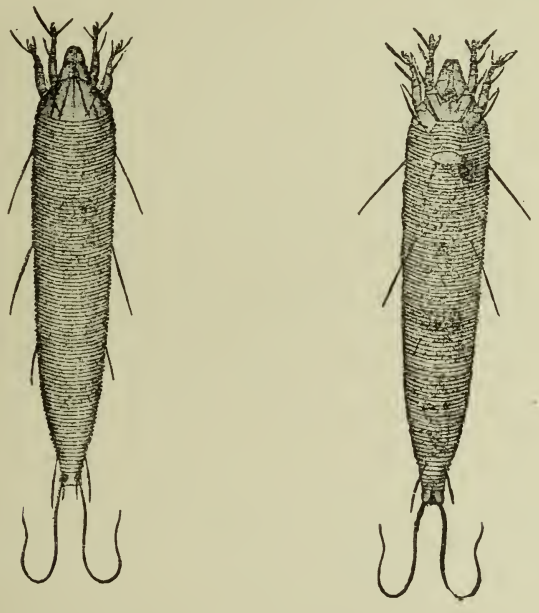
(2) To scrape the cankered areas on the limbs and to paint these areas with a disinfectant, such as copper sulphate, and to coat it with tar or paint;

(3) To cut off the smaller cankered branches wherever possible, and to burn them.

(4) To spray with Bordeaux mixture. Observations in New York have shown fairly conclusively that cankers are most abundant in those orchards that are not sprayed with Bordeaux. Applications of Bordeaux made year after year appear to have a cumulative effect in keeping down all kinds of fungus diseases.

The Apple Leaf Blister-Mite.

This enemy of the apple is an old enemy under a new guise. It has been known for many years in Ontario as a pest of the pear, but it is only within the last few years that its injuries to the leaves of apples in Ontario have been observed and have become worthy of serious attention. In Europe, however, this pest has for a long time been observed on apple leaves.



1 2

Apple Leaf Blister-Mites.
(1) Upper surface. (2) Lower surface. (After Parrott.)

The Leaf Blister Mite is not a true insect; it belongs to the group called *Acarina*, and is known to science as *Eriophyes pyri*. It is a very minute creature, about 1/125 inch in length, hardly visible to the naked eye. It has four legs and a wormlike body divided into a large number of rings by fine lines, and provided with a few pairs of stiff hairs. For the main facts regarding its habits I am indebted to Prof. Parrott, of the New York Agricultural Experiment Station, Geneva, N. Y., who has made a special study of this mite and many others of the same group; and who has very kindly given me the latest information he has obtained in his investigations of a difficult subject.

Life History. The Leaf Blister-mites feed by sucking the juices of the buds and leaves. They pass the winter under the scales of the buds, frequently in colonies. In spring as the young leaves unfold the mites move

out upon them, and soon burrow through the skin of the underside, and feed upon the juices of the soft tissues within. Through the irritation produced by these operations galls or blisters are formed. Within these galls eggs are deposited which hatch in a few days, and the young mites feed on the juices of the leaf. When mature they pass out of the leaves through openings made on the under surface, and betake themselves to other leaves to repeat the same process. Throughout the growing season the production of mites continues, and not until October do they desert the leaves for the buds, where they hibernate.

Nature of Injury to Leaves. As already stated, the main injuries are those done to the leaves, but the fruit stems and fruit are often injured.

The galls on pear leaves are at first greenish, then reddish, afterwards bright red, and finally, with the death of the affected tissues, brown or black, often most conspicuous on the sides of the midrib. When the mites are very numerous the injuries produce defoliation of the trees.

The color of the galls on apple leaves is much less striking than that on pear leaves. The galls are usually more abundant on the margins of the leaves, and are at first greenish, soon becoming brownish, and only occasionally red. The coalescence or merging together of several of the galls produce irregular-shaped dead areas, which often rupture at the margin. Parrott says: "About July first the most striking effects of the mites upon the leaves appear, especially if there is much yellowing of the foliage, as frequently occurs. Upon the upper surfaces of such leaves the mite-infested spots are of a light brown or of a dark green color, and are uniformly brown beneath. These spots are thickly massed, forming a dark, broad band of irregular width along each side of the leaf, which contrasts conspicuously with the intervening light yellow area about the main rib. To one standing on the ground and viewing the leaves from beneath, this striping of the leaves is very suggestive of variegated foliage of certain ornamental plants."

Remedies. Cultural methods are of little value in dealing with this pest. Careful pruning will of course remove large numbers of the mites, but it will not exterminate them. I believe Prof. Gillette, then of Michigan, first suggested in 1886 the use of strong soap suds, and kerosene emulsion during the dormant season as a means of control on pears. In 1890 Professors Comstock and Slingerland, of Cornell University, published (Bulletin No. 23, C. U. Ag. Exp. Sta.) the results of some experiments with kerosene emulsion in the control of the Blister-Mite on pears. In 1893 Prof. Slingerland published (Bulletin No. 61, C. U. Ag. Exp. Sta.) the results of successful experiments using kerosene emulsion. He said: "Our experiments strongly indicate that the Pear Leaf Blister can be nearly exterminated in a badly infested orchard by a single thorough spraying of the trees in winter with kerosene emulsion diluted with from five to seven parts of water."

All these experiments had to do with the Leaf Blister-Mite on pears. In the attempts, however, to deal with the same pest on apple it was found a more difficult task. The Geneva Station has made many experiments. In Bulletin 283, published Dec., 1906, the following recommendations are given, based on spraying operations carried on for two years:

(*a*) *Whale-oil Soap Solution* not effective.

(*b*) *Miscible oil* (1 part to 20 of water) effective.

(*c*) *Kerosene emulsion* (1 part to 8 of water) effective. Two sprayings are better than one, but if only one is practicable, make the application in early fall as soon as possible after the leaves have fallen.

(*d*) *Kerosene* pure—effective—but fruit crop lost.

Since the publication of Bulletin No. 283 the experiments have been continued, and new ones added; and as a result of two more years' work, Prof Parrott informs me that in a Bulletin soon to be published he will recommend strongly the lime-sulphur wash applied in the dormant season just before the buds burst. This application will at the same time take the place of the first treatment of Bordeaux mixture.

THE HANDLING OF THE STRAWBERRY PLANTATION.

By S. H. Rittenhouse, Jordan Harbor.

I start to prepare my land for a strawberry crop one year before the time when I want to set my plants, by manuring the field and planting a hoe crop, such as potatoes, roots, tomatoes or corn. The cultivation of this hoe crop during the previous year puts the land in excellent condition, destroys the weeds and otherwise makes the soil suitable for giving good results when I plant my strawberries. After the removal of the hoe crop in the fall I plow and put on a heavy coat of manure. In the spring I start cultivating early, working the manure into the surface, and getting the land into the very best possible shape for the setting of the plants. On my soil, which is a deep sandy loam, plowing is not necessary, and in fact I never plow manure in anyway.

When the field is thoroughly prepared, I mark both ways, making the rows three feet six inches apart and the plants in the rows from eighteen to thirty inches apart, according to the variety, some varieties make an excellent stand and form a splendid row when set thirty inches or even three feet apart.

I consider that one of the greatest elements that contributes to my success is my choice of the plants at the time of setting. The usual custom amongst strawberry growers has been to take plants from the side of the rows: this of course gives them the small and weaker plants.

In procuring plants I take up the whole row, taking only the best and strongest plants. This plan is along the line of plant breeding, a subject which should receive greater attention by practical fruit growers.

Of course it is scarcely necessary to say that plants should always be taken from a new row, a row grown the previous year and one that has never fruited. Some growers will sometimes take plants from the side of a row that has given a crop, but this should never be done.

The time for setting plants depends, of course, largely on the season. I do not favor too early setting, preferring to wait until the danger of heavy frosts is over—in our district from May 1st to 15th—and have had good results from plantations set as late as May 24th.

Cool cloudy days are preferred, but we do not wait when soil is in proper condition, only taking great care not to expose plants and roots to wind and sun.

After plants are prepared by digging and selecting only the best, and trimming off dead leaves and runners, and carefully straightening out the roots, and placing them compactly in an ordinary eleven-quart basket, I

use a man and a boy for setting. The man with the spade runs it into the soil about six inches, at an angle of forty-five degrees. Instead of drawing the spade out of the soil, he simply presses it away from him to raise the soil up, and then the boy with the plants places the plant behind the spade, the spade is withdrawn and the pressure of the foot completes the operation.

Great care is taken to get all the roots covered, and at the same time prevent the soil from covering the crown. I try to get the crown of the plant about on a level with the level of the field.

I have of late years preferred not to set the strawberry plants into the little track or furrow made by the marker, as it brought the crown of the plant too low down, and made it difficult to keep the crown from being covered while hoeing and cultivating. Therefore, I do not plant in the little furrow, but in one corner of the angle formed by the marker, and am careful to plant in the same corner of the angle all across the field, and when I am through setting the plants, they are in perfect rows both ways, just the same as if planted in the mark made by the marker.

As soon as plants are set we commence cultivating and hoeing, repeating this process every week or ten days until fall.

We cultivate crossways just as long as we can do so without injury to the new runners.

When hoeing the first time we invariably use the fingers around the plant, adjusting the soil so as to prevent any soil lying on the crown or leaves, and always keep the blossoms nipped off whenever they appear.

I consider that it is strict attention to small details that makes the difference between a profitable crop and an unprofitable one.

Towards fall, when the runners have begun to spread, instead of dragging them with cultivator to prevent the rows from getting too wide I cut them off with a roller plow coulter. It is quite a simple thing to attach a rolling coulter to each side of the cultivator with clips, and it does the work nicely and prevents the too thick setting of plants along the side of the rows, which is not desirable.

I have had some trouble with cut worms, but have not done anything to protect against them, except good cultivation of the ground the year previous when under hoe crop.

I do not mulch or use any protection whatever for the winter, and have had little trouble with my plants winter killing.

The following spring we do not cultivate before picking the crop, simply cutting weeds between the rows with a hoe and pulling out of the rows by hand whenever they appear. Great care should be taken not to have many weeds to remove at time of blooming, as much damage may be done to the crop at this time by disturbing foliage and blossoms.

We invariably crop the plantation two years, simply preparing for the second crop by narrowing up old rows after the first crop is picked and continuing the cultivation and keep rows free of weeds by hand the remainder of season.

Spraying with Bordeaux mixture is very important, and is especially so when plantation is kept over for second crop.

I have said nothing about varieties, as it is impossible to lay down a hard and fast rule. It is absolutely necessary that each grower study his own case, what is best suited for his particular district and market.

The Williams is the great commercial strawberry at Jordan. But it would not be so well adapted for a grower who was catering to a fancy local market.

The foregoing fairly describes our practice in handling a strawberry plantation. We do not claim that it is the very best, in fact, we know of many successful growers who follow out a different system. We do know that the strawberry crop has succeeded well with us for a number of years past, and has contributed very largely in making a balance on the right side of the ledger at the end of each year's operations on a small fruit farm in the Niagara fruit belt.

A. E. Sherrington, Walkerton: I prefer to use clover sod or a piece of land that has been in some crop during the previous season for the strawberry plantation, plowing it in the fall, and manuring it and preparing it in the spring. I am not favorably impressed with preparing the soil too well the season previous to planting. I like the rows 3 ft. 6 in. apart, and the plants two feet apart in the rows. Cultivation should be thorough; you cannot have too much in a dry season. The question of varieties depends upon locality. Climatic conditions have a great deal to do with the resulting crop. We may have a splendid plantation when the snow goes off and have a crop failure through light frost or dry weather. It is an important crop, and we realize a good deal from it in a good season; otherwise we make nothing. I take only one crop off a plantation and then plow it down. I find it cheaper to plant than to clean and cultivate the old bed. We have had considerable trouble with the May beetle taking the crop. Care should be taken to pick the berries so that when the customer gets them they will be just ripe. For the local market, a great many growers pick too green. I have seen strawberries on the market that were picked several days before they should have been. Berries should be dry when they are picked. They should not be picked till the dew is off or for some time after a shower of rain. In regard to grading, it can be done, but if we are thorough in cultivation, and have the land well fertilized and properly mulched during the summer, we can handle the fruit very well without grading. It is of course important to have clean packages. In the northern and western towns, I often see packages that are in a wretched condition, and often the boxes are only three parts full. Have clean boxes well filled. We pick the plantation over every other day, not every day, and in that way always have fresh fruit.

W. F. W. Fisher, Burlington: I was very much pleased with Mr. Rittenhouse's address. His views appeared to me both sensible and practical. There are two or three points that cannot be too strongly enforced. It pays to fertilize first before you put in the hoed crop which is to produce the strawberries, and again before you plant your strawberries. There cannot be too much attention paid to the selection of plants. I know there are some people who select their plants more carefully than I do. I am always in a hurry at the time of strawberry planting, but this is not to be recommended, as the selection of plants is always important, and should not be overlooked. Cultivation should be frequent. In marketing, it is very important to cater to the market you are supplying. The fancy local trade wants ripe berries. On the other hand, those who are supplying distant markets, such as Montreal, and the east, are required by the commission men to pick their berries on the green side.

L. A. Hamilton: Some six years ago I planted out a young orchard and set out strawberries between the rows. I do not find that the trees have suffered in consequence. The Ontario apple came into bearing in three years, which would show that it was not detrimental to the growth of the trees, and that an orchard can be established in that way without any cost beyond

the initial cost of the trees. In that orchard the crop of berries of the year before last ran over 5,000 boxes to the acre. Last year the crop was 4,000, and this year 6,500 boxes to the acre. So that I have, during the last three years, while growing a young orchard, produced an annual crop that would net $200 to $225 per acre. In picking, I start my pickers at the far end of a row so that they pick towards the packing house, and save carriers. I think that six baskets in a carrier is too many, as exposure to the sun is very detrimental to the fruit. In the Western States four-basket carriers are used. I use five, and find it an excellent plan, as in bookkeeping it brings in the decimal system. I have two crops from the same plants, and the second is practically as good as the first. We cultivate between the rows for the second crop just as for the first. At the end of the first season we mow and burn over the vines. Care must be taken not to burn in too dry a season, or the crowns of the plants will be burnt. This year for the first time I sprayed my strawberries according to Mr. Johnson's formula, and I attribute to that spraying the fact that I had a larger crop than ever before—far superior berries, and the foliage of the plants remained bright and green until the close of the season.

Mr. Rittenhouse: With reference to yield and returns, the following is my record with the Williams variety:—

1906, $2\frac{3}{4}$ acres, 1,000 crates, gross value, $1,250; 1907, $4\frac{1}{2}$ acres, 1,820 crates, gross value, $3,420; 1908, $3\frac{3}{4}$ acres, 1,140 crates, gross value, $1,375.

Estimating the value of the yield for the three years at $3\frac{1}{2}$c. per box would give a net return of $300 per acre, as compared with a return of $210 per acre for peaches.

OBSERVATIONS ON THE USE OF FERTILIZERS IN GERMAN ORCHARDS.

By Prof. R. Harcourt, O.A.C., Guelph.

Statistics show that, while one-sixth of the cultivated land in Germany is devoted to the growing of potatoes, sugar beets, turnips, cabbage, etc., only one-fiftieth is in orchards and gardens. This statement gives some indication of the relative importance of fruit culture in Germany.

Fruit growing is most successful in the middle and southern part of the empire, especially in Saxony, Franconia, and the Rhine Valley. But I did not see whole districts devoted to fruit raising as may be seen in some parts of this Province. An exception must be made in the case of the grape, which is the most important of the fruits grown in Germany. It is found most extensively cultivated in the Rhine Valley, the valleys of the Moselle and the Neckar, where all the lower slopes of the hills are literally covered with vines. Grapes of somewhat inferior quality are also grown in the valleys of the Saale and Elbe near Dresden.

Comparatively a small amount of these grapes are used for general household purposes, they are almost entirely converted into wine. To show the extent of this industry, it is only necessary to state that recent records prove that the annual production of wine in Germany is about 1,000,000,000 gallons.

My observation of actual orchard conditions in Germany were almost entirely confined to the neighborhood of Dresden, Leipzig, and Halle, or what might be called central Germany. The roads in this part of the country, like those in almost all parts of the old land, are narrow and wind-

ing, a noticeable feature being the absence of fences along the lines of travel. But in many districts a row of fruit trees, principally apples, plums, cherries, flourish on either side of the driveway, and when in bloom they make an exceptionally fine appearance, and take the place of unproductive ornamental trees, such as are seen in many parts of the old land. These fruit trees are the property of the municipality, corporation, or person who owns the road.

The common practice of the country is to sell the crop of fruit early in the summer, just after the fruit is set. The ordinary price is about twenty-five or fifty cents per tree, the purchaser to take all risks of the fruit being stolen, and to do all the work in connection with spraying, picking, etc.

The same evidence of thrift is manifest in the planting the sides of gullies or ravines with fruit trees. On one farm visited there were 16,000 trees planted on the steep sides of a ravine. The place where the tree was planted was terraced and kept free from grass. The fruit from these trees was sold in the same way as that along the road sides, and the otherwise waste land—for no stock is pastured—was made to do its share in increasing the profits of the farm.

One feature of the cultivation of the soil everywhere in evidence was the thoroughness with which it was done. The German farmer has not as many labor saving implements as we have, but labor is cheap, and they do not hesitate to make use of it. As an instance of this I may cite the case of one 2,000 acre farm visited. On this farm there were several hundred acres of potatoes and sugar beets, nearly 100 acres of peas and beans for canning, 90 acres of asparagus, besides rye, wheat, barley, and oats. All the crops, with the exception of rye, were hand hoed, and the ground was as clean and as free from weeds as a well kept garden. On this farm there was no orchard, but the sides of the lanes and rough places were planted with fruit trees, which were both ornamental and profitable.

Another point that is particularly striking to a stranger is the amount of trellis work in orchards and on their fruit experimental grounds. On either side of the main drive at the Diemitz Fruit Experimental Station there are rows of trellised apples and pears. These may or may not be profitable, but they show the methods of doing this work, and certainly add variety and beauty to the orchards. The trellising of fruits, as for instance, pears, on the sides and ends of old buildings, is very common; thus serving the double purpose of covering up the wall and improving its appearance, and of increasing the total revenue of the farm.

By way of further increasing the returns from the land, it may be interesting to know that fertilizers are quite extensively used on all farm crops. But the Germans admit that they have not studied the characteristic food requirements of the fruit crops so fully as those of the cereal and root crops. The subject, however, is receiving a great deal of attention, and as a result many valuable conclusions have been reached. It was my good fortune to visit several farms where fertilizer experiments on fruit crops had been carried on for several years. Among the most interesting of these was a series of experiments that had been carried on for sixteen years on an orchard at the Diemitz Fruit Experiment Station. The object of the experiment was to ascertain the effect of each of the important fertilizer ingredients on the growth of wood and the color, size, flavor and the yield of fruit. In other places there were special experiments with the various kinds of small fruits.

It is impossible in an article of this kind to discuss the results obtained in each individual experiment, but I shall endeavor to give in a general way some of the impressions gained as a result of my observation and through conversation with those in charge of the experiments.

In the first place, it would seem to be fairly established that the manurial constituents required per acre for the full development of fruit trees does not materially differ from that required for root and vegetable crops. But extensive experiments have repeatedly indicated that hoed crops, such as potatoes and sugar beets, make a better use of farmyard manure than fruits. It is further agreed that commercial fertilizers cannot take the place of stable manure, but that the best results are obtained when both are used, the one supplying humus and some plant food, and the other supplementing the deficiencies of the mineral constituents in the stable manure.

At Diemitz and Stassfurt, I had a good opportunity of observing the results of the application of fertilizers on the apple orchard, which, after grapes, is the most important fruit of Germany. In both places experiments have demonstrated that mixed fertilizers, containing the three essential manurial constituents—potash, phosphoric acid, and nitrogen—can be used with profit, but that the lack of potash affects the results more than any other one constituent. Where potash was not supplied, even though light dressings of stable manure were made every three or four years, the trees have assumed the appearance of those grown under adverse conditions, on poor soil, etc., the growth of wood is arrested, the leaves are small and have an unhealthy color and are covered with yellow spots. After the fruit is matured there is some growth of wood, and the next spring there is put forth an abundance of blossoms, of which, however, few develop, owing to the lack of proper nourishment. In spite of the fact that there is an abundance of phosphoric acid and nitrogen in the soil, most of the fruit falls off during the summer. and in consequence, the yield obtained when potash is not supplied is very little greater than when no fertilizers are used. I may say, however, that these conditions are not general—certain varieties showing a marked ability to thrive under unfavorable conditions. In fact a number of these varieties which were pointed out to me form strong wood and large leaves, and apparently possess the ability to throw off the superfluous fruit which the tree is not capable of fully maturing. Lack of nitrogen in the soil has been shown to have a somewhat similar effect upon the development of the fruit, although not so pronounced; while the absence of phosphoric acid is even less noticeable.

Experiments have fully demonstrated that the use of a complete fertilizer will more than double the yield of plums. Where nitrogen was omitted, the yield was much lower, and where phosphoric acid was lacking it was still lower. In fact, the results of German investigations appear to indicate that the yield of stone fruits is more influenced by phosphoric and nitrogenous manures than core fruits. It is quite possible that this is due to the fact that stone fruits have a large kernel which is rich in phosphoric acid, and, as the proportion of the kernel to fruit is much larger in stone fruits than in core fruits, the former have a greater need for phosphoric acid.

The results of fertilizer experiments with gooseberries indicate that potash is the most important constituent in influencing yield. With some varieties phosphoric acid stood second and nitrogen third, and with others the nitrogen ranked second and the phosphoric acid third. It would, therefore, appear that, while different kinds of fruits make use of the various manurial constituents in different proportions, the different varieties of one kind of fruit also have their own peculiarities, which have to be studied.

Strawberries have been found to respond readily to the application of commercial fertilizers. The study of their requirements is not so difficult as are those of other fruits. This is partly because they come into bearing

quickly and partly due to the fact that they are generally grown in rotation with vegetables. Experiments have demonstrated that the complete mixture of fertilizers give the largest yields, and that, on ground in good condition, the plot that received no nitrogen gave nearly as good results, while if either potash or phosphoric acid are omitted, the yield is seriously diminished.

From these observations it is not surprising to find that the general opinion among many German fruit growers should be that potash and phosphoric acid are of the utmost importance in the development of fruit bearing trees and bushes. Even if these constituents are applied in excess no harm will be done, whereas an excess of nitrogen may injure the trees, and, besides, exert an unfavorable influence on the composition of the fruit. Large applications of nitrogen to strawberries, especially if the season happens to be a wet one, causes the berries to begin to decay early. Apples are said to be similarly affected, while gooseberries, raspberries, and currants are affected to a lesser extent.

Regarding the quality and flavor of fruit, the results of German investigators show that the presence in the soil of an abundance of phosphoric acid and potash is extremely important; on the other hand, where nitrogen is somewhat deficient the effect on the quality was scarcely perceptible.

Considerable work has been done on determining the influence of the several ingredients on the size of individual fruits. With core and stone fruits the experiments are not far enough advanced to warrant definite conclusions, but with berries, a greater number of results have been obtained, and these appear to indicate that the lack of phosphoric acid did not materially decrease the size of the berries as compared with those grown where a complete mixture of fertilizers was used; but when potash was not applied the berries were smaller; and where the nitrogen was left out, they were still smaller.

Another question which is receiving a great deal of attention is whether a different action is detectable when nitrogen is applied as nitrate of soda or sulphate of ammonia or horn meal, the phosphoric acid as ground bone or superphosphate, or the potash as the chloride or sulphate of potash. So far as I was able to learn, no definite results have been obtained.

The problem of what quantities of fertilizers must be used to force maximum crops and whether these large quantities will sufficiently increase the yield to pay for the extra cost of the fertilizers is also being studied.

Laboratory investigations are being made to ascertain the amount of the fertilizing constituents in the various fruits and the distribution of these in the plant.

In conclusion, I may say that the Germans appear to have proved to their own satisfaction that the use of commercial fertilizers on general farm crops is profitable, and they are now making a serious effort to gather sufficient data to enable the fruit grower to use these substances intelligently.

President PEART: Too many of our orchards are decidedly lacking in food. The problem with most of us is what special food should I give? Each one tries to be economical in the management of his business, and if we had information as to what was the proper food to apply to a given orchard and to a given variety of fruit in that orchard, it would be of very great service. The matter is now open for discussion, and I should like to ask Prof. Harcourt whether it is the practice of German fruit growers to use commercial fertilizers largely?

Prof. HARCOURT: So far as I was able to judge, they are using them largely for all crops, including fruit.

Q.—How would you apply potash in this country? Would wood ashes answer?

A.—It is a question of buying them right. If you knew the materials from which they were made, you could form some idea of what they were worth. Ordinary ashes do not contain more than five or six per cent. of potash. Some samples we have analysed have contained as low as half per cent. I would not for a moment say that good wood ashes should go out of the country, but would like to put in the caution I have mentioned. We can usually estimate 5c. per pound for potash in ashes. With 5 per cent. ashes that would mean 25c. per 100. Then there is a little phosphoric acid and lime, which would raise it to 35c. per 100, at the very outside. If you have any way of knowing that they have not been leached, they may safely be bought at that price.

Q.—Would it be better to pay $5 or $6 per ton delivered than to buy commercial fertilizer?

A.—The form in which you buy potash in commercial fertilizer would be either as sulphate or chloride of potash, and you would pay 5c. or 6c. per pound.

Q.—How would 12c. a bushel do for ashes?

A.—If a bushel means 60 lbs., I think you would be safe at that figure.

Q.—How does the price there compare with here for ready mixed fertilizer?

A.—As a rule, they buy the different constituents and mix them themselves, which of course is the right way.

Q.—Is sulphate or muriate of potash best for potatoes?

A.—Chloride of potash should never be used on potatoes where you care for the quality and mealiness of the potatoes. In Germany a great many potatoes are grown for starch making, in which case it does not matter.

Q.—In using potash, how would you apply it?

A.—It may be applied when the soil is being cultivated. There is no loss of potash from the soil. It is therefore better to apply it early, and allow time for combining with the soil.

Q.—You would not put nitrate of soda with your other fertilizer when you plant your potatoes, would you?

A.—Nitrate of soda should be fed to the plants.

Q.—You will get better results sometimes from ground bone the second year than you will the first?

A.—It depends on how finely it is ground. It should be ground quite fine.

Q.—Is it cheaper to buy rock phosphate or ground bone? The former is $14 per ton and the bone meal about $30.

A.—Rock phosphate will not come into solution in the soil so readily as bone phosphate. I would not hesitate to use rock phosphate on soil that is rich in humus if I wanted to build up a reserve on that soil, but not for immediate results.

Q.—Would there not be some nitrogen in the bone?

A.—That is removed before it is ground.

Q.—When you use 10 tons of green barnyard manure per acre each year, what proportion of phosphoric acid would you add to get results on an ordinary soil?

A.—Ten tons of green manure would be equivalent to about 75 lbs. of phosphoric acid. But the annual application of ten tons of farmyard manure would give too much nitrogen for the growth of the plant, although it would in itself contain enough potash and phosphoric acid. That is a point

to consider in mixing fertilizer with farmyard manure. Farmyard manure may be used to give humus in the soil, and then build up on the other side with commercial fertilizer. I should be inclined to use much less farmyard manure than that and build up with ash constituents. Unless you have plenty of humus and give good cultivation, you will not get the value of the potash.

Q.—How would you fertilize grapes?

President PEART: I might attempt to answer that question. I have three acres on light, sandy, gravelly loam. Perhaps once every five years I apply barnyard manure and the rest of the time I use potash, usually muriate, at the rate of 200 lbs. per acre. The last time I used sulphate, as I thought that possibly the sulphur element might tend to prevent mildew of the grape, I do not know whether that is scientific. The general results have been very good.

Prof. HARCOURT: I think it is generally recognized that potash is the fertilizer for grapes.

Q.—In regard to rotted manure, is this really what we have been supposing it to be, or have not the best elements been rotted out of it? My experience is, that rotted manure may be very well as a stimulant in the spring, say on early vegetables, but that as an application on the surface of the soil, it is by no means equal to green manure.

A.—I think it largely depends on how much leaching has taken place during the rotting processs. You cannot rot the constituents out of it, but they become soluble and may be washed away. There is no doubt at all that the quicker you get farmyard manure on the ground the greater the value you get out of it. Green manure has a very beneficial effect on the texture of clay soils, improving their physical condition. Heavy applications of coarse manure on sandy soil will, on the other hand, open it up too much, so that it will not hold water.

Q.—Can you get any idea as to the contents of a car load of stable manure from analysis?

A.—If the sample were taken in a great number of places through the car, you might get a fairly representative analysis.

Q.—What is the relative value of farmyard manure from different classes of stock?

A.—As a rule it is a mixture from all classes of stock.

Q.—I have in mind where a farmer feeds 40 or 50 head of cattle on a heavy grain ration in winter.

A.—That would be the richest kind you could buy, richer than from dairy stock.

Q.—Would the grain furnish potash?

A.—There would be more potash from the straw; the grain would furnish phosphoric acid. About 90 per cent. of the phosphoric, nitrogen and potash contained in the feed would occur in the manure from full grown animals, as these animals are putting on principally fat. In the case of young animals, the amount of these elements that goes to the manure pile would not be more than 60 per cent. This is not the case, however, with cows giving milk.

Q.—What fertilizing element is responsible for color in fruit?

A.—I asked this question a number of times when in Germany, but never got a satisfactory answer. The feeling was that when an abundance of the ash constituents—potash and phosphoric acid—were present they felt very much surer of color than would otherwise be the case. If we want fruit to be of the highest quality as regards texture, firmness, color and keeping

qualities, it must go along with ash constituents, and not with too much nitrogen. Where the trees are too thick, and the fruit too much shaded, of course you get poorly colored fruit.

Q.—At what time would you apply manure?

A.—Whenever you can get it on with the least labor. That may not apply to hilly ground, however, as a great deal of it might reach the low ground in the spring.

Q.—Is there very much loss hauling green manure out to the field and allowing it to heat?

A.—You cannot rot manure in any form without loss of nitrogen. Whenever you can smell ammonia, there is nitrogen going off in that form. However, the best time to get manure on the ground is as soon after it is made as possible.

Q.—Our soil is a little sandy?

A.—Then you have to sacrifice a little nitrogen for the sake of having rotted manure, or else cut the straw before using it for bedding.

Q.—What proportion of the potash and phosphoric acid is contained in the liquid manure?

A.—The liquid contains most of the fertilizing constituents.

Q.—And that is lost in a good many stables?

A.—Yes, when we say that 90 per cent. or more of the different elements is left in the manure pile, it is taken for granted that the liquid is properly looked after by using enough bedding to absorb it.

FUNGOUS DISEASES OF ONTARIO ORCHARDS, PEACH YELLOWS AND PEAR BLIGHT.

By M. B. Waite, Pathologist in Charge, Investigations of Diseases of Fruits, U. S. Department of Agriculture.

I am called upon to discuss two very common and destructive diseases of the orchard; peach yellows, the most dangerous and deadly disease of the peach tree, and pear blight, the contagious and destructive disease of pomaceous fruits. Neither of these diseases is preventable by spraying.

I will precede this discussion with a short account of the treatment of some of the prevailing fungous diseasese in this section, and will tell something of sulphur as a fungicide, particularly the new self-boiled lime-sulphur mixture.

Sulphur vs. Copper as a Fungicide.

Although both sulphur and copper have been known to possess the property of killing fungi for many years, sulphur antedates copper as a practical fungicide. It was in fact in use long before the year 1886, when the word "fungicide" was coined. The discovery, widely published in 1885, by Millardet, at Bordeaux, France, of the remarkable fungicidal properties of the copper-lime mixture, put copper far in the lead as a useful fungicide. Since that time it has been brought out that the practicability of this mixture depends not alone on the copper. It is the peculiar combination of copper and lime and its resulting properties that gives it its value. Much experimenting has been done with other compounds, mainly of copper, yet to this day no compound of copper has been found approaching it in value. The peculiar properties of Bordeaux mixture are that it is harmless, or nearly

harmless to most plants when sprayed on them during active growth, it sticks tightly for weeks and even months on the plant after it is applied, it is nearly insoluble, and yet will dissolve just enough in rain water to give this sufficient copper to kill most fungi. There is no trouble in finding poisons and chemicals that will kill the fungi; the problem is to find poisons sufficiently insoluble so as not to hurt the plant and yet which will continually give off just enough of the fungicidal material to do the work when needed.

During the last twenty years, Bordeaux mixture has been recognized as the most satisfactory fungicide available. We can now, it is believed, use sulphur in somewhat the same way. Let us think for a moment what we have available for experimentation in this connection. Beginning with the simplest form, we have flowers or flour of sulphur, which can be used for dusting on a plant. The California grape growers use it for mildew on the grape. It is almost insoluble in water, but by making a cream of lime, and mixing the sulphur with it, we have, after it has cooled, a spraying material consisting of lime and sulphur in an uncombined state, with the lime water to fasten the sulphur on the plant. This form is used only on the tenderest of plants.

Second, take sulphur and lime, five pounds of each per barrel; put the lime in the barrel and pour on cold water. Then at once add the sulphur and stir them up together, and you have cold-water or self-boiled lime sulphur wash.

Then, if you use hot water instead of cold water, you get greater heat and a little more of the sulphides. This makes a most beautiful mechanical spraying mixture.

Then, as you know, we have the boiled lime and sulphur, in which after slaking the lime and sulphur together, you add heat and keep up the cooking process until all the sulphur is brought into solution. I might add to this the factory boiled lime and sulphur, which is a concentrated solution of the latter class of preparation.

Q.—At what time would you apply the self-boiled lime and sulphur for peach rot?

A.—Four times; first, when trees are dormant; second, when the peaches are well set, the third to follow in two or three weeks, bringing the fourth about a month before ripening.

Q.—Is there any method of controlling pear blight by treating the soil?

A.—No; there is a method of influencing, but not of controlling; you can control it to some extent.

With sulphur we have had available for use either the extremely soluble compound, like the boiled lime-sulphur wash, which scorches or burns living plants, the liver of sulphur, which has to be used extremely dilute when applied to the foliage, and which is readily soluble, so that it washes off with rain, or else the comparatively insoluble flowers of sulphur. The latter substance is not sufficiently active as a fungicide to be used alone.

The Self-Boiled Lime-Sulphur Wash. Recently, through the investigations of Mr. W. M. Scott, of the U.S. Department of Agriculture, the peculiar value and desirable properties of the self-boiled lime-sulphur wash have been discovered. This mixture is very simply made by adding the flour or flowers of sulphur to the lime before slaking. No heat is used except the heat produced by the slaking lime. The value of this preparation was discovered by Mr. Scott in seeking a remedy for brown rot of the peach. He found not only that this mixture was an excellent fungicide, preventing the brown rot and black spot of the peach, but when properly made with a small quantity

of soluble sulphides, it could be applied to peach foliage with perfect safety. For the first time, then, we have a practicable fungicide, with fairly good sticking qualities, slowly soluble and not injurious to peach foliage. It may also be sprayed on the sensitive Japanese plums. This important discovery was made in the season of 1907, and very satisfactory results were obtained. In the season of 1908 they were repeated by Mr. Scott and his assistants, and by some other investigators, and great success was attained in the prevention of several of our leading diseases. This gives us practically a new fungicide, which is in many ways a rival of Bordeaux mixture. It does some of the things that Bordeaux mixture will not do; on the other hand, it does not quite equal Bordeaux mixture as a fungicide, and unless a better form is discovered than we have available now, this mixture should not displace the standard Bordeaux except where the latter is injurious.

The important point has been gained, that in the treatment of peach diseases where the use of Bordeaux mixture or any other copper compound had to be abondoned, we still have a most excellent and thoroughly practical fungicide. From the results obtained from recent experiments, it is quite probable that on the Ben Davis, and possibly even on the Baldwin apple, where russetting by Bordeaux is a serious matter, we can still spray our fruit with a fungicide that will give satisfactory results.

Furthermore, attention should be called to the fact that this sulphur spray, while slightly inferior to Bordeaux mixture, is a most excellent insecticide, especially for certain types of insects. It is the deadly enemy of mites and scale insects. The self-boiled lime-sulphur mixture was tried as a scalecide on dormant trees and put in the background by the more active form of sulphur in the boiled lime-sulphur wash, but it looks as though we had here an excellent scalecide, thoroughly satisfactory for use when the trees are in foliage, in addition to its other merits as a fungicide. It is expected that the entomologists will work out the exact status of this spray as an insecticide. However, at the present time they do not advise its use as a dormant spray.

Factory-Boiled Lime-Sulphur. Recently, several of the chemical manufacturing firms have put on the market stock solutions of the boiled lime-sulphur wash. These are more perfectly prepared, at least from a chemical standpoint, than the ordinary home-boiled wash. They remain in perfect solution and require only dilution with water to be ready for immediate application. Recent experiments have shown these preparations to give excellent results in the summer treatment of the more resistant plants, like the apple, cherry, and others, in comparison with Bordeaux. If the factory-boiled solutions can be put on the market with sufficient economy they may have very widespread use, not only in supplanting the self-boiled and the boiled wash, but also in competing with Bordeaux mixture.

Apple Scab.

The principal fungous diseases of the apple in Ontario, preventable by spraying, is the apple scab, caused by the fungus *Venturia inaequalis*. This disease, which is very susceptible to the influence of wet weather, is only preventable in a moist season by thorough spraying. The first treatment should be made when the trees are in bud, the second when the last petals are falling, the third about two weeks later, the fourth two or three weeks later, and the fifth a month later, making the last treatment occur the last week in July or about August 1st. The fungicide giving the best results for this is the standard Bordeaux mixture, say the 5-5-50, or, if the spraying

is done copiously, the 4-4-50 formula will answer about as well. The new self-boiled lime-sulphur wash gives good commercial results when sprayed on the same dates, and, if we had nothing better, would be considered entirely satisfactory; but the Bordeaux mixture slightly exceeds it in efficiency. It is slightly more persistent, sticks on the fruit and foliage more thoroughly, so that the longer intervals between the latter sprayings are slightly more effective. To either of these mixtures one-quarter of a pound of Paris green per barrel, or, from one to two pounds of arsenate of lead may be added for codling moth and other insect enemies.

Pear Scab.

The pear scab, caused by a related fungus, is amenable to the same treatment. In both of these diseases, the factory-boiled lime-sulphur has been shown to give good results when diluted sufficiently so as not to burn the foliage immediately after application. One part to forty, or perhaps one part to fifty, concentrated stock solution is the dilution required. If these preparations can be brought to the standard and rendered non-injurious, they will make a very convenient spray mixture for this purpose.

Cherry Leaf Blight.

Both the sweet cherry and the sour cherry over a large part of Michigan and New York State have been very severely defoliated by the cherry leaf blight fungus, *Cylindrosporium padi*. This disease seems to have increased in severity during the past few years, until cherry growing without spraying is almost impossible. Further south some of the varieties of cherries have been killed off, or rendered worthless, commercially, by the repeated attacks of this leaf blight. Some of the varieties of plums, notably the Lombard, are so badly defoliated by the same fungus as to require treatment. Fortunately, two or three thorough sprayings with either the standard Bordeaux mixture or the self-boiled lime-sulphur give perfect results in preventing this disease. Two or three treatments, the first made after the trees are in full leaf, and the second and third following at intervals of three to four weeks, give most excellent results.

Peach Curl Leaf.

Probably the most important fungous disease on the peach in this section is the curl leaf. This is also perhaps the easiest of all fungous diseases to prevent. The plants can be rendered almost entirely free from it by a dormant spraying. From the fact that the trees are dormant when treated, almost any fungicide can be used with entire satisfaction. The treatment with standard Bordeaux mixture of the 5-5-50 formula is slightly superior to any other. Even the simple solution of copper sulphate, 3 pounds to the barrel, answers fairly well. Probably the best general treatment of the peach orchard is to spray it with this standard boiled lime-sulphur wash, since this will prevent not only the leaf curl, but the San Jose scale and certain other insect enemies. The factory-boiled lime-sulphur apparently answers just as well in this case. This single treatment can be made either in the fall or early spring. It can be given just before the buds begin to swell in early spring, or, if this interval is too short, and for other reasons it is more convenient, it can be applied in the fall after the leaves are off.

Peach Brown Rot.

In certain wet seasons where the heat and moisture are unusually great, peaches are attacked by the brown rot fungus. This disease is especially prevalent and destructive in the humid Southeastern United States, from Pennsylvania southward, but occasionally it does bad work in the Lake States and in Canada. Fortunately, through the investigations of Mr. Scott, with his self-boiled lime-sulphur, in the season of 1907, this malady is now added to the list of commercially controllable diseases. On account of the entrance of the fungus through weather cracks, caused by moisture, and through insect punctures, it is rarely possible to control more than 90 per cent. of the disease, but to one who has seen the frightful destruction of a crop attacked by this fungus, 90 per cent. seems large. The standard mixture for this disease is made by placing five pounds of stone lime in a barrel, pouring over it five pounds of flour or flowers of sulphur, and slaking the lime with just sufficient cold water to do a good job, and give a creamy, pasty mass. This should be stirred occasionally and the barrel kept covered for twenty minutes with gunny sacking, or some similar protection. At the end of that time it should be diluted with cold water to the capacity of the barrel. It can be used at once or kept for several hours diluted, but should not be kept in concentrated form, as it gains in soluble sulphides.

The treatment for Monilia or brown rot fungus entirely prevents the the black spot of the peach, often a serious disease. In fact, one or two treatments for this disease alone will often pay a good profit. This treatment should be made about three weeks after the blossoms have fallen, when the young peaches are, say, three-quarters of an inch long, and can be followed by a second one, three or four weeks later.

Pear Blight.

Description. The well known bacterial pear blight, caused by a tiny bacillus, is one of the prominent orchard diseases in this part of the country. It attacks particularly the pear and the apple, but also affects the quince, the Siberian crab apple, the wild crab apple, the Hawthorns, and practically all the fruits of the pome family. The germs producing the disease enter the tree in three different ways: first, and most commonly, through the blossoms, being distributed from flower to flower and tree to tree very widely through bees and other flower visiting insects; second, through the tender tips of growing shoots, including the water sprouts at the bases of the trees; and third, directly into the fleshy bark. Infections of this latter type are few in number, but result in a very serious form of the blight. The amount of damage resulting from an infection may vary enormously. Thousands of infections simply kill the blossom cluster or a few inches of the tip of a growing twig. On the other hand, the blight may run down on to large branches, or run clear to the ground, killing the whole tree, or it may spread from a lateral infection, doing more or less damage. The spread of the disease, the number of infections, and the amount of extension of the blight on a tree after infection are dependent upon a number of different conditions. The factors controlling an outbreak of pear blight may be summed up as follows:

1. The presence of the germ and the amount of holdover blight available for reinfection.

2. The amount of bloom on the trees. It is difficult for young orchards to catch the pear blight until they bloss m.

3. The number of insect visitors available. This is largely, however, constant if the next is favorable.

4. The weather during blossoming time. If the weather is favorable for insect activity and nectar secretion, the blight germs are generally carried about. On the other hand, rainy weather or cold, dry sunny weather discourages the spread of blossom blight.

5. The variety and species of the tree. Each different horticultural variety and each species of pomaceous fruit has a different relative resistance to the disease.

6. The age of the tree. Young trees are more susceptible than older ones. The most susceptible age comes at the time the trees are first in bearing, say the first four or five years they are in bearing.

7. The vigor of growth. This is influenced by fertility of the soil, soil moisture conditions, favorable weather, artificial manuring, fertilizing and cultivation. In general, those conditions most favorable to vigor of growth of the tree are most favorable to the blight, and, conversely, those influences which dwarf or check the growth of the tree tend to hinder the progress of the blight.

Most of the blight dries out in the trees during the summer. On the other hand, occasionally at the bases of the blighted twigs, or more commonly on the thick fleshy bark, on the large limbs and on the bodies of the trees, the blight keeps slowly progressing until the close of the season. The germs die out in the dead bark, but keep alive on this advancing margin, and the cool, moist weather of winter, though it checks their growth, tends to keep them alive until spring. This type of blight we call "holdover blight," and is the source of the new infections each season when the trees spring into growth.

Collar Blight. I wish to call particular attention to the forms of pear blight known as body blight and collar blight. Body blight occurs abundantly on young trees, more particularly on young Bartlett and other pear trees, but it may even kill young apple trees. Frequently the blight gets into the thick, fleshy bark on the body of young trees, either by running in through a fruit spur or water sprout, or by means of the punctures of insects or mechanical injuries. Possibly the germs may enter directly into the fleshy bark through growth cracks. Once in the fleshy bark the germs rapidly spread in all directions. They extend vertically in the direction of the vessels and fibres more readily than they do laterally. Oftentimes the infection is at the ground line or at the collar of the tree. Sometimes even below the soil line. The blight then spreads on the moist bark in all directions. Below the soil it more readily spreads in a lateral direction around the collar and down the bark of the roots. Frequently large irregular areas are formed, and quite often they girdle the trees, absolutely killing them. Sometimes a V-shaped area runs up from the point of infection on to the body. French stocks are often more susceptible to blight than the grafted top, even though the latter may be the susceptible Bartlett. Trees affected with body blight usually take a year to die. This is unlike the branches, which are, of course, killed by the blight of the current season. Trees often live another year, and sometimes a second, even though completely girdled, and show the destructive effects the season after the blight has done its work. Sometimes the blight germs have died entirely out of the bark and the dead bark has dried up, and yet the tree dies the following year from girdling. In case of a collar blight, where it does not completely girdle the tree, the tree often takes two or three years or more to die, but finally does so from the girdling. A small amount of blight at the collar or around the body does the maxi-

mum amount of injury. This type of blight may be regarded as the most injurious, and more trees are killed by this form, as a rule, than from blight in the top. It is also the hardest for the orchardist or inspector to find. However, it produces one very striking symptom that often leads to its detection. The foliage on these girdled trees, or even on the particular side of the tree attacked, begins to take the reddish autumnal color from midsummer on. In walking through the orchard after the first of August, these reddish trees or reddish parts of trees are usually distinguishable from a distance. These premature reddened or bronzed leaves often contrast very strongly with the normal dark green foliage. This is particularly true of well kept orchards. The reddening of the foliage is not always an infallible guide, as sometimes branches color their leaves red from other diseases, root troubles, girdling by mice, and unknown causes. On examining these reddened trees, however, the blighted area can usually be found.

At least two types of frost injury also very closely resemble pear blight at the collar. In one of these the tree is injured from the soil line upward, usually on the sunny side, but not always so. Blight is easily distinguished from this winter sun scald when the latter occurs as an elliptical area on the main trunk of the tree from the soil or snow line nearly to the branches. On the other hand, another type of frost collar girdle reaches but little above the soil line, or only occasionally extends upward in a V-shaped area, but spreads well under the ground, partially or wholly girdling the tree. Still another type, is that of root winter killing. In this case the roots near the surface of the ground are frozen and killed, while the top of the tree may or may not be injured by frost. It is necessary to know these other collar injuries in order to distinguish them from true collar blight.

Treatment. Referring again to the factors influencing pear blight, it will be noted that the presence of the germs is of primary importance. If the pear blight germ is not present in the orchard or in the immediate vicinity, there can be no blight. When spring opens up and new growth begins, if the germs are present or conveniently nearby, and the conditions favorable, blight has a great opportunity to spread and accomplish its work of destruction. If, on the other hand, the germs do not occur, no matter how favorable conditions may be, there can be no blight. The main method of controlling pear blight is to cut out the holdover blight. This is usually best done in late summer and autumn, but it may be done at any time through the winter or early spring before the blossoms appear. When blight occurs on the main limbs or on the collars of the trees, one of the principal things in combating the disease is to find all the cases, especially where the blight occurs under the rough bark. It requires close examination to find and remove all the blight in the top of the trees, but this can best be done in the summer or early in the autumn, while the foliage is still on, the blackened dead leaves enabling one to easily locate the blighted branches. Summer cutting out of pear blight must be regarded, however, as of secondary importance in the treatment, though still a good thing to do, when followed by later treatment. On rapidly growing twigs and branches it is usually necessary to cut a foot or more below the lowest discoloration of the bark. In fall and winter pear blight cutting, it is usually possible to cut pretty close to the blight, say four to six inches, or, where it has thoroughly died out an inch may do. On the other hand, when the blight blends off imperceptibly from the dead bark into the live bark, as it often does in summer, from one to two feet below the lowest point may be considered necessary.

In all work of cutting out pear blight a disinfectant should be carried to sterilize the tools and cut surfaces. For this purpose, one of the most convenient germicides is a 1-1,000 solution of corrosive sublimate. A bottle of

this can be carried in the pocket, and a sponge, tied to a string, kept saturated with this solution. After trimming out the blight or removing the blighted bark from a diseased area, the cut surface, as well as the instruments, should be sterilized before turning to another infection. It is possible with proper tools, such as a gouge, draw shave, or box scraper, or better, a specially made scraper, to remove the bark from a blighted area, disinfect the surface and thus save a large limb or the trunk of the tree instead of removing the same. All small limbs which can be easily spared should be cut out in removing the blight. The object of the treatment of pear blight is to cut all blight from the trees and save all the healthy parts that can be saved. Blight completely kills the bark of that portion of the tree which it reaches, but leaves the rest of the tree wholly uninjured. The only exception to this is where the girdling effect is produced by the blight at the collar or on the branches. Very few orchardists thoroughly know and understand pear blight. It has been with them so long that they regard it as one of the inevitable troubles of the pear, and in fact the apple as well. Still less generally known are the modern methods of controlling this disease by eradication.

Peach Yellows.

Cause of the Disease Unknown. The cause of the peach yellows is unknown, but it behaves precisely like a parasitic disease. It is contagious, spreads through the orchard from colonies or from individual trees which become centers of infection, and is distributed from tree to tree and orchard to orchard by natural methods unknown to investigators. In all respects, therefore, it acts like a parasitic contagious disease. Up to the present time all microscopic and bacteriological methods of investigation have failed to reveal any parasites. Investigation along these lines have been wholly negative, although they have been pursued especially in years past with great persistence and thoroughness. It seems almost certain that had it been an ordinary germ or bacillus, the methods employed would have revealed the same. It is hard for me to believe that the disease is not a parasitic disease, however, and that some day the parasitic organism will be found. The failure to find the cause of the disease or any definite parasite associated with it put this discussion of peach yellows, which I am called upon to give you, on a different plane from that of the ordinary fungous or bacterial disease of plants. However, by comparison with definitely known germ diseases, such as pear blight, and with a general knowledge of physiology and pathology, we may be able to steer clear of false theories and make the most of the facts available.

Symptoms. The most reliable symptoms of peach yellows is the prematuring and red spotting of the fruit. Another symptom almost equally certain is the bushy or wiry twig growth often resulting from premature pushing of lateral buds. Diseased trees, more or less promptly, assume a sickly or yellow color in their foliage. The leaves often have a peculiar roll and droop. After the second year the twigs and branches begin to die back, and the tree gradually dies from the top down, ordinarily becoming totally dead at four or five years from the appearance of the first visible symptom.

The leaves on trees affected by this disease usually turn yellow rather promptly. This results in the common name of the malady. However, frequently when the trees are first attacked and the fruit decidedly red spotted and premature, on the whole tree or on certain branches the leaves, instead of yellowing, become even darker colored and larger than normal.

That is to say, when the yellows first attacks strong, vigorous trees, it sometimes stimulates the tree, both fruit and foliage, before it begins to weaken it. This may even hold true the second year in some cases. The twig growth is shorter on such trees. They behave like trees on which summer pinching of terminal buds is practiced. Ordinarily, however, especially on trees under average cultivation, the yellowing of the inside leaves begins as soon as the premature fruit appears. Sometimes these leaves are distinctly rolled upward toward the mid-rib and droop and curve inward by the bending of the leaf stem and mid-vein. This symptom is more or less variable just as the presence of the yellows sprouts may or may not be prominent.

Other Causes of Yellowing. I hardly need to say here that many other causes produce yellowing or discoloration of foliage. These other yellow effects need have no relation whatever to the yellows and, of course, occur on most all trees and plants, whether they are affected by the yellows or not. Some of the principle causes of yellowing of the foliage of peach trees, in addition to borers and frost girdling, are starvation or poverty of the soil, particularly nitrogen starvation, the fungous root rot, sour soil, root aphis, the root knot or eel worm disease, root winter killing, and various other root troubles. These diseases, except the fungous root rot, are all more or less curable and non-contagious, and, of course, should never be confused with the true yellows. A yellow peach tree, therefore, does not necessarily mean a tree affected by peach yellows.

Related Diseases of the Yellows Group.

Two other diseases should be mentioned in this connection as they belong to the same general group as the yellows. They are the "little peach" of the Northern States and peach rosette of the South.

Little Peach. The little peach is particularly important inasmuch as it occurs quite seriously in Michigan, New York and Ontario. This disease resembles yellows in many respects, particularly in its foliage symptoms, yet it is very distinct, in fact the opposite in other respects; namely, its fruit symptoms. The fruit on trees affected by little peach is undersized, belated in ripening, but similar in color and appearance to the normal fruit. Especially in the imperfectly developed specimens, it is rather flat and insipid, but not so distinctly off flavor as in the case of the yellows. The fruit may be only slightly reduced in size in mild cases, or in extreme cases may be reduced to tiny peaches less than three-quarters of an inch in diameter. Trees affected by the little peach rarely produce the wiry, bushy growth. When forced to throw water sprouts by heavy cutting back or winter killing, they do to some extent make twig growth resembling yellows. Trees with the little peach *usually* roll their leaves upward and droop the foliage as yellows occasionally does. The leaves begin to discolor on the inside of the tree, especially on the main limbs and the yellowing proceeds outwardly as the season advances. Little peach is quicker than yellows, killing the tree ordinarily in three years instead of four or five years. The twigs die back from the top in the same way. It apparently spreads more rapidly in the orchards, and since it has not the premature red spotted fruit, its symptoms are more obscure and more difficult to recognize. This makes it rather harder to handle than the yellows. The little peach occurrs mainly in Michigan, Western New York, and to some extent also in Ohio and Pennsylvania, and New Jersey.

Peach Rosette. The rosette, which occurs in Georgia and the neighboring State of South Carolina and also to some extent in Missouri and Arkansas, is still another disease of the same type. It is only interesting to Ontario growers for comparison. The affected trees produce small, very short, bushy growths, like extreme cases of the yellows, but they are so dense as to form small rosettes or bunches of leaves on the trees. The affected trees usually throw their fruit while it is still small and the trees, in fact, are usually dead by the time the fruit should ripen. Occasionally trees partially affected produce small, green, shrivelled, and imperfectly developed fruit, but it is not premature. On the healthy side of half diseased trees, which only rarely occur, the fruit is normal. The trees mostly die, root and branch, before the season is over. This rapid death of trees affected by rosette is a distinct advantage to the orchardist as the disease mostly eradicates itself.

Host Plants of Yellows Group. Peach yellows occurs mainly on the peach, but it also occurs on the Japanese group of plums sufficiently to be of importance as a plum disease. So far as we know, other plums are not affected by it. It also occurs on the nectarine, the smooth form of the peach, and on the almond and apricot. These latter are of course only occasionally grown within the range of this disease.

The little peach is known only on the peach and Japanese group of plums. It may possibly also attack some other stone fruits. The Japanese plums are so peach-like that they form ready hosts for these diseases.

The rosette occurs on the peach and on the native Chicasaw plum, and probably also on the Japanese group of plums.

Apparently peach yellows and peach rosette are native American diseases. If this is the case they are doubtless diseases of our native stone fruits just as pear blight is with the pome fruit. Rosette is very probably a disease of the wild Chicasaw plum. Little peach may possibly be a native American disease, but I very much doubt it, since it only recently appeared and the date of its appearance some twenty years ago corresponds with the introduction of the Japanese plum into American horticulture. My suspicion, therefore, is that it was introduced with the Japanese plums, but further investigations, particularly in Japan, would be necessary to determine this.

Yellows on Nursery Stock. Unquestionably yellows can be budded into nursery stock. This has been done experimentally, notably by Smith. I have done it myself in a number of cases. Naturally well-marked specimens are selected for this purpose. Nurserymen ordinarily would not bud from pronounced cases of the yellows. On the other hand, incompetent help may secure bud sticks from diseased trees; but what is more likely, buds may be cut from incipient or incubating cases which do not show the true symptoms at the time. Smith transmitted the diseases by budding from the apparently healthy side of a diseased tree. Unfortunately buds cut from yellows trees slightly affected grow fairly well in the nursery.

This is not the case, however, when pits are used from diseased trees. So far, all attempts to grow trees from diseased pits have failed. Recently I planted one hundred pits from trees well marked with yellows, with premature red spotted fruit, and 100 pits from typical cases of little peach. None of these grew. Not a single seed germinated. In all cases, so far as I know, where pits from well-marked diseased trees have been used, a similar result has been obtained. If this could be assumed to be always true, it would remove one great possibility of reproducing the disease. Unfortun-

ately we do not know what happens when pits are taken from trees only slightly affected or from incubating or incipient cases. There is then a certain amount of suspicion justifiable as to trees propagated from pits grown and buds cut in yellows infested districts. I am inclined to think that this possibility of yellows transmission has been rather overworked, however, by orchardists.

Replanting after Yellows. The trees can be replanted where yellows trees have been dug up, and they will live and bear well. This has been demonstrated repeatedly for over forty years, both in New York State and Michigan. I recall very clearly some excellent cases of this sort in the Niagara County Fruit Belt in the orchards of Dr. C. A. Ring and Mr. Jesse Lockwood. Some orchardists have combated this idea, and held the opposite opinion, but it should be remembered that replanted trees have the same opportunity to catch the disease as the original tree. In fact, experience shows that yellows causes less trouble in replanting, and the same thing is true of little peach disease, than root rot, black peach aphis, eel worm disease, or other root diseases. All of these in fact live over in the soil and cause serious trouble on the young tree set in the place of the one dug out. This is, of course, quite another matter from the yellows question.

Method of Control. In the early discussion of peach yellows around Philadelphia, mention was frequently made of destroying the diseased trees. It seems to have occurred quite frequently to orchardists that this was the proper thing to do. In the outbreak at Benton Harbor in the early seventies, it was not only discussed, but actual eradication was carried out by a number of men. The most decided step in the promotion of this method of fighting the disease seems to have been made, however, at South Haven, Michigan. A committee appointed by the South Haven Pomological Society, reporting in 1874, stated that where cases of yellows had been found in certain orchards and promptly removed, two years before, none occurred at the present time. They also brought out the point that new trees planted in the same place, were growing finely and appeared to be vigorous and healthy. They showed that it was impossible to cut off a single limb affected with the disease and that even where two affected peaches were found on the end of a limb and the limb removed, the yellows still persisted and destroyed the tree. The South Haven Pomological Society seems to have been the first Society to persist in advocating and promoting the eradication of the yellows. The results were watched with interest by the Michigan growers and were in the main satisfactory around South Haven. Other districts in Michigan have followed their example, usually, however, after being hard hit and partially or wholly wiped out before they were willing to take up the work. In New York State a great many of the better class of growers have been eradicating this disease for twenty years or more. I can cite the case of Mr. Jesse Lockwood and Dr. C. A. Ring, both of Olcott, New York, as excellent examples, also the orchard of Mr. Willard Hopkins, of Youngstown, New York. In these cases several nearby orchards less carefully handled have had serious destruction from the yellows and little peach.

Eradication Tests. About six years ago when the writer's investigations led him to the conclusion that little peach belonged to the yellows group, an eradication test was started in a definite area in Saugatuck Township, Michigan. This area contained about seven square miles, was thickly planted to peach orchards and had about one hundred and forty thousand peach trees. There was some four or five thousand trees diseased that were found the first season. A small proportion of these, however, were affected

with yellows. Three inspections were made and the diseased trees were removed with a fair degree of promptness after each inspection. The next year only between four and five hundred diseased trees were found, being only a small fraction of 1 per cent. A slight increase of somewhat over a thousand trees was found the third season, evidently due to a local outbreak in the neighborhood, but the total number of diseased trees in this area was less than 1 per cent. Only about one-fifth of these were affected with yellows, the remaining four-fifths being little peach. Similar results were obtained by the local yellows commissioners in the fourth season, which was 1906, and the orchards in this area are still standing in good condition as far as the yellows and little peach are concerned.

A similar eradication test was started by the Department of Agriculture in 1906 in an area of some six or seven square miles around Youngstown, New York, in co-operation with the Cornell State Experiment Station, through arrangements with Professors Bailey and Craig. In general it may be stated that from the eradication tests where careful records have been made over a considerable area and from the experience of the best worked orchards, of which there are a large number in Michigan and a good many in New York, it is considered that when ordinary conditions obtain, the annual loss from the yellows should be reduced to less than 1 per cent. per annum where prompt and careful eradication is done.

What is Good Eradication. We have always considered that three annual inspections, when properly made at the right time were sufficient for finding the affected trees. It need hardly be mentioned that the important thing about this work when it is really undertaken is to find the diseased trees. Their prompt removal, after being found, is a secondary matter, which is to be taken for granted . Ordinarily three inspections are sufficient. In Ontario the first one should be made in July or perhaps about August 1st; the second one should be made the latter part of August or about September 1st, and the third late in September or even running over into October. If a previous eradication has never been carried out, all plainly diseased trees should be removed as soon as they can be noted in the spring. It is always a good thing to inspect a block or row of peaches when they are ripening or about to ripen their fruit. Then the symptom of premature fruits can be utilized. It is always a good plan to have the pickers instructed to call attention to every tree with suspiciously large or premature, red spotted fruit. Orchards should be inspected tree by tree, row by row, thoroughly, regardless as to whether they are supposed to have the disease or not. In this way unsuspected cases will often be found.

It seems to me that where a severe outbreak occurs, doubling the number of inspections may well be advised. That would mean pretty nearly an inspection about every two weeks from the first of August. It certainly is advisable to make a very late inspection in October so as to prevent, if possible, the disease carrying over another year.

The orchardist or inspector is often puzzled over a doubtful case. He dislikes to condemn a tree for removal unless certain that it is diseased. To my mind, however, the real doubtful cases which are not plainly caused by some other disease or injury should invariably be removed. One is certainly taking chances of leaving infection behind when he leaves these uncertain cases. It should always be borne in mind that the removal is done for the benefit of the healthy trees left behind.

Inspection Laws. Undoubtedly the best results are to be secured in districts where every orchardist will be his own inspector. No outside man

can more quickly and accurately detect this disease than a peach grower in his own orchard. He knows the appearance of the trees on every different piece of land, soil, type and exposure, and keenly recognizes and watches any change of symptoms which could be attributed to the yellows. On the other hand, it is absolutely necessary, to secure good work in a community, to have official inspectors. The reason for this is that many growers, although constantly in the presence of this disease, do not learn to recognize it in its early stages, especially when the trees are not in fruit. Furthermore, there are a good many trees in gardens or by the roadsides or otherwise out of commercial peach orchards that would receive no attention. To secure proper uniformity, therefore, some sort of an official inspector, no matter by whom paid, should be employed. The smaller the unit, the better. The less territory an official inspector must cover, the more thoroughly he can be expected to accomplish his work. As a matter of fact only a few orchardists in my experience have ever done strictly first-class work in eradicating the yellows. Many orchards otherwise well cared for by progressive and enterprising growers are still somewhat neglected in this regard, and it is a question in my mind whether the recent severe outbreak in Southern New York and Connecticut cannot be to some extent attributed to carelessness on the part of the growers. I have been through these States every summer for the last four years and have been surprised to see the yellows left so commonly scattered about.

Disposal of the Diseased Trees. A word in conclusion as to what to do with the yellows trees after they are found. The main thing, of course, is to find the diseased trees, but when they are found, with our present lack of knowledge about the disease, we feel that the only safe way is to dig the tree up or pull it up with horses and destroy it by burning. Perhaps the very safest way of all is to bring dry wood into the orchard and burn the tree on the spot or in the center of the colony, if there are several trees, without dragging it out. As a matter of fact, however, there has been so little unsatisfactory experience as to make this seem an extra precaution. Possibly it might be advisable to pull the trees up and let them wilt or dry out before removing from the orchard. At any rate, there seems to be abundant evidence that a dead peach tree, though it may have had the yellows, is not dangerous in transmitting the disease. Never cut the tops off of yellows trees and leave them standing. Such trees may still sprout out new growth and from the yellows standpoint are still in action. Kill the tree, root and branch, at any rate. Many orchardists wish to use their yellows peach trees for fuel, and, while this is not supposed to be absolutely safe, I have seen good results in many cases where this was done.

Summing up, therefore, I should say that if you wish to be extra careful concerning infection, burn the tree at once, but if the tree is promptly pulled out and allowed to dry you have probably done all that is possible in killing the disease.

Above all, the best advice I can give you is to pull out and destroy every peach tree in the Province which shows the slightest symptom of the yellows next season. If this is carried out, especially if repeated for two or three seasons in succession, all the previous history and experience connected with this trouble points to success in bringing this malady under control. New orchards can then be rapidly planted out and the peach industry renewed under more favorable conditions than ever.

It is ordinarily necessary to take fairly good care of the orchard, at least to give it fair cultivation and fertilization, in order to tell diseased trees. If trees are weak and sick from nitrogen starvation, growing in

uncultivated and neglected weedy orchards, it is often times impossible to properly inspect them. On the other hand trees over-stimulated with fertilizers, especially nitrogenous manures, may fail to show the yellowing or leaf symptoms promptly.

THE COMMERCIAL STATUS OF OUR STANDARD VARIETIES OF FRUIT.

Apples.

W. H. Dempsey, Trenton: The district I represent comprises the eastern part of Hastings and the Counties of Northumberland and Prince Edward. Among the fall apples in our section of country, Duchess stands first.

Gravenstein is not doing as well as Duchess, but can be grown over a larger area than at present. Alexander comes next, and wherever I have observed it growing, it is doing remarkably well. Then comes Fameuse and McIntosh Red. Wolf River does remarkably well all through the eastern part of Hastings and Northumberland and Prince Edward. Buyers have apparently lost sight of the fact, however, that it is a later fall apple than Alexander, and it is being picked too early in our district. Ribston Pippin is another fine variety. Blenheim I find very successful. In some sections it is one of the most productive varieties; in other sections it is not so productive. Soil and atmospheric drainage seem to have a great influence on it, but where it can be grown, it is a very profitable apple. Greening is doing very well. Seek-no-Farther is doing remarkably well in many locations. Nonsuch is one of the best for light limestone gravel, producing large, fine apples in abundance. Spy is doing well wherever there is good atmospheric and soil drainage. Baldwin seems to be a sectional apple, like Blenheim. Adjacent farms will sometimes not produce Baldwins equally well, but where it can be produced, it is one of the best.

Golden Russet on certain clay soils is doing remarkably well, and also on a few of the sandy loams. Cranberry Pippin does well in special locations, producing as heavy crops as any variety.

The varieties mentioned comprise fifteen that all do well in the district in which I live, and all are of good quality with the exception of Cranberry and Baldwin, the quality of which I would not place as high as the others.

As to their susceptibility to fungus, canker and pear blight, Duchess has a small amount of fungus, and I have found some pear blight on it, but not much. Gravenstein I find quite subject to canker in some locations. Alexander is slightly subject to canker, and there is some blight on it in some sections. On McIntosh, I find but little canker, but the fungus is bad, as it is on Fameuse. Wolf River has been fairly free from this pest, so far as I have observed. Ribston Pippin will canker some, and so will Blenheim. Greening, Baldwin, Spy and Seek are probably as bad as any on the list for canker. I have found both canker and blight on Golden Russet in some sections.

Q.—Are any of these varieties so subject to spot or scale that they should be eliminated?

A.—No, none of that lot; we can thoroughly control scab with Bordeaux mixture.

Q.—Is there any apple on which scab is so difficult to control that the variety ought to be eliminated?

A.—McMahon might be so classed.

Q.—It is not worth keeping anyway.

A.—No. I find the Spy extremely bad in some locations; also Greening and Baldwin.

I should like to mention the fact that I am continually receiving enquiries about worthless varieties which we have been condemning for years, because some agent takes hold of them and recommends them. For instance, Longfield; we find quite a number growing in Hastings, Prince Edward and Northumberland. These orchards have been very difficult to sell. Longfield, Scott's Winter, Bismarck and Lawver should not be planted in our section. Also Ozark, which is nothing more than Gano, or Black Ben Davis.

Q.—What do you think of Wallbridge?

A.—I would not recommend planting it in our district.

A MEMBER: Or in any other.

PEACHES.

J. L. HILBORN, Leamington: While we grow some of the same varieties of peaches in the Essex district as you do in Niagara, there are many varieties, which you grow largely, of which I cannot speak definitely of my own experience. I will give you a list of the varieties we are chiefly growing. I have left out white peaches, as I think all will agree that yellow varieties are more profitable for us.

The Triumph we are ceasing to plant. The tree does not do well with us after it is six or seven years old. By keeping it heavily pruned and well thinned, we get a fairly good crop for its season, but Dewey being about the same season and a much better peach, we are ceasing to plant Triumph. Dewey is also subject to rot, but not so much so as Triumph; but as the trees get to be seven or eight years old, we find them rotting somewhat. That was the great trouble with Triumph.

St. John does very well a little north-west of me, where the soil is a trifle heavier, but it is subject to some fungus disease, and the fruit appears to be stung by curculio. The tree also exudes gum in many cases.

Garfield does splendidly with us and is very free of all disease, but a rather shy bearer. It would be the best of its season if it bore more.

Bernard used not to be very clean, but since we have been spraying for other troubles, it has been growing very fine fruit. By keeping the trees well pruned and well cultivated, we get fair size and nice clean fruit.

Crawford: What few peaches we get are nice, but we get so few that we are ceasing to plant it. Fitzgerald is much the same.

Engol Mammoth is the best peach of its season with us, being very free from blemish, bearing regularly and not requiring much thinning. New Prolific ripens about the same time and is pretty nearly as good. It does not grow quite so large, but is productive, and free from fungus trouble.

Elberta comes in just after it. It does not grow so rugged with us as on slightly heavier soils, and does not bear well on an average. It is very susceptible to curl leaf, but as we have to spray for other things and the curl leaf is so easily controlled, I do not think it should count very much against it.

Kalamazoo: I think I was the first to introduce this variety in our section, and I do not know if you in the east are acquainted with it. It should be classed along with Engol Mammoth in its season, or perhaps about

a week later, and it is the best peach of its season. It grows very clean, and its fruit is particularly free from blemish. There are very few culls. It does not color quite as well as Engol or Crawford. It is a good size, and we have difficulty getting three rows in the basket. It sheds more fruit than any variety I know of, and even then it usually requires some thinning.

Longhurst, Hill's Chili and Wager are disappearing entirely on account of fungus. Kalamazoo is entirely replacing them, being about the same season.

Q.—Is it as good quality as Longhurst?

A.—I think it is better.

Q.—It cannot be better.

A.—Well, not better for canning purposes. They say Longhurst, if you get it full grown, is a splendid canner, but it is not as profitable on the market as Kalamazoo.

Q.—Do you find it a larger peach?

A.—Yes, on an average, and it runs very even in size.

Crosby comes in after that. It does well with us. By keeping the trees fairly well pruned, thinned and sprayed, it grades a satisfactory size, and the quality is good.

Banner is one of our best peaches, but it is hardly as free from fungus as some, but nearly so, nor is it as even in size as some; it bears heavily.

Golden Drop is a few days later in most seasons. It grows very clean and nice as a rule, but in wet seasons there is a little fungus.

Lemon Free is a good canning peach, and does well, but is not as attractive for the market as some others. It is very hardy, and a great bearer.

Smock is not grown as much now as formerly. The tree is inclined to split and break down when there is a heavy crop. Banner is taking its place.

Salway is not planted to any extent on account of late ripening, although in some seasons it does well. This year it sold as high as any variety.

Pears.

W. F. W. Fisher, Burlington: There are a great many varieties of pears, but only a few have been thoroughly well tested for our district. Our plantations of late years have been confined largely to Bartlett, Standard, Dwarf Duchess, and the much despised Kieffer. A grower wishing to extend the season would probably plant Wilder, Giffard or Lawson, and Boussock. Boussock we have not tested commercially, not having had it long enough to say as to its merit, except that it has good quality and fine appearance. The most delicious pear we have is Sheldon, but it does not hang on the tree sufficiently well in many seasons to be profitable.

Q.—Does it bear well?

A.—Yes, with age, and it has this to recommend it that it will get age, which is not the case with a good many varieties.

Q.—What about Boussock in respect to blight?

A.—It is very free from blight. I would recommend it for a young man to plant, as the tree will live as long as he will; but it is late coming into bearing.

Q.—What about Anjou?

A.—It has good quality, is a good grower, but a shy bearer in most instances. It also with age and on a heavy soil will, I think, bear well.

Q.—Do you recommend Clairgeau?

A.—It is a much better bearer, and of much poorer quality. It may be presumptuous for me to differ with some authorities on the subject of pear blight, but I think that some of the precautions advised are quite unnecessary. You might as well kill a man as scare him to death. I do not agree as to the necessity of sterilizing pruning implements and that sort of thing. I have made experiments. I have cut off limbs having the worst cases of blight, and then, with the same saw, have cut off healthy limbs on healthy trees, and have never known a case in which the bacilli were transferred to healthy trees in this way. I think it is wise to paint large limbs where cut in pruning as a precaution against blight, and in order to keep the weather out and render the tree immune from diseases that might enter through large wounds.

Q.—What do you think of Howell?

A.—An excellent pear of good appearance and fair quality.

Q.—What is the most susceptible pear to blight?

A.—Clapp's Favorite. I have a few rows running across my orchard with Kieffer on one side and Boussock on the other. Clapp's Favorite have been very full of blight, but it has not been transferred to the varieties on either side. Bartlett is very subject to blight, but still very profitable. Planted 15 feet square, you get 200 to the acre, and even at a low price, they will show a profit. With dwarfs we get practically 400 to the acre, and with the trees yielding about half as much of a crop, we get practically the same result.

Q.—With trees subject to blight would you recommend keeping the land poor or having it rich?

A.—If you keep your land poor and do not prune your trees, they will not blight so much, and they will bear a lot of inferior fruit. I would rather take chances of cultivation, get a few crops of nice fruit and then take the trees out.

Q.—Don't you think that less nitrogen and more potash might be beneficial?

A.—I don't know; I am not acquainted with the use of commercial fertilizers in a large way.

Q.—Manuring with barnyard manure and rapid growth on wet land would make trees susceptible to blight.

A.—I agree with you.

Plums.

E. D. Smith, Winona: Plum growing during the past season has not been very profitable, and on that account is perhaps of not as much interest as some other topics. It is, however, one of the main industries in the Winona district, and about a hundred thousand baskets have been grown and sold there in each of the past two seasons. The lowest price this year was 15c. a basket of 11 quarts. That is a very low price, but even at that, while there is perhaps no profit to the grower, there would be no loss. It looks to me as though this season represents the worst that can come to plum growing for many years. There are many reasons for this. Last year there was a heavy crop, and from 50c. to $1 per basket was realized. On account of the high prices paid by the canners, they were unable to profitably dispose of the season's output, and this year they did not want any plums practically. Thus, one of our best markets for plums, the one that last year took practically all, was absent. In addition to that, times were the worst for many years, and the demand was not good except at very low prices. But in spite of that, the whole crop moved off at prices that left a slight margin of pro-

fit. They were all sold, and I can remember years when a considerable portion of the crop remained on the trees. The canners will require some plums another year, and I think we may look for some improvement in trade conditions. Then there are a number of old orchards in our section that have been planted fifteen or twenty years and cannot bear much longer, while there have not been many plums set out for some years past. A year ago last spring I set out two or three thousand plum trees, and if I had suitable land, I would not be afraid to plant to-day.

Q.—What varieties?

A.—I would not plant Abundance. There is a large number of these trees over the country. A gentleman said here yesterday that he would plant Abundance; the variety has gone out in our section. I would plant Burbank; it is a heavy bearer and good shipper, and is fairly good quality. It has so many good all round qualities that I would plant it. Lately we have been planting more late plums. Years ago we would have planted Washington, but would not do so to-day. As time goes on we discover many new varieties of plums that supersede to a large extent those planted years ago. Hudson River Purple Egg is a favorite of mine. It is a strong-growing tree and a good bearer. The plum is of good size and color, and a good shipper. I think it would be all right for anyone in Southern Ontario where plums are grown successfully. I am speaking particularly of the district where there is a large shipping industry. We must look to distant markets as we have pretty well occupied Ontario, Quebec and the Maritime Provinces. We can reach all this country by express, and a good deal by freight. We now have to reach out to the North West market, which is expanding at a tremendous rate. By selecting good shippers, we could lay our plums down there by express, if we had reasonable rates, and could take the whole of that market when plums were cheap.

Reine Claude is the variety planted most largely in our section. It is not only a good shipper, but is in demand by the canners at all times. It is of choice quality, a heavy bearer, but somewhat tender perhaps.

Of the newer varieties, I would plant Monarch. It is a fine, large, blue plum and a heavy bearer. It comes into the market after the glut of Lombard is over.

Grand Duke is a large, fine plum, and a heavy bearer, but not as good a shipper as Reine Claude or Hudson River Purple Egg.

Q.—Would you plant any Lombard?

A.—I think the time is approaching when Lombard should be planted. I would advise planting some.

Q.—Empire?

A.—It is a good plum, but the tree is not a strong grower.

Q.—Lowrey's Gage?

A.—We introduced that variety; it is extra early, but does not bear well now.

Q.—Imperial Gage?

A.—It is inclined not to bear well. It bears almost every year with me but not heavily.

Q.—The Dawson?

A.—There is a demand for a certain quantity, but I think the market could be easily overstocked. It is an excellent shipper.

Q.—Is not Archduke and Grand Duke the same plum?

A.—Practically the same.

Q.—Would you plant Prince of Wales?

A.—It is a handsome plum, and very desirable, much handsomer than Lombard.

RESULTS OF ORCHARD SURVEY WORK IN NEW YORK STATE.

By Prof. Chas. S. Wilson, Cornell University, Ithaca, N.Y.

The subject I am presenting is a new line of work which has been started in the states and which has proved one of the most valuable and practical works ever done in orcharding.

I feel that this work is connected more or less closely to the interests of the fruit growers of Canada. In the first place, the work has been done in the counties of New York State bordering on Lake Ontario, counties which are neighbors of your Canadian Dominion. In the second place, the work was suggested and begun by one who formerly was a member of this Association, who was born and brought up within your borders, and who is known and loved by many of you, Prof. Craig.

In the summer of 1902, at a meeting of the New York State Fruit Growers' Association, held at Olcott Beach, Prof. Craig suggested that it would be an important part of the work of a Fruit Growers' Association to take up a definite study of the orchards in the leading fruit growing sections. The executive committee was keen for the project, but had no funds at that time to carry it out. In the winter of the same year, Prof. Roberts, who was then Director of the Cornell Experiment Station gave the necessary authorization and funds and the work was begun.

The word survey may be somewhat misleading. It does not mean, as the word might convey from the Civil Engineer's standpoint, the accurate measurement and the number of acres in the orchard, their location, etc. It means more than that. It means that a detailed record and history of the operations and products of that orchard for a period of five or ten years. Reference to the blanks which I have passed about will give you some idea of the work, and if you will refer to these, I shall try to explain to you how the work is performed, the tabulations made, the accuracy of the results and their value. In the first place, the work is done by a surveyor, so called, a graduate student of the College of Agriculture, who has taken his work in Horticulture. This surveyor visits personally every orchard in the county or state and takes records of the different factors entering into its production. For example, in the case of the soil management factor, the surveyor will secure information from the owner as to how that orchard has been managed for the past ten years. Has it been tilled for ten years? Has it been in sod? Or is it tilled part of the time and in sod part of the time? If it has been tilled, how often each summer is the work done? If it has been in sod, has it been pastured with hogs, or with cattle, or with sheep, or not pastured? So, in the case of the spray, data is secured relative to the mixtures which are used, the number of applications, the machinery, the effects of the spray, etc. Detailed records are made of each one of the different factors which are represented on the blanks, and then, most important of all, a record is taken of the yields and prices per bushel. The practical value of the work depends upon a comparison of the yields and income. It is important, therefore, that data relative to these be secured. This data is taken for five years back.

After the surveyor has visited all of the orchards in the county, the work having been done in the summer when orchards could be best inspected, that is during August and September, the records are brought to the office and tabulated. The tabulation is done in this way. For example, let us take the tillage factor, we divide the different methods of tillage somewhat as follows:—

Tilled ten years or more. Sod three years at least.
Tilled five years or more. Sod five years or more.
Tilled three years at least. Sod ten years or more.

Then we take the records of all the orchards which have been tilled ten years or more, putting the number of such orchards in one column and the number of acres included in these orchards in another column. We add the yields of all the orchards and divide by the number of orchards. This gives us the average yield of an orchard under that method of treatment. The same for the income, this gives us the average income per acre. We do this for all the different treatments under this one factor which gives us our tabulation on the basis of average yields and income in such a manner that we can compare side by side the real results the fruit growers are securing under the different treatment. We do this for all the different factors and make out our tabulation in the same way.

Now the question of the accuracy of these results is one of great importance. One might think that inasmuch as some of the records given by the fruit growers are estimates, that these estimates would make the result of the survey inaccurate, but this is not true. Of course some of the records of the yields and prices are estimates, but usually the grower knows definitely for three years back and can estimate closely for the other two years. Often when we have several estimates, the net average gives us accurate figures. The orchard survey is built up on the law of averages, and the law of averages, when a great number of orchards are considered, is accurate. Let me give you an example to show how accurate these averages are. One of the men at the College was presenting the surveys at a meeting, and he wished to impress upon the minds of the members the accuracy of these averages. In order to do this, he brought into the meeting a number of slips of paper on which were struck off a single line of the same length less than an inch in diameter. He distributed these slips of paper and asked the members to guess on the length of that line. There were 30 guesses made, varying from a minimum of $\frac{1}{4}$ of an inch to a maximum of one inch with all intermediate lengths. These guesses were averaged and the average of the 30 guesses gave him .723. He had measured the line before coming into the meeting and the nearest measurement he could make was .72 inch. Thus the average of those 30 guesses gave a more accurate measurement of that line than the measurement itself. Now in our orchard survey work, we are dealing not with 30 surveys, but with hundreds of surveys, many of which are definite, only a few of which are estimates; hence, our results must be accurate.

And now for the results which we have secured. I wish to state that there are four factors concerned in the good care of an orchard, tillage, pruning, fertilizing, spraying, which are important to the good management of that orchard and none of which ought to be neglected. I shall give you this morning only the results which we have secured from the orchard survey work on tillage and spraying. Do not conclude from what I shall say that these are the only two factors. The others are equally important. Below are given the results of tillage:—

Five year average per acre	All Orchards.				Well cared for only	
	Niagara		Orleans		Orleans	
	Bush	Value	Bush	Value	Bush	Value
Tilled ten years or more	280	$120	327	$182	337	$189
Tilled five years or more	254	100	274	138	296	148
Tilled at least three years	239	97	225	113	234	121
Sod at least three years	209	67	222	107	242	118
Sod five years or more	197	76	204	108	258	134
Sod ten years or more	194	75	176	87	232	117

Let us see what these figures teach us. If we look at the figures for Orleans county, we see that in the case of all orchards, those that were tilled 10 years or more, gave 86 per cent. larger yields than those which were in sod ten years or more, and those which were tilled 5 years or more gave 34 per cent. larger yields than those in sod 5 years or more. In the case of the orchards well cared for, only those which have been tilled ten years or more give 45 per cent. larger yields than those in sod 10 years or more, and those tilled 5 years or more 15 per cent. larger yields than those in sod 5 years or more.

Another interesting thing is shown by this table. We often hear the question discussed, are apples grown on sod better than those grown on cultivated land. The answer is generally given in favor of the sod apples because of their higher color and early maturity. As a matter of fact, buyers have been paying more for those grown on cultivated land than for those grown on sod. If we look at the figures of Niagara county, we find that for those grown on land tilled 10 years or more, the average price per bushel is 43 cents. Those grown on sod 10 years or more, the average price is 38 cents. In Orleans county, the average price of tilled apples is 56 cents per bushel, and the sod apples 50 cents per bushel, or in other words buyers have been actually paying 15 cents to 18 cents per bushel more for those grown on tilled land than for those grown on sod. Whatever the opinion of the fruit grower and the buyer, the facts shown by these figures cannot be denied.

But all orchards are not tilled, and it would not be good for all orchards to be tilled. As a matter of fact only about 5 per cent. of the orchards of these counties are tilled year after year, where 20 per cent. are in sod year after year. But while some orchards in sod are given this treatment, there are others not pastured at all or pastured with cattle or sheep or hogs. The results of our surveys comparing these different methods of treatment are interesting. We have them for three counties, Niagara, Orleans, and Wayne. They are given below:

THREE YEAR AVERAGE PER ACRE.

Pastured with	Niagara	Orleans	Wayne
Hogs	138	312	271
Sheep	129	308	216
Cattle	117	153	159
Not pastured	141	217	185

What do these figures show us In the first place they all show that the orchards pastured with cattle give poorer returns than those not pastured at all. The reason for this, I think is evident. The cattle run against the trees and break the bark and the branches and browse the bark and branches as far as they can reach and do considerable damage. The little expense which would be incurred in securing pasture elsewhere will be saved many times over by preventing the injury to the trees. If growers have cattle and no place to pasture them, turn them into the roadside. Sheep, we see, give better returns than no pasture at all. The reasons are again evident. In the first place sheep receive most of their feed outside of the orchard and the manure dropped is a constant addition to the humus and fertilizer. In the second place, sheep graze grass close to the ground, preventing excessive evaporation from the surface on the blades of the grass.

Hogs give the best results of any kind of pasture. As in the case of the sheep, hogs receive most of their feed outside and the manure dropped adds to the fertilization. Hogs eat the apples which fall early in the summer, which apples fall because they are wormy, and thus hogs do a great deal of good in destroying insects.

Again, most important of all, the hog pastured orchard is really a cultivated orchard. If the hogs are allowed to root, they break and turn over the sod under the trees wherever the apples are, and in the course of two years will have completely turned over the sod of the whole orchard. This is cultivation, which differs only in the kind of machinery. In the one case the machinery is the hog, in the other case the machinery is the cultivator. The comparison of this table with the one preceding is interesting. We see that although hogs give the best results, often these results do not equal the results of tillage. As a matter of fact, 70 orchards in Orleans county, which were pastured with hogs and sheep only one in five gave yields equal to the average yield of the tilled orchard. And an orchard in order to be successful ought not to be equal to the average but above the average.

I do not want you to think that I believe that all orchards ought to be tilled, as the tables might indicate. It is impossible and impracticable to till all orchards, because some might be on soil which could not be tilled, or might be on hillsides where tillage would be impossible or not advisable. Again, some of the sod orchards pastured with hogs or mulched will give results, which considering the expense of tillage, will be better than the results from tillage of the same orchard. Our work, however, enables us to say that taking into consideration the expense of tillage, extra cost of barrels, labor, handling, etc., four-fifths of the orchards which are now in sod in these counties would bring up the net results if they were tilled.

Our tabulation on spraying is given below:

All Orchards.

——	Niagara.		Orleans Co.	
	Bushels.	Value.	Bushels.	Value.
Unsprayed	261	$ 45	245	$ 92
Sprayed once	364	93	307	116
" twice	509	101	343	127
" 3 times	577	171	322	139
" 4 times	590	183	569	211

Well Cared for only.

——	Niagara.		Orleans Co.	
	Bushels.	Value.	Bushels.	Value.
Unsprayed	266	$ 95	328	$103
Sprayed once	353	146	346	139
" twice	422	147	374	143
" 3 times	440	201	414	184
" 4 times	285	226	569	211

This table shows us, considering well cared for orchards only, that those in Niagara county which were sprayed four times gave more than twice as much income per acre as those which were unsprayed, and in Orleans county we have the same results. It seems to me that this proves without the shadow of a doubt the beneficial results of spraying.

To conclude, these are not experimental figures. They are the results of a comparison of the results the fruit growers have obtained in the last eight or ten years in their orchards, whatever their methods of treatment. The figures are astonishing, scarcely believable, and yet they are facts. We cannot doubt their accuracy.

As I said before, there are four factors entering into the good care of an orchard—tillage, spraying, fertilizing. pruning. No one of these ought to be omitted. In some cases one might be omitted without seriously affecting the results, or perhaps one might replace another. For example, tillage might take the place of fertilizing, or we might use fertilizing instead of tillage. Often a grower receives good results from one of these factors and he immediately becomes convinced of the importance of this factor and makes it a hobby and loses sight of the others. Such practices are wrong. A proper balance must be maintained between all four of these factors if the fruit grower is to be successful. If he maintains a proper balance, he will be successful.

Q.—Which will do best in an orchard, hogs or sheep?

A.—Hogs, I think.

A MEMBER: I do not think so.

Prof. WILSON: Hog pasturing is practically cultivating the orchard, and if you must have orchards in sod, pasture with hogs. My father's own orchard at home, of about 20 acres, has not been plowed in my memory, and every year he has taken an excellent crop of apples by pasturing two or three hogs per acre. Father believes in tillage, so do I, but I believe in letting a good thing alone.

Q.—I know of an orchard that was ruined by pasturing with hogs.

A.—They may have had too many hogs. I have never seen any injury to the trees from two or three per acre. They will root in spots under the trees that have fruit on that year. In about two years all the trees will bear, and in that way they will all be cultivated.

Q.—I have noticed that the holes they make become filled with water, and this has a tendency to sour the land on heavy soil.

A.—I do not know how it would be in this section, but I do not think it would hold with us. In New York State nearly 20 per cent. of the orchards are pastured with hogs, and I have never seen any serious injury to trees.

Mr. HAROLD JONES: I know that injury is sometimes done when small orchards are over pastured—particularly with brood sows and their litters. In such cases I have known them to strip the main roots. Avoid that, and there is no danger.

A MEMBER: That is the experience also with us.

Prof. WILSON: That may be true. We feed the hogs in a pen outside the orchard, and then let them run in the orchard. We do not ring them as they will do more cultivating without. The table shows, however, that even when hogs are pastured in sod orchards, the result is not quite equal to tillage.

Q.—How would it do to keep the orchard tilled for two or three years; then let it go to sod for a year or two, and while in sod pasture with hogs?

A.—It would be an excellent scheme.

Q.—Would it answer to cultivate around the trees and leave the rest in sod, and allow hogs to run all summer?

A.—The roots go far beyond the ends of the foliage. If there is a method of sod management equal to tillage, we have not found it out yet. In Orleans, of the seventy orchards in sod, fourteen of these, or only one in five, gave a yield equal to the average of the tilled orchards, and an orchard to be successful must yield better than the average.

Q.—Do you believe in shallow or deep cultivation?

A.—If you were starting to till a sod orchard you would have to begin with shallow cultivation; you might have to begin with a disc harrow. Shallow tillage is better than deep tillage unless the roots are already down. Do not cut too many roots; it will do no harm to cut a few. If the orchard has been in sod the roots are near the surface.

Q.—How late do you cultivate?

A.—Do not cultivate after the middle of July, then use a cover crop of rye; vetch and clover seed cost too much.

Q.—Do you consider rape as good as rye?

A.—I have seen rape only in a few cases.

A MEMBER: Rye grows when the crop is not growing.

Prof. WILSON: Do not allow the orchard to remain bare during the winter; keep a cover crop on, buckwheat, rye or something.

Q.—On what dates do you spray?

A.—First with Bordeaux mixture and arsenate of lead just before the blossoms open; again with the same mixture just after the blossoms fall; a third time two weeks later, and a fourth time later than that, to be determined by weather conditions and insects.

Q.—Would you recommend an earlier spraying when the leaf bud is opening?

A.—For the bud moth? The bud moth is not serious with us, but I would recommend an earlier spraying where it is bad.

Q.—I notice your figures show a smaller return from four sprayings than from three sprayings?

A.—I cannot explain that. The average per tree was greater.

Q.—Do you really believe the figures indicate the result.

A.—I do not, but I cannot find the error. The surveyors commenting upon the discrepancy said that the difference in price was due to the high quality of the fruit: but I do not believe it could have brought so much of a higher price, because the average yield is almost 200 bushels more per acre, but the average income per acre overbalances that.

Q.—It is entirely different in the next column?

A.—Yes, when we take our tabulation for the well cared for orchards only. If we compare the income from the sprayed and the unsprayed orchards, there is certainly a great difference whether or not one may believe in spraying once, twice, or three times. These figures show what growers are actually getting and have got for the last ten years, and you can decide for yourselves how many times you think it best to spray.

Q.—Are bees necessary in an orchard?

A.—They are a great help, and I should advise the fruit grower to keep bees in the orchard if he can.

A MEMBER: Last year I put in a few hives, and this year the crop has been twice as much as last, although I sprayed more this year.

Q.—The last figures of the chart would show that spraying is everything?

A.—No, I do not think so. Sometimes one of these four factors—pruning, fertilizing, tillage and spraying—may be omitted without serious injury, but it is not well to do so, when perhaps one may replace the other to a certain extent. For example, we may till our orchard to take the place of ferti-

lizer, or we may double fertilize to take the place of tillage, but can the fruit growers of New York afford to do this? The mistake commonly made is this: one grower will get good results from tillage alone; tillage at once becomes his hobby, and he forgets the other two factors. Do not omit either factor.

Q.—Have you ever seen any bad effects from spraying?

A.—Yes, a few years ago we sprayed as an experiment to determine injury from Bordeaux spraying, and we got it. We had sprayed twice, and went back to spray a third time, but found that two-thirds of the foliage was on the ground. We got injurious effects from using formulas as strong as recommended here yesterday. The formula recommended here yesterday for apples was about 5-5-50. We got serious injury from that. We find that a 3-3-50 mixture will control fungus just as well and cause no injury.

Q.—How much lime?

A.—We use 3 pounds copper sulphate, 3 pounds lime, and 50 gallons of water.

Q.—If you increased the proportion of lime, would you still get injury?

A.—We got injury all the same where we increased the lime.

THE SHIPMENT OF EARLY APPLES AND TENDER FRUITS TO GREAT BRITAIN.

By J. A. Ruddick, Dairy and Cold Storage Commissioner, Ottawa.

I want to lay before you some information collected during the past season in connection with the shipments of early fruit to Great Britain. This subject may very properly fall under three heads: First, is there a market in Great Britain for our early fruit at remunerative prices? Second, if so, can fruit be landed there in good condition? Third, will it pay growers to make an effort to secure that market for this class of fruit in place of others they may have now?

Early this fall before the shipping season began, I was authorized to announce an arrangement with two steamship companies for the reservation of cold storage compartments on certain steamers, for the carriage of fruit only. Shippers were invited to use this space, with the understanding that whatever dead space there might be would be paid for by the Department. We arranged for space on four steamers sailing for London. The reason we selected that port was because we wanted to make a succession of small shipments of fruit for the Franco-British Exhibition, and thought we could work the two things together. We made no arrangement for any other port. We gave no guarantee as to temperature. It was simply an offer of the accommodation required by shippers of this class of fruit. In the past the trouble has been that when a man wanted to ship, say, a carload, he was unable to get the right accommodation. The smallest cold storage chambers contain about 2,000 cubic feet of space. On some lines the smallest ones measure about 4,000 cubic feet. The quantities of fruit available for shipment have been so small that it has been a case of paying for a large amount of dead space, or accepting an unsuitable temperature in order that other produce might be carried in the same chamber, neither alternative being satisfactory to the shipper.

Q.—Was there a man along in charge?

A.—No, it was left entirely to the steamship company. The only precautions taken were to see that the fruit was inspected,—the loading was watched by the cargo inspectors, and a thermograph was placed in the chamber. Then we had a special report by our cargo inspector at London when vessels arrived.

The correspondence I have before me from receivers shows, on the whole, that there was quite a good demand—that they liked the fruit, and wanted more of it. Some shippers complain in many cases that the returns were not sufficient to encourage them to make further shipments.

Here is a report on a carload of pears, consisting of 1,194 boxes, shipped to Glasgow. The net proceeds amounted to only 32 cents a box, the freight being about 25 cents, and the other charges, which all consigners of fruit understand, amount to £29 on that one carload. The commission merchant speaks highly of the shipment, and asks for more.

Q.—Were these pears shipped to commission houses or to some private agent?

A.—They were shipped to a well known, and, I think, reliable commission firm in Glasgow. The highest price received for these pears was 4/9 per box.

Q.—What variety?

A.—Anjou. For Kieffer, 2/9 was received. In another shipment Clapps brought 5/, and Bartletts 7/6.

Most of the dealers emphasize the fact that it is important to wrap the early fruit. Being early in the season, it is apt to be warm weather when they are landed, and consequently a great deal of moisture condenses on the fruit when it is taken out of the cold storage chamber. Wrapping helps to avoid the damage from this cause.

Q.—Mr. R. Thompson's pears were wrapped, and they did not bring good returns either.

A.—A good deal depends on the kind of market they happen to strike, as well as the condition of the fruit.

Q.—Were these goods all sold by auction?

A.—I presume so. James Adams reports, "Your apples were not only good, but finely packed, and we would like regular shipments.

Q.—Were they boxed?

A.—Yes. Every receiver who reported, except one, emphasized the importance of having dessert and early apples packed in boxes.

It is difficult to make actual comparisons, or to show how much better price has been obtained for cold storage apples, and this is important to the shipper. Of course, it is all a matter of the condition of the fruit. It is quite possible that fruit carried in ordinary temperatures might land in better conditon than other fruit carried in cold storage if the cold storage fruit was out of condition when it was placed in the chamber. That is what often happens.

Losses sustained by shippers arise largely from the fact that the fruit arrives in an over ripe condition. In a season like the present one has been, with extremely hot weather continued through September and a good part of October, such losses are heavier than usual. Cold storage delays the ripening of fruit, and if it had been applied properly to certain shipments this year, the gain would have been very large indeed. We have been at some pains to collect information on this point, by studying the reports of sales in conjunction with the reports of our cargo inspectors on the condition of the fruit both at Montreal and at ports in Great Britain, and we have fixed the loss during a certain period at about $1.50 per barrel—a loss which would have been largely avoided if these apples had been shipped in cold storage.

I make this assertion: that every sound apple grown in Canada, if picked at the proper time, could be delivered in Great Britain in perfect condition if proper use was made of cold storage.

Between September 17th and October 3rd, the steamships "Ottawa," "Virginian," "Pretorian," "Marina," "Athenia," "Hesperian," and "Lakonia," carried 58,664 barrels of apples. Taking the proportion of these shipments which sold at a reduction in price owing to bad condition, and we have a total loss of something like $50,000, or enough to pay for a lot of cold storage. Of course, these vessels sailed during the hot, smoky weather, when there was much delay in getting out of the St. Lawrence. The ventilating systems fail in such emergencies, because the outside air is too warm to cool the fruit when circulated through the holds.

As to the fruit at the Franco-British Exhibition, Commissioner Hutchison reported on it under date of October 26th, as follows:—

"On the 5th of September, we received 26 cases of new crop apples and 35 more on Saturday, September 12th. On September 18th, we received a small consignment of 17 cases of assorted fruit, among which were 3 boxes of "Bartlett" pears called "Williams" here, and a box of peaches of the "Crawford" variety. On October 5th, we received a shipment of 151 cases of assorted fruit, consisting of 61 boxes of apples, 24 boxes of pears, 60 boxes of peaches and 7 crates of grapes. You will be pleased to learn that all this fruit arrived in perfect condition and was remarkably well assorted and packed. The Elberta peaches have certainly made a record. Some of the peaches have been for ten days on plates in the exhibit without showing any signs of decay."

The report goes on to state that sample packages of peaches and pears were sent to commission merchants and dealers in London. One box of 33 peaches sent to Geo. Munro, Limited, netted $3.65. Another box which went to Wm. Brooks & Sons, fruiterers, of Regent St., netted $2,43 for 30 peaches. Averaging the two boxes, the wholesale price received was nearly 10 cents per peach after paying the commission. It is reported that peaches of about the same size were selling in London at 1s. each retail at that time and pears were selling at 2d to 6d each.

The following letters were received by the Exhibition Commissioner from Geo. Monro, Limited, of Covent Garden Market:

October 13th, 1908.

Secretary Canadian Government Exhibition,
Franco-British Exhibition,
Canadian Pavilion, Shepherd's Bush.

DEAR SIR,—We duly received the sample case of Elberta peaches, and the box with samples of pears.

The peaches arrived in extra good condition compared with others of the same variety that are coming on the market, and we were able to make more money of them than average of what are coming. The fact of this sort being rather uncertain as to condition, depreciates the sale, as so many of them are in rather ripe condition, go rotten very quickly on the salesmen's hands, so that you must not lead your people to expect that they would make this money in quantity. At the same time, we should advise you to draw their attention to the fact that they should not be allowed to get too ripe before sending. All the pears are fairly saleable sorts, but the "Clairgeau" is very treacherous, and if they arrive at all ripe, are worthless. We should, however, suggest that you advise the growers to follow more on the Californian varieties, such as "Doyenne du Comice," "Brown Beurre," "Winter Nelis," and "Glout Morceaux," which are all a better quality than those you send, and being well known here, find a ready sale. As far as the market for peaches is concerned, we are almost clear now, and really good ones in good condition would find a ready sale. The English and French now are practically finished. We shall be pleased to see your Mr. Girardot. The best time for the writer is before one o'clock any day.

Yours faithfully,

(Sgd.) GEO. MONRO.

September 18th, 1908.

Messrs. The Canadian Government Exhibition Commission,
Franco-British Exhibition, 1908,
Shepherd's Bush, London W.,
Canadian Pavilion.

GENTLEMEN,—We are in receipt of yours of the 16th inst., and have also received the samples of apples, and have carefully examined them, finding the samples very good of each. The varieties are also good ones for early sale here, and some years they would do exceptionally well. This year, however, there is a very large crop of English, the bulk of which are put on to the market through August and September, so that prices are not up to the average.

The fact that crops of apples here are so uncertain year by year has kept our growers from any proper system of arranging to keep their crops, so that you will see that when the exceptional crop comes, the market is very much flooded as they are taken from the trees.

As a rule, however, these early varieties would pay you to send, and even this year, the color of the "Red Astrachan," "Duchess," and the fact of them both being suitable for dessert apples—would enable us to get better prices than the bulk of the English coming on to the market. We think the best way to pack these two, or similar dessert varieties is in the 40-lb box nett, which is now almost universally used for California, Oregon, and other States for their dessert apples, as well as all coming from the Australian colonies being packed in the same way; and as the earlier varieties are naturally rather softer, it is best to wrap each fruit in paper in the same way that the above are always packed, as it not only protects the fruit, but they color rather more quickly, and generally result in a better clearer color than if packed without wrapping. The "Alexanders" too, would come well in this way unless they were extra large, which often happens with this variety off young vigorous trees; but as they are only used for cooking, the "case" would not be so useful as for the dessert varieties, all our best buyers now being able to buy dessert apples in cases the whole year through, and are more each year in favor of all dessert apples being packed in this way.

One great reason is that so many stores and retail firms can get consumers to take a case where they could not induce them to take a barrel. Another great advantage is that customers can examine the smaller package more easily, and if they are graded into ones and twos for the larger and medium good fruit, keeping all small and bad-shaped fruit out, we should be able to do very well with a regular supply of good dessert apples for our customers all the year round, and are continually getting good grocers on to selling them, who at one time, did not touch fresh fruit at all. We do not sell by auction, so you will realize that if we can keep customers regularly supplied with good dessert fruit in the same size case all the year round, it must be of great advantage to the senders as well as being more easily worked by us as distributors.

Yours faithfully,

(Sgd.) GEO. MUNRO.

Cooking varieties seem to do here in the barrels if well graded.

A letter was also received from Mr. J. A. Alexander, F.R.G.S., who is attached to Kew Gardens, and acted as one of the judges of fruit at the Exhibition.

24 LAWN CRESCENT,
KEW GARDENS, SURREY, 12th Oct., 1908.

Fruit Exhibit in Canadian Court,
Franco-British Exhibition.

In June last I had the honor, with the two leading pomologists in Britain, Messrs. Geo. Bunyard and T. H. Rivers, to adjudicate the fruit in the various courts at the Exhibition. We were most favorably impressed with the quality and high coloring of many of the samples, the apples in particular exhibited at the Canadian Court. Their good keeping qualities were very marked. I have again this week inspected the general fruit exhibit in this Court and find the samples after one year from date of gathering to be in most excellent condition. The peaches and grapes recently received are of fine flavor and compare with equal merit to Australian and Continental fruit grown out of doors.

I see no obstacle in the way of placing the fruit before the British public to find a ready market at a reasonable and remunerative price. Possibly the Commercial Agent of the Dominion (if there is one), might be the best channel to distribute the produce to the retail dealers and customers direct.

(Sgd.) J. A. Alexander,
F.R.G.S., etc., Agri. and Horti. Expert.

From the results of these shipments, there can be no doubt that we can land early apples, pears and peaches on the markets of Great Britain in good condition. If tender fruit is to carry successfully, however, it is necessary that it should be properly handled at this end. I can say this, that in nine cases out of ten when fruit reached its destination in bad condition it was because it had not been delivered to the transportation companies in fit condition to carry safely. This year, with the high temperatures prevailing, it seems strange that more advantage was not taken of the facilities offered in the way of cold storage.

Q.—Should apples be placed in cold storage before they are packed?

A.—It you pack warm apples in barrels and put them in cold storage, it takes a longer time to cool them down than it would if they were in open packages. Cold fruit does not bruise as readily in packing as warm fruit does, and that is also a consideration.

Mr. Peart: The Burlington shippers made shipments in cold storage. We have no cold storage warehouse, but order a refrigerator car a little ahead and cool our fruit in that.

Mr. Ruddick: During a visit to New York State, I was particularly struck with the quantity of apples that were going into cold storage in the various towns along the south Ontario shore. I noticed one point in connection with the business end of the matter that is worthy of consideration. In a good many cases these warehouses operate only during the apple season; they do not attempt any other kind of cold storage business. They expect a season rate for all apples, no matter how long they remain.

Q.—Will a temperature of 40 degrees answer?

A.—That is not low enough for efficient preservation; you should have it as near freezing as possible.

I hope next year, if it is considered desirable, to make some further arrangements for the handling of early fruit. We might arrange for instance to have refrigerator cars start at certain stations and pick up shipments along the route, the same as is done in the case of dairy products.

E. D. Smith: The results of the shipments of which Mr. Ruddick has spoken appear to have been very gratifying so far as the carriage of the fruit on the steamship is concerned. There will be no difficulty in shipping even our peaches if these conditions can be assured. There have been cold storage facilities for years, but they have not been operated in the interest of fruit shippers. This year on account of the Government having secured the chambers, we got the use of them for fruit. I assume they instructed the ship owners as to temperature, and the fruit was carried at that temperature. There is a market in Great Britain for all we can send, but until now, we have not been sure of getting the right temperature crossing the ocean. We tried it year after year, but with such varying results that no one had any confidence. The plan adopted this season should have been undertaken long ago. It has proved that we can ship Bartlett pears over there in proper condition. That is the leading pear to ship. There is also a market for all the Elberta peaches we can grow. I hope the Government will continue this, and place as many cold storage chambers as are necessary at the disposal of

the growers. Cold storage is of no use unless the proper temperature is maintained, and it cannot be if meat and everything else is shipped in the same chamber.

Robert Thompson: As one of those who took part in these shipments, I can voice the feeling of those who joined with me, that unless there is some profit to be made you will not get many men to ship. I think, however, that before these shipments return good figures, it will be necessary to have someone to represent our interests at the other end.

The following resolution was moved by Mr. E. D. Smith, seconded by Mr. R. Thompson, "That it is the desire of this Association that the Department continue to operate cold storage chambers in the manner they did this year, and, if possible, on a larger scale." Carried.

OBSERVATIONS ON FRUIT CONDITIONS BY THE DISTRICT REPRESENTATIVES OF THE DEPARTMENT OF AGRICULTURE.

Essex County.—A. McKenney, Essex.

Although the County of Essex is considered to be one of the greatest fruit counties in the Province, in some respects it is the most backward, particularly in regard to fighting the San Jose scale. That is our most important problem in connection with fruit culture in that section. We have been endeavoring to induce the farmers to take up spraying by holding demonstrations at different points—showing them how to mix lime-sulphur wash and how to apply it. Where these demonstrations have been held, the results have been good. We have also carried on some spraying experiments, with different mixtures, in an orchard of 86 trees, every one heavily encrusted with scale. Before commencing to spray, we took notes of the condition of every tree. We first tried crude oil, then an emulsion of crude oil and Gillett's lye, a second crude oil emulsion, home-made lime and sulphur and the commercial concentrated mixture of lime and sulphur; also the remedies known as V 1 and V 2. After spraying we went over the orchards carefully, taking observations at different times throughout the summer.

We did not expect to get very satisfactory results from crude oil, but it is very cheap there, about a dollar a barrel, and we therefore deemed it wise to experiment with it. It killed the scale, and it also killed three out of four of the trees treated.

In order to lighten the crude oil up a little, we made an emulsion of crude oil and Gillett's lye, and treated four trees. At the end of the season we found the fruit almost entirely clean.

For the other emulsion, we used 12 gallons of crude oil to 40 gallons of water. This killed practicaly all the scale, but the bark of the trees seemed to be slightly injured, and it is a question whether it could be used continuously without affecting the trees.

The results from lime and sulphur were very good indeed. We sprayed four trees, and the fruit showed absolutely no scale spot.

We tested the concentrated lime and sulphur on about 16 trees. We applied it first when the leaves were coming out. There was no serious injury to the foliage, and it killed the greater portion of the scale, and the fruit was clean. This mixture was 1 to 11. The makers recommend a solution of 1 to 50 as a summer spray, but we got no results. With a mixture of 1 to 25 we got results, the majority of the scale being killed.

With the V 1 mixture, which is claimed to kill most of the pests that affect the orchard, we sprayed 25 trees. The results were marked by their absence. The row on one side of these trees was sprayed with lime and sulphur, and on the other with the oil emulsion, and the difference, in favor of the lime and sulphur particularly, was noted by everyone who visited the orchard. We sprayed the V 1 mixture in the proportion of 1 to 100, as called for by the instructions. In two weeks the scale should have been dead, but was as healthy as ever. In everyone of these experiments we left a check tree at the end of the row. We could see absolutely no difference between the trees sprayed with the V 1 solution and the unsprayed tree. We came to the conclusion that the remedy was worthless so far as scale was concerned. It was also claimed that it would kill apple aphis, codling moth and a number of other insects.

Mr. Spark: It was never claimed that it would kill codling moth.

Mr. McKenney: Perhaps not, but it was claimed it would kill aphis. We found a great deal of aphis on these trees, and we sprayed with V 1 and also with V 2. As to V 2, we received a letter from the firm, saying that there was some mistake in the mixture, and that they would send another lot; but we did not have time to apply it.

The results with V 1 were quite conclusive. We were very careful to test it accurately, spraying one side of the tree on one day and the other side when the wind changed, and we put on twice as much as was recommended.

Prince Edward County.—R. M. Winslow, Picton.

The County of Prince Edward has three main sources of revenue, the canning industry, dairying, and orcharding. Very little fruit is canned, and this report will deal altogether with orcharding as an entirely distinct branch of effort.

At the present time, the number of plum trees in the county is small, and the trees are not in good condition, due to hard winters, particularly that of 1903-4, which destroyed a great many fruit trees of all kinds, and also to the Volsa canker and shothole fungus, all combined with a degree of neglect due to a discouraging outlook for the plums as a profitable venture. Pears are in a similar condition, due to the severity of the same winter, canker and blight. Sour cherries are in a very encouraging state; the trees are healthy and bearing well, and the acreage is being extended. As profits have been large of late years, small fruits are grown in the vicinity of Picton and Bloomfield quite extensively, which do well, and the plantations of these are also being extended.

Prince Edward has a climate very much governed by the water of Lake Ontario, the Bay of Quinte, and many small bays and inlets, which give the county, scarcely fifty miles long, over four hundred of shoreline. Spring frosts and fall frosts are very largely governed by this condition, and a long fairly moist season of moderate temperatures is the result. When the water is frozen over, however, the county is like those to the north of it, liable to occasional severe freezes. Such a one ocurred in 1903-4, destroying a great majority of the plum and pear trees, and a large number of apple trees. The blow was so severe that a great many men, before enthusiastic, were discouraged, though many at once set out their new orchard, so that the county has now a very large number of these, practically all apples.

Since that time, the growers have had to contend with many diseases working on trees already weakened. Oyster-shell bark-louse became plentiful and destructive in the next few years, borers were plentiful, fungus diseases got a stronger hold, and since the growers were inclined to place all the blame for the injury done entirely on the hard winter, orchards were allowed to be severely injured by various obscure diseases without any great attempt to locate the cause of the later injury.

In addition to this, a great many of the young trees set out were in a very unhealthy condition. Black heart and blight seem to be the cause of the greatest loss, but buffalo tree hopper, root injury, and the substitution of varieties brought other and serious losses to the planters. So many thousands of dollars have been lost directly and indirectly by the sale of black hearted trees or substituted varieties to the unsuspecting farmer, that his protection from the dishonest or careless nurseryman is a problem of pressing moment in this county. For that reason, we are particularly interested in a law which shall attempt in any degree to eliminate such stock from the trade, or to insure the farmer against loss in this connection.

While the older orchards were gradually dying from winter injury, the spread of insects and diseases went on almost unchecked and unnoticed. Under such circumstances did the black rot canker, or New York apple tree canker come in and secure a strong foothold, with hardly any attempt at identification or control. For this reason, and because of its wider, though less serious, distribution, through Ontario, it seems desirable to report on it at length on this occasion.

The black rot fungus is reported as being prevalent through the greater portion of the Eastern States, from Alabama to the northern boundary, and from New Hampshire west to Illinois and Nebraska. In Ontario it has been reported from so many districts that it may be said to be present in all parts of the Province. It is undoubtedly the worst enemy of the apple in Prince Edward and neighboring centres.

Kinds of Trees Affected.

The fungus affects the leaves of at least the apple, causing the familiar leaf spot, which has erroneously been attributed to Phyllosticta and spray injury. It affects the fruit of apple, pear and quince, causing the well-known black rot. It affects the wood of apple, pear, hawthorn and some forest trees, causing in the trunks of young trees and the limbs of old ones, brown or black sunken areas in the bark, known as cankers. The infection of forest trees does not affect the application of measures for the control of the disease in orchards.

On the foliage of the apple, the disease causes the common leaf spot, usually attributed to the Phyllosticta or the spray injury. The two latter occur on leaves, but this is usually not great, but sometimes it is severe enough to cause defoliation in August or September, especially on young trees, set in old orchards. There, it is, of course, serious, because of the immaturity of the wood, and consequently winter killing.

On the Fruit. The black rot of the fruit has been known for some twenty years. It is not usually serious in the orchards, though it may cause a loss of several per cent. of fruit still on the trees. It is a common rot of fallen fruit and stored fruit. Infection seems to be possible only after mechanical rupture of the skin of the fruit. The distinguishing features of this rot are: It is firm and not much sunken, if any; it turns

from brown to black, and black pustules about one-hundredth of an inch in diameter appear in large numbers in October and November. The fruit dries up and mummies, usually falling to the ground.

On the Tree. The cankers on the trunk of a young tree appear as a slightly sunken area of brownish bark. This dead area enlarges often in well marked concentric rings. The growth is usually fairly rapid, and the canker may extend clear around the trunk and up into the branches. Black pustules develop in late summer and fall; these are similar in nature and function to those on the fruit. They are not found on young cankers before late summer, and on cankers over two years old they have usually disappeared.

In the fall, the dead bark in the canker becomes roughened and cracked by dying out, and the growth of sapkophytic fungi usually turns it black. On old trees cankers occur on limbs of from one to several inches in diameter. They grow more slowly, more irregularly, and are less easily recognized than cankers on young trees. Owing to the congestion of sap and consequent deposition of wood, these cankers are often swollen to a size greater than the natural diameter of the limb.

The canker is the serious feature of this disease. The rot does little damage, and the leaf spot is of little consequence, but the cankers are causing really great loss to apple orchards in this section.

Life History of the Fungus.

This is not yet thoroughly known. We know, however, that the canker of fungus is perennial as mycelium in the cankers, and reproduces itself from leaf, fruit, and canker, by means of spores found in the pustules. These spores are shed in the spring, and are carried by rain or wind where under suitable condition of moisture and warmth they penetrate the plant, forming the disease again. It is known that the spores on the cankers may form leaf spot and that spores from rotten apples form cankers. There seems no doubt that the disease is transmissible from any one form to another.

Control of Disease.

1. Cut out and burn dying branches or dead and dying trees. Destroy apples affected with rot, by feeding to hogs or removing and burying at once. The practice of leaving dead branches or trees in place, or leaving them in brush piles in the orchard is dangerous, and should not be followed. The use of cankered limbs as props for the trees is of course a direct aid to the infection of healthy wood.

2. Where infection is not too severe and trees can be saved profitably by this means, it will pay to cut out, disinfect, and paint over the cankers. In cutting out it is necessary to remove all the diseased tissue, and disinfection should proceed at once. Use corrosive sublimate tablets, dissolved in one pint of water, kept in a glass or wooden vessel and put on with a brush. This is a very strong poison. For paint, a heavy bodied paint that is waterproof and germ proof for several years is wanted. White lead and raw oil make a very good one. Cutting out of cankers will pay where there are only a few on an old tree. It will also pay where a canker is located on the trunk of a young tree. It is a good economy to spend a few cents to preserve the life of a tree in which several dollars have been invested.

3. On old trees badly affected, the practice of re-heading must be followed. Save the suckers, and as they become able to take the sap remove the diseased branches. This is best spread over two or three years, and is

easily practised on Spy, Snow, Russet, etc. On trees that sucker less easily, it may be necessary to insert scions of the same or another variety. In this work, limbs up to six inches in diameter have been found to graft successfully.

4. Since the greater part of the cankers on young trees is following sunscald, it will certainly pay to protect from sun-scald where that is prevalent. Building paper, wrapped tightly around the trunk is a protection against mice as well as sunscald. It is applied in the fall and removed in late spring. Protection of the trunk is generally necessary only on those from two inches in diameter up to the time when enough rough bark forms to render paper unnecessary.

5. It has been constantly observed that trees in good vigorous condition suffered less from canker than others. It is true in general that good health is the best preventive of disease, and this is quite true of apple cankers. Generally speaking, sod is a detriment to the best success of an orchard, and wherever it is present, should be broken up, the soil cultivated in the spring and cover crops ploughed down. Barnyard manure, wood ashes, or commercial fertilizers will give not only profitable returns for the application, but as a preventive of canker as well. Pruning and spraying will also be advisable.

Spraying to prevent scab and other fungus diseases, when carefully and persistently followed up, has resulted in a comparative freedom from canker. It is probable, therefore, that spraying for canker three times with Bordeaux mixture, first before the buds open, next after the blossoms fall, and third, ten days after the second will result in efficient control of canker. It may be advisable to substitute lime sulphur, either home boiled or commercial for the first Bordeaux spraying, especially where leaf blister mite, or oyster-shell bark-louse is present.

The black rot fungus, which is widespread over the United States and Ontario, is especially prevalent in Prince Edward and neighboring counties. It causes leaf spot, black rot of the fruit, and canker on the limbs and trunks of apple trees. The canker does a great deal of injury to both young and old orchards.

Control of this will be secured by the following methods:—

1. Cleaning up and burning as much of the dead and dying wood as possible and destruction of rotted apples.

2. Where cankers occur on the trunks of young trees and are not too large to be so treated, cutting out, disinfecting and painting the affected area.

3. On trees whose limbs are so badly affected as to render cleaning out the cankers impossible, cutting back the limbs below the cankers and forming a new head in one, two or three years by using the suckers or inserting scions of the same or other varieties.

4. Prevention of sunscald and other injuries to the bark of trunks and limbs.

5. Increased vigor and healthfulness of orchards, by cultivation, manuring, clover crops ploughed down, pruning and spraying.

6. Spraying to prevent infection, using Bordeaux mixture or lime-sulphur before the buds open, Bordeaux mixture after the blossoms fall, and a third spray with the same ten days later.

GEORGIAN BAY DISTRICT.—R. E. MORTIMER, COLLINGWOOD.

If one were to depend upon the statistics that may be at hand regarding the acreage of orchards in the Georgian Bay district, together with what information he may have obtained in reference to the establishment of storage plants, canning factores, evaporators, apple-butter factories and cider mills, he might conclude that this section was one of the distinguished fruit districts of the province; and rightly so, if he does not entertain a misconception regarding the conditions that prevail there at the present time.

It is true that there are numerous orchards varying in extent from one to forty acres; it is true that an enormous storage and forwarding plant has its existence under the title of "The Georgian Bay Fruit Growers, Limited," with branches at Thornbury and Meaford; it is true that the Collingwood Packing Company have begun the fruit canning business, and it is also true that cider mills and apple-butter factories are almost as common as post offices; yet I claim that if one, knowing of these establishments, based his opinion thereon, that everything was lovely regarding fruit growing in this district, he would be not right. He would have no idea of the feeling, or fruit-growing spirit among the growers, which I am sorry to find is not what it might be, and is not what it should be for the proper development of the industry. Just whether the growers there ever did have the real zeal of a fruitman, may be difficult to say; but it is quite evident that they have allowed their interest to "flag." Of course, there has been some reason for this, which if we could remedy now we might soon again be classed with the best fruit districts of Ontario.

Just a few words now in reference to what might have been effective in producing this great indifference apparent among the majority of the fruit-growers: No doubt, just as in other districts, there are men who have been buying apples as a private business. Their methods were to buy by the barrel, by the tree or by the orchard; but in every case the object was to get the goods at the very lowest price possible. We believe, further, that more or less scheming was done between or among the buyers, because orchards were "parcelled"—that is, one buyer would come for this man's apples, the the other would take that man's, without any competition whatever, and the grower got only one bid; he had no option. Some buyers were even clever enough to get around in August, before the fruit was grown, and when there was not any appearances of a good crop, and buy the orchard. It was a comparatively easy thing to do at that time, when farmers' bank accounts were slimmest, and a great number of sales were then made, most of which, in the end, were to the disadvantage of the grower. Other little things, too, which we need not refer to here, have done a part to render fruit-growing less interesting as well as less profitable. Can you blame the growers much then, in ceasing to work to the interests of men, selfish indeed, who cared not a whit whether the producer found the industry profitable or not, so long as they themselves did, and who would not do the smallest act to further fruit-growing, to the growers' interests?

Then you may ask a man why he does not spray his orchard, why he has not pruned it; why does he leave it in sod; why not cultivate, spray and prune according to the advice given by expert growers, and he will tell you "I haven't time," or "It doesn't pay me," either of which seems absurd, in view of the remarkably good results being obtained from good treatment of orchards elsewhere; but still each is a truism. No man has time for anything that is not profitable; and I really believe that the fruit markets might be controlled by monoplies to such an extent, that any time a man would

spend in sharpening his pruning saw would be utterly lost. Remember, I do not go so far as to say that such has been the case in our district; but there has been something that has discouraged the growers, and I think it is the treatment measured out by the buyers and packers. What we want, then, and what we must have to revive fruit-growing and to conduct it as it should be conducted, is some concern to handle the products, and deal honestly and fairly with the growers; and, I believe we have such in the co-operative organization, "The Georgian Bay Fruit Growers, Limited." But it is not my object to discuss the same here; the President, Mr. John Mitchell, is with us, and I hope that he will be given an opportunity to speak in reference to the work of the association, of which he is justly proud. I have not the slightest doubt but that with honest treatment from the men who put our fruit on the market, every grower will go back into the work with a new heart. We might be able to do something in the meantime to hasten the day when orchards are no longer ill-treated, the day when those unsprayed, unpruned, and uncultivated acres are not seen. I had an idea that it would be possible to give a few orchards in each locality proper treatment by a man appointed to the district, and by that as an object lesson, show the growers what really is to be gained both in quality and quantity, by pruning, spraying and cultivating. In talking to Mr. Mitchell, to whom I have already referred, the other day, I learned an idea from him which should be good, indeed, in inducing the growers to take off their coats again. It is truly a bright idea, well worthy of the consideration of the Ontario Fruit Growers' Association so well as the Provincial Government, and I should like to see it adopted, and I take the liberty to say that Mr. Mitchell will present it when asked to do so.

Then, while fruit-growing is not where it should be in a naturally favored section such as the Georgian Bay District is, I am confident that with the adoption of these ideas, and the extension of the co-operative organization, "The Georgian Bay Fruit Growers', Limited," to which I have already referred—to other localities of the district other than its present locations at Thornbury and Meaford, there will be a great revival in fruit-growing, and one day the Georgian Bay District, will not merely be classed with the best fruit sections of the Province, but will be conceded, universally, to be the premier.

Mr. A. McNeill, Fruit Division, Ottawa: Nine-tenths of the difficulties complained of would disappear if the suggestions contained in the foregoing address for co-operation were put into effect. Farmers have the remedy in their own hands. It would be better not to wait for the Georgian Bay Fruit Growers' Association, or any other large concern, but for farmers to unite, half a dozen in a place, and form these unions over the county. This would be better than for one large concern to control the whole situation.

Ontario County.—J. H. Hare, Whitby.

To prove that Ontario county is a great apple producing district—that is the southern end of it—I have only to instance the numerous prizes Ontario county growers have obtained at the Fruit Show here. Unfortunately all the fruit growers in the county are not up to the standard of these men, although we have some of the best growers in the Province in the vicinity of Oshawa and Whitby. I believe it to be one of the best apple growing districts in the Province. In Oshawa we have a co-operative association that is doing splendid work, and the influence of the association is very evident in the vicinity.

Being paid for their fruit according to quality, the growers realize the importance of a first-class output, and are paying more attention to spraying and proper methods of orchard management. Twenty-five per cent. of the growers in the vicinity of Oshawa are spraying, but speaking generally, over the whole county, I should say that not more than ten per cent. are doing so. Those who spray in the Oshawa district are satisfied apparently with results, because they continue to spray year after year.

This year there was very little codling moth. The county has an advantage in this respect on account of the altitude, or for some such reason. We have a comparatively new pest, however, in the blister leaf mite. In some of the orchards, trees have been killed by fleshy fungus. This sometimes occurs where trees have been badly pruned, showing the necessity for treating the wounds.

The oyster-shell bark-louse is the worst pest we have. Some growers near Oshawa, however, have successfully destroyed this pest, and this will serve as an object lesson. There is a good deal of canker, especially in the younger trees. It is not as bad as in Prince Edward county, but it is doing a good deal of harm. On account of the difficulty in eradicating it, I believe it is the greatest problem we have to face. The farmers generally regard it as winter-killing.

Of the younger orchards, I should say 50 per cent. are fairly healthy, and that the other 50 per cent. are more or less attacked by oyster-shell and sunscald, generally followed by canker.

PACKING AND PACKAGES—MARKETING OUR APPLES.

By Elmer Lick, Oshawa.

The problem of packing apples depends very largely on the quality of the fruit we have to work with. If we have fine, well-grown, well-colored fruit, free from insect and fungous blemishes, we have a comparatively easy task. If, on the other hand we have, as we did a year ago, green, immature, or frozen specimens, then the task is a most difficult one.

Good packing depends very largely, first on the skill, and second on the character, of the men doing the work. With skilful men who are honest, it is a comparatively easy matter to get apples packed as they should be.

Apples are packed in all manners and styles,—some of them not the wisest—and in all conditions. I do not wish to criticise the average dealer's gang, but I will say that I dread to see a man who has worked during the fall with the average apple gang come into our packing house. We took on a couple of such men a short time ago, and they admitted before they had been there very long that the methods they had followed were very careless. They had been packing for the Manitoba trade. The apple should be treated like an egg, and any treatment that would be likely to break an egg, we should be very cautious about giving to our apples. Another element that enters into the situation is the picking of the fruit. In our association we do not do much packing in the orchard, unless it is too far distant from the fruit house. Often the men who pick their own fruit are very careless in handling it, and bruise it so that we have to throw out one-third of it on that account. More careful handling and picking are very necessary, and after it is picked the fruit should be drawn to the station in spring wagons, one of the things that dealers are very neglectful of.

But after all, the most important thing is the reliability of the men doing the work. You have pretty nearly to get men whom you can trust implicitly. I do not know how it is in other sections, but there are lots of young men in our section who will not go with the average apple gang because of the bad character of the men who compose them. In many sections growers will not board the men or keep them over night.

It is also very desirable that the grower should take a personal interest in his fruit, and that his interest should keep up until the fruit is ready to be put upon the market. That is what we are striving to arouse in the members of our association, as in my opinion success or failure depends largely on this factor. No matter by what method or combination of methods apples are to be handled in the future, success must always depend on the personal interest taken by the grower in his fruit until it is marketed. The methods of dealers in the past have not helped much to that end. We had a man in our Association last year who brought 126 barrels of apples to our house—mostly Ben Davis. He received less than $26 for them; there were scarcely any No. 1's. This year he took thorough care of his orchard, spraying once with arsenate of lead, and there was scarcely a wormy apple in the whole crop. This man's apples gained first in the barrel and first on the pyramid at this show. This man has a brother, also a member of our association. Out of a crop of 300 to 350 barrels he brought in only 60 or 70 barrels, leaving the rest on his trees because of the codling worm. We are trying to bring these men to realize that they must produce better fruit.

As to packing: It would not be difficult to prove that you can pack more apples and pack them better with less skilled labor, with fewer men to superintend, by packing in the fruit house rather than the orchard, and be surer of your pack. I am not prepared to say that you can pack any cheaper. I am inclined to think that the cost is about the same, perhaps in some cases a little less in the orchard.

We like a face of evenly sized apples. In filling, the barrel should rest on an even surface, and be rocked or jarred as each basket of apples is put in. Many packers simply give one jar. After the barrel is full, we have been in the habit of double tailing, but I believe the best way to finish is by simply racking down after the barrel is full. The difficulty with double tailing is that an apple will sometimes get directly above the one beneath, leading to injury.

We brand our barrels before they are filled, which saves the necessity of marking with a pencil. With regard to the barrel: We like a good barrel. We like five nails in the liner, two of which should come through and be clinched, as an indication that the others have been properly driven home. We ought to have a better barrel than we have been getting. I prefer a basswood head, for the reason that when the apples are pressed with the circular head block, we can get spring in the centre with the basswood head, and we consider that this, together with the natural resistance of the apples, is likely to carry the package tight to the market without nearly as much pressure as we formerly gave our fruit. It is difficult to get basswood heads, most of the heads supplied being of hardwood.

We have been using boxes for the last two years. These we wire around the centre to prevent splitting. I understand that the Tasmania boxes are all wired in this way.

Mr. TWEDDLE: There was a great deal of damage to apples this season on account of hot weather at the time of packing. My practice has been to bore one inch holes in the staves at the bilge of the barrels. I have shipped apples to Germany in hot weather in that way, and they carried in splendid

shape, although some were delayed in New York for two weeks, and I thought would be spoiled. Last year a buyer from Manchester was here and bought a shipment of my apples. When he saw us boring the holes, he requested that it should not be done. However, he afterwards reported that the barrels that were bored came through in perfect condition, while the other fruit had commenced to scald.

PACKING AND PACKAGES—TENDER FRUITS.

H. L. Roberts, Grimsby.

The package question for fruits might truly, I think, be called the hardy perennial of fruit growers' meetings. I am glad it is, because I think this shows that growers realize that it is one of the most vital questions of the whole industry. The success or failure of any business depends on the shape in which its product reaches the consumer, and to no industry does that apply with such force as to those which are concerned with the food of our fellow men, and in fruit we have the most perishable food used by human beings.

Please note in this connection that I say the shape in which the article *reaches the consumer*. Unfortunately, too many fruit growers think that their part has ended when they hand over their fruit to the transportation company in fine shape, nicely packed in a package which, if they have given the subject any consideration, they know is quite unfit to stand the handling it will receive.

Before going into the question of the package I will say all I have to say—which is not much—on the packing. This should be considered under two heads, firstly, as it affects the fruit industry generally, *i.e.*, other growers, and secondly, as it affects the individual owning the fruit. As to affecting the fruit industry generally, the following three points must be enforced: First, that the fruit must be properly matured; second, evenly graded; third, that the face is a proper sample of the contents. No man, however, good a grower, can grow all number one fruit, a varying proportion must be of lower grade. If, however, his grading is even, and his facing a true sample, his poor fruit will damage himself more than other growers, although, of course, all poor fruit helps to destroy the price of good. A certain amount of cheap fruit is wanted by the market, and if we could only reduce the proportion of it to the right place, we would do away with the damage it now does the good fruit.

I think the dealer is largely to blame in this matter, as he sets the price, and does not discriminate enough between good and poor fruit. Whatever the grade may be, it must, in justice to the trade generally, be even and up to the sample shown on top. It must also be properly matured. Inspectors to enforce these three points are a crying necessity. That they should be enforced rigidly I think no one will deny, because a man who does not carry them out is simply trying to dishonestly make a profit at the expense of his honest neighbor. Of course, the proper method for dishonesty is for the person who is swindled to take proceedings against the swindler. Unfortunately in the fruit industry, this is almost impossible in most cases, as the fruit has to move so quickly, through so many hands before the fraud is discovered that tracing it back from the consumer is generally a practical impossibility.

The means the consumer therefore takes to protect himself is simply to give a price which he thinks would be right for the package if it were not up to its face value. The dishonest packer therefore gets full value, while the honest one loses. It therefore behooves the honest grower to see that the dishonest man is detected. There are two means of accomplishing this—one is to enable the tracing to be done by forcing every packer to stamp his name and address on his basket. The other is to have inspectors at the points of shipment.

The stamping method is, of course, the cheaper, but would probably be objected to by the dealers. If they have objections to that method, then I think it is up to them to stand the larger part of the expense of inspectors. Those qualities of pack affecting the individual packer *only* are neatness and attractiveness. These can safely be left to the individual himself, as failure to comply with them will bring its own reward, but will do no one but himself harm.

Regarding the package, I would say at once, that I do not condem the present six and eleven quart baskets as regards size. This subject was well discussed and gone into at many largely attended meetings of fruit growers and although a compromise can be made which has to take into consideration the demands of the grower, consumer, and express company all in one package. It is a compromise in another respect as between strength and cost, and unfortunately these two last are generally contradictory. To my mind the present baskets are far too expensive and not expensive enough. Far too expensive when carrying low grade of cheap fruit and not strong enough (more strength means more expense) for the best grades of fruit.

Where is the sense in selling grapes at 10 cents per basket, as many growers have had to do this season, when the package costs you 3.8 cents, leaving you 6.2 cents for the grapes. Are these correct proportions between cost of packages and value of contents? I think not.

Again take the Keiffer pears at 15 cents per basket, of which the basket costs you 4½ cents, leaving 10½ cents for the pears. That is not quite so bad, but is it right? On the otherhand, take No. 1 peaches, at 60 cents per basket, and look at the awful state they too often reach the consumer's hands in, compared to the state in which they left the grower. I think there would have been far more than 10 cents added to the price of the peaches if there had been 5 cents added to the strength of the package.

It is very easy to show the faults in anything as it exists, but very difficult to propose a really satisfactory remedy. I will not, therefore, discuss the faults of the present package any further, but will endeavor to explain my ideas as to how a satisfactory package may be got.

Now, let us consider what are the conditions that an ideal package would have to fulfil? First, it should suit the sort of fruit it is to carry; second, it should suit the consumer; third, the value of it should correspond with the value of the fruit in it. This last is a matter of extreme importance, but it is really the limit to which we may go in reaching a satisfactory answer to the three first conditions, and as this last varies with the value of the fruit, a satisfactory solution is by no means easy.

Now, we are going to limit the expense we are willing to go to in getting a satisfactory package for high grade fruit to the low limit that the price of low grade stuff will warrant. I think we should not. The majority of lower grade fruit is not wasted in small packages, because it is nearly all used for preserving, and I do not think the average householder only preserves eleven

quarts of anything, generally it is at least twenty-two quarts, and oftener more than that. Now, for this grade of fruit a light package such as the present is good enough, but too expensive.

Therefore, I would say the simplest solution to this part of the question is increase the size so that the cost of package may be less in proportion to the value of the contents. By adopting this method we give ourselves the chance to adopt a satisfactory package, meeting all other conditions for good grade fruit, the cost of it remaining about the same as present package.

In this improved package we have to meet the following conditions: To suit the sort of fruit, *i.e.*, both variety and grade, it should be of a great variety of sizes. To suit the handling, two conditions are necessary; first, uniformity of size, so that they will stack well and securely, and second, strength. To suit the consumer a great variety of size would be best. Here we have two conditions which are absolutely contradictory. For the grower and consumer, a great variety of sizes, for the transportation company, uniformity of size. The only solution is various sized packages fitting into a uniform crate for transportation. I have found from experience that the package meeting with the least damage in transportation is the 24 quart berry crate. It has one of the tenderest fruits to carry, yet it does it well, not because the express companies show any special consideration, but because from its size and weight and strength they are unable to do it so much damage.

I would therefore adopt a size and weight as near this as possible for our crate. I would make the height and length of all crates the same to facilitate stacking. I would vary the width a little if necessary to allow of all sorts and sizes of light baskets inside (these smaller packages to be made oblong or square, according to how they fitted, but in the style of the berry quart). The varying depth of inner package required could be got by varying the number of layers in the crate. The small packages, could, of course, be made very cheaply and might be of any size. I would suggest 8 and 4 quarts, with, of course, the quart retained as at present for berries. These crates could, if thought advisable, be made collapsable so that they might be returned empty. They could then be made much stronger.

There is another thing essential—these crates must have a handle on top as the present berry crate has. If they had not they would be treated as I have seen the Georgia peach crate treated in transit—that is, rolled over and over. The only way to get fruit transported properly is to make the package so that the transportation companies' employees cannot damage it unless they go about it wilfully.

I am quite aware that the first example I gave on price of packages as compared to contents (that is the grapes) is only met satisfactorily if the crate be made collapsable. The grapes are the worst problem of all. They are very low in price, therefore requiring a cheap package and very easily damaged; therefore the difficulty cannot be met as in other cheap fruits—by increasing the size of the packages. The returnable crate seems to be the only solution of the difficulty. Now, as to the adoption of the returnable crate. There are, of course, difficulties in making any change of package. Who are likely to be the kickers? and why? *The grower* will be satisfied because it will give him a cheaper package in the end. Of course, he will have to provide about half—or rather more—of the total number of crates he will require in the season, and will have to have them all stamped with his name and address. *The transportation companies* will like the crate owing to the time it will save in handling, compared to the present method. Their objection will be the returning empty. Why should they object? In Eng-

land, all fruit packages are returnable empty free of charge, and I think most European countries are the same. The express companies would be saved enough time in the handling to more than recompense them for the returning of the folded crates.

The dealer, of course, would not object, but the difficulty would be to get him to return the crates. If, however, it was made to his pecuniary advantage to do so—as for instance by offering half the value of the crate for its return, I think that the difficulty would be met, and the grower still be well ahead of the game. As to the cost of these crates I can give no figures on collapsable ones. If the crates were not collapsable, I suppose they would cost about the same as the present berry crates, or not a great deal more.

In the case of the baskets for the inside, we can judge of the cost from the value of the quart basket for the Georgia crate, which was sold this season in Grimbsy for one cent. I offer these suggestions for consideration, feeling that between the downward trend in the value of fruit, and the steady increase from year to year in the cost of packages, we are rapidly reaching a position of absurdity which must be tackled soon. The increase in the cost of baskets has been steady and gives every sign of continuing so.

THE MARKETING OF ONTARIO FRUIT.

By F. G. H. Pattison, Grimsby.

The subject assigned to me of "Markets," or, the distribution of the fruit crop, is one of the most important in the fruit growing industry. For the entire science of fruit growing can be briefly expressed in two words, "production" and "distribution;" and the time and labor expended in producing a good article of fruit is wasted if we do not adopt a systematic and proper system of distributing it. Let us now, accordingly, consider what would be an ideal system of distribution and then examine our present systems and see how far they come up to, or fall short of it; and let me here preface that I am going to discuss mainly the distribution of our basket fruits throughout the Dominion of Canada. An ideal system, I take it, is one which enables the fruit growers to deliver to the consumers in every practicable place throughout the territory mentioned, an even supply of good honestly packed fruit during the season at a reasonable price, whilst at the same time securing a fair profit for themselves and for all who handle the fruit on the way. Taking this definition as a text I purpose preaching on it a sermon as brief as my natural disposition will permit of. I am also going to avail myself of the usual privilege accorded to reverend word-mongers, of dwelling elaborately on some points and comparatively lightly upon others. You will notice that this ideal system comtemplates the handling of good fruit. Are the large majority of our growers producing good fruit? The answer is, no. A considerable number are, a considerable number are not doing so as yet. Next, the fruit must be honestly packed. A system of distribution which does not insist upon this is certainly not an ideal one. Is by far the larger proportion of fruit shipped from the fruit district honestly packed? I wish that I could say "yes" to that question, but, George-Washington-like, I cannot. In spite of all that has been spoken and written upon the subject, a large amount of dishonestly packed fruit, nay, even unwholesome fruit, is continually being unloaded on the public.

Travel through the great fruit belt between Toronto and the Niagara River in the fruit season, and look at the fruit hanging upon the trees and vines, and you would imagine that but little poor fruit ever came upon the market. Travel through the towns outside of the fruit belt, and behold the fruit exposed for sale, and you would wonder if any good fruit was grown here.

The fruit growers are a noble body of men, but, as our friend, J. H. Hale, of Georgia and Massachusetts fame, would say, "They need watching," and there is a simple method of watching them which can be easily applied without much expense. That is the appointment of three or four travelling inspectors, to act during the fruit season between Toronto and the Niagara River, and inspect the fruit at the point of shipment, endowed with authority from the government to stop the shipment of fruit either dishonestly packed or unfit for consumption, publish the names of the offenders, and have such penalties inflicted on them as may be thought advisable. Three to four competent men could easily cover that territory, and would only be needed for four months in the year. A salary of from $100 to $150 per month would be ample to secure such men. The public would be protected and honest fruit growers encouraged at a cost of at most $2,400 a year—a small sum to secure such great results. It is a matter greatly to be deplored that the Fruit Marks Act, which has greatly improved the export apple trade, has been allowed to remain almost a dead letter as far as the home fruit basket trade is concerned.

The following are the chief methods of distribution at present available to growers: 1, open markets in or adjacent to the fruit belt; 2, the commission system; 3, the order system; 4, the co-operative system; 5, canning and wine factories. No. 1 will not need much discussion and is confined chiefly to Niagara Falls, St. Catharines, Hamilton and, partially, Toronto, Of these, Hamilton is by far the most valuable open market to the fruit grower, and a very large amount of fruit is disposed of in this way there, buyers coming from other places in great numbers. There is a fruit inspector on this market who looks after the fruit packages fairly well and consequently restrains certain propensities of the fruit growers already referred to. No. 2, the commission system demands more attention. In the early day of fruit growing in the Niagara district the bulk of all the fruit shipped was dumped into the hands of commission men in Toronto and Montreal to be distributed by them as they saw fit, they keeping as much of the proceeds as they choose, and remitting the balance to the growers. These conditions produced a heavy crop of commission men in the cities referred to, some of whom sprang up like mushrooms in the night, stayed in business for a little while, obtaining high prices for fruit consigned them, then, suddenly vanished, taking with them much of the growers' hard-earned money. Under this system, too, the market was very uncertain, high prices ruling one week and slaughter prices the next; and even the better class of commission houses seemed utterly unable to prevent these "slumps." To counteract such abuses, in August of 1889, a number of prominent growers in the Niagara District formed the Niagara District Fruit Growers Stock Co., which established agents for whom the company was financially responsible, not only in Toronto and Montreal, but in many cities and towns all over Ontario and Quebec and later in the Northwest. This was a great improvement, as by this means the fruit was better distributed, new markets being continually opened up by the company; and the growers were, to a great extent, protected against financial loss. This company certainly did a lot of good, and indeed at certain times was the salvation of

the fruit industry. It also bought baskets at wholesale rates, thus effecting a considerable saving for its patrons. All its sales, however, were made upon a commission basis. In the meantime, in 1879, Mr. E. D. Smith, of Winona, inaugurated a much better plan of selling, viz: The order and quotation system, No. 3, upon our list, by which fruit is sold on order directly to the retailers throughout the country at a fixed price f.o.b. at the point of shipment, price quotations being sent out in advance to the customers at frequent intervals. By this method for the first time in the history of our fruit trade, the growers had some say in fixing the price of their fruit. Mr. Smith was followed by others of the large growers and there soon sprang into existence a number of local buyers, men who purchased fruit from their neighbors for cash and shipped it on quotation to customers all over the country. The number of these buyers rapidly increased till they covered practically the whole of the fruit district and handled a very large percentage of the fruit grown.

For a good many years this system was a great assistance in improving the quality of the fruit produced, as the buyers examined the fruit and refused to pay good prices for poor stuff; but as their business grew to very large proportions and competition increased amongst them for the fruit, the examination came to be of a very superficial character, and now a great deal of very poor fruit is got off by the growers on the dealers at the price of good fruit, and this, when shipped, does not give satisfaction either to the retailers or to the consuming public. Hence the urgent need of travelling inspectors as already outlined by me, to protect the public. Sometimes, moreover the buyers in their eagerness to secure customers, offered fruit to dealers at outside points, at prices lower that it was worth, the result being that the market was lowered to such an extent that growers actually were selling their fruit to the buyers at less than the cost of production.

To remedy this the plan of uniform quotations was established, by which similar prices were granted to retailers by buyers from all the different shipping points, and this has worked fairly well for the last two or three years. The adoption of this order system has had the effect of reducing considerably the number of commission men in the cities and larger towns, leaving only the more reputable houses in the trade, and has done away with them altogether in some of the smaller places.

No. 4. The co-operative system now demands attention. About the year 1883, some of the leading growers around Burlington formed a co-operative association called "The Burlington Shippers Co." for the purpose of shipping their apples and pears to the Old Country. This company has been in existence ever since and has shipped more or less fruit every year, and the results in the main have been satisfactory to its members, of whom there are now about fifteen.

In the year 1898, the fruit growers in the neighborhood of St. Catharines formed a co-operative company termed the St. Catharines Cold Storage Company. Beginning in a small way, the company has been very successful as a purchasing and distributing company, storing, packing and distributing fruit for its members and selling it both by order and by commission, also purchasing supplies of all kinds in wholesale quantities at a great reduction in price. In the year 1907, they shipped out 210 cars of fruit, netting about $100,000 and saving their members $21,000 in express charges alone, and also purchased $25,000 worth of supplies at a large saving to their patrons. This company has raised the standard of fruit produced in its neighborhood, and has enabled the growers to realize better prices for their fruit, whilst at the same time giving the consumers a better article.

In 1905, the Grimbsy Co-operative Company was formed, a purely distributive company confined to a few growers. This company has proved fairly successful, has turned out a good quality of fruit, and has given good returns to its members.

Quite a number of co-operative societies have come into being throughout Ontario, for the purpose of handling apples during the last four or five years at Simcoe, Walkerton, Oshawa, Oakville and a number of other places, and have met with a fair measure of success.

No. 5. The last method on our list, is by means of canning and wine factories. These two, especially the canning factories, have been very valuable aids to the fruit growers. By buying large quantities of fruit at profitable prices to the growers they have at many times kept the market in a healthy condition and prevented a glut and the consequent drop in prices. They have also opened up new markets in Europe, South Africa and other places. In the past, it is true there has at times been some friction between the growers and the factories. On the one hand, the factories have tried to make the price too low and have not always strictly carried out their contracts, and on the other hand, the growers have tried to unload inferior produce in the factories, but the fact is that the factories and the growers are mutually dependent on one another. On the one hand the factories cannot exist without the growers, on the other many parts of the country largely depend on the factories for a market. Undoubtedly it is to the best interests of the canning factories, to pay as large a price to the growers as they can, consistently with making a fair profit on their finished product. At the same time, the growers ought to take a pride in supplying the factories with produce of good quality, for the factories need a high class of goods produced in order to enable them to successfully compete with other countries in the world's markets. All these systems exist to-day and all are needed, one system frequently acting as a check upon another. In the larger cities, the better class of commission houses are quite necessary to the distribution of the fruit there, and local buyers, purchasing for cash and selling on order at uniform quotations, supplemented by local inspectors at the points of shipment, make an excellent means of distributing the crop.

To me, the co-operative system seems to afford the best outlook in the future for the ordinary grower, who undoubtedly is not fitted to both produce a good article of fruit and to distribute the same so as to bring him the best returns. A co-operative society certainly demands a good capable man for manager and one who can gain the confidence of the growers. Under such, I think that system approaches nearer to the ideal than any other. By purchasing supplies in wholesale quantities and shipping in carload lots, a great saving is effected, and more can be accomplished with the carrying companies by an organization of this kind, than by individuals. By this means the packing can be carefully attended to, and an article of uniform excellence turned out, which will give satisfaction to the consumer. Sales can be made on order for nearly all the better grades, and arrangements can be made with the canning and wine factories to considerable advantage. This system encourages the grower to produce a good article of fruit, as he knows he will get good value for it. As co-operative societies increase and further develop, the supply of fruit can be largely controlled and thus in a measure, the price. The next few years will probably see considerable development along this line and the day may come when all the growers in our fruit belt between Toronto and the Niagara River will be united in one central organization, controlling the output and operating through smaller societies at each shipping point.

PROPOSED LEGISLATION.

President PEART: It has been suggested that some legislation should be asked for in regard to the codling moth and little peach. I would suggest that a resolution be passed empowering the executive to deal with the matter.

Mr. TWEDDLE: A law to be effective should empower the municipality to pass a by-law making it compulsory to spray for codling moth, and in the event of an owner failing to do so the municipality should do the work and charge it against him, the same as in the weed by-law. A petition by fifteen ratepayers should compel action on the part of the municipality.

R. THOMPSON: A clause might be added to the Act respecting Black Knot and Yellows.

A. E. SHERRINGTON: There are some growers who control codling moth by other means than by spraying, and it would not be fair to compel spraying in such cases.

The PRESIDENT: Empower the executive to prepare legislation along lines similar to the present Yellows and Black Knot Act so as to make it applicable to these present troubles.

REPORT OF THE COMMITTEE ON RESOLUTIONS.

IN MEMORIAM—THE LATE DR. JAMES FLETCHER.

Moved by Mr. HAROLD JONES, seconded by E. D. SMITH, "Whereas the announcement of the untimely death of Dr. James Fletcher, Entomologist and Botanist of the Central Experimental Farm, has come as a grievous shock to his many friends; that the Fruit Growers' Association of Ontario at this time assembled in Annual Convention at Toronto do convey to his sorrowing family, and to Dr. Saunders and the staff of the Experimental Farm, this expression of our own deep regret and of sympathy with them in the loss they have sustained, a loss which is indeed common to the whole Dominion, over which the deceased gentleman was well known and highly esteemed."—Carried.

Mr. HAROLD JONES, Maitland: Dr. Fletcher was a very dear friend of mine, and, I am sure, of a great many here. He built up a record for himself in this country in connection with his work. For some years past he was recognized in the whole of America as our leading entomologist and botanist. I do not think there is his peer in America to-day. He had the faculty of making himself understood by children as well as by adults. He took a deep interest in everybody he met, and remembered faces and people. I feel that it is our duty and privilege to mark our appreciation of his work and character by passing a resolution of sympathy and forwarding it to his family and fellow workers of the Central Experimental Farm. I feel that we ought to show our appreciation of the work he has done for us, and for this country as a whole.

Mr. STEVENS: Dr. Fletcher was well known and well liked by all who knew him. It is a great many years ago since he first came to the Central Experimental Farm and assisted Dr. Saunders to organize it, and afterwards to bring it to its present high state of efficiency.

Mr. E. D. SMITH: I am sure we all feel as Mr. Jones does in regard to the great loss this country has sustained in the death of Dr. Fletcher. He was not only eminent in his profession but a most charming friend and con-

versationalist. As a lecturer, he had the faculty of imparting his information in a pleasing, plain and practical way, which is often lacking in persons who present technical subjects. We shall for many years feel his loss.

Little Peach Disease.

Moved by G. C. Brown, Fonthill, seconded by Robert Thompson, "That it is the opinion of this Association that the disease known as Little Peach should be added to the Act respecting Black Knot and Yellows, and that the same regulations should apply to the inspectors under the said Act as apply to inspectors under the San Jose Scale Act."—Carried.

Grand Trunk Railway Fruit Sheds, Toronto.

Moved by Wm. Armstrong, Queenston, seconded by Murray Pettit, Winona, "Resolved that we forward our thanks to the Grand Trunk Railway authorities for renovating and enlarging their old Scott Street fruit freight shed in the City of Toronto, all of which is greatly appreciated, especially by the commercial fruit growers of the Province."—Carried.

Moved by E. D. Smith, seconded by Jas. E. Johnson: "That the Department be asked to increase still further the number of inspectors for apples, and also to supply two or three inspectors to carry out the Fruit Marks Act in regard to tender fruits in the Niagara fruit belt, and in other tender fruit districts."—Carried.

A. McNeill, Fruit Division, Ottawa: In compliance with the demands of the fruit growers, the Department made a very considerable increase in the staff of inspectors this year, two of whom worked almost exclusively in the Niagara district.

Mr. Smith: I never heard of them.

Mr. McNeill: Nevertheless they examined much of Mr. Smith's fruit, and we have their reports to show it. These inspectors are in a measure detectives, and have been working at the most effective points, the fruit having been examined in large quantities.

Mr. Pattison: There is a great objection to secret methods. Much of the fruit is examined at Toronto, and this fails to accomplish what we desire. We want it examined at the point of shipment. It is publicity that is wanted. The Department is making a very great mistake in adopting secret methods. One of the greatest drawbacks to the local buying and order system is that they cannot depend on getting an honest quality of fruit. A buyer is so busy that he cannot look after each shipment himself.

Mr. McNeill: That is simply asking the Government to assist the buyer by looking after the individuals from whom he buys. You cannot expect that. A man must look after the shipments himself or stand the consequences.

THE WESTERN PROVINCES AS AN OUTLET FOR ONTARIO FRUITS.

By J. W. Crow, O.A.C., Guelph.

Accurate or even approximately correct figures on the quantities of fruit shipped to the western provinces year by year are difficult to obtain. Transportation companies and shippers are in possession of the only sources of information on matters of this kind, and these are not often open to public inspection.

I am indebted to Mr. Charles F. Roland, Development and Industrial Commissioner for the City of Winnipeg, for the following estimate of the total quantities of fruit received in that city from all points during 1907. Fruit from Ontario and from the central United States is usually distributed throughout the prairie provinces from Winnipeg and is included in this estimate. These figures do not include, however, large quantities which enter these provinces from British Columbia, Washington, Idaho, Oregon and California, and which is distributed from Regina, Brandon and other points west of Winnipeg.

"Fruit received in Winnipeg in car lots from all points during 1907:—48 cars of strawberries; 430 cars of tomatoes; 680 cars of peaches, pears and small fruits other than strawberries; 600 cars of oranges, and upwards of 1,000 cars of apples. Large as these receipts may appear, you can judge that the receipts will be even double in a very few years, as the population of Winnipeg has grown from 67,000 in 1904 to 118,250 in 1908. I am informed that over seventy per cent. of these receipts was consumed locally."

The proportions of fruit received from different points and handled in Winnipeg are estimated by the McNaughton Fruit and Produce Exchange as follows:—

California, Oregon, and other northwestern States	50 per cent.
Ontario	35 per cent.
British Columbia	15 per cent.

Mr. A. Mallinson, who has this season bought very largely in Ontario for western firms, estimates the total quantities of fruit shipped to the West from Ontario this year as follows:—

83,500 barrels apples, including a few boxes, estimated at three boxes per barrel.
220 car-loads of grapes, estimating 2,400 six-quart baskets as one car-load.
73 car-loads of tomatoes, pears and canteloupes.
Included in the last item would in some cases be a few baskets of plums, and a few peaches went forward also.

Mr. A. Gifford informs me that fully 20 per cent. can be added to the above estimate of total shipments. Mr. A. Mallinson states further that shipments of fruit from Ontario to Winnipeg have increased fifty per cent. during the last five years, and fully one hundred per cent. in the last ten years.

From a communication received from Mr. A. McNeill, Chief of the Fruit Division, I quote the following, with reference to the apple trade of 1907:—

The North West Transportation Co. handled	100,253 bbls.
The C. P. R. handled	18,720 "
Other boats handled about	10,000 "
	128,973 "

The G. T. R. and American lines not known,—probably half the C. P. R.

These figures show beyond doubt that a large and growing market for fruit exists in the prairie provinces. They show also that large quantities of fruit are annually being marketed there. They fail to show, however, anything regarding the kind or quality of fruit most in demand in that market, and on this point a great many Westerners have most decided opinions. The writer had the pleasure of interviewing large numbers of people at Winnipeg Fair this year regarding Ontario fruit matters. The opinions obtained regarding the grading and branding would have delighted

the heart of a British Columbia or Oregon shipper, but they surely operated to humble the pride of an Ontario shipper in the quality of our goods and in the honesty of certain of our citizens. A very large number of Western people know from experience on the old homestead in Ontario of the quality of fruit produced here. They will tell you emphatically, however, that since residing in the West they have too often been unable to secure value for money invested in fruit from the home province. They will tell you that in order to get what they pay for they are compelled to purchase the honestly marked and attractive packages from British Columbia, Oregon and other western points. This condition of affairs it must be admitted is not universal, but it is nevertheless far too common. It is unfortunate that we have in Ontario careless, ignorant, or dishonest growers and shippers, as our hitherto enviable reputation has suffered severely at their hands. One hears, too, of wilful unscrupulousness at the other end of the line, and it must be said in fairness to Ontario men that not all the fault lies at their door. In some cases, if one can believe all one hears, western receivers have encouraged misbranding of goods by such advice as this: "Send on your No. 1's if you have any; if you have none, send on your No. 2's, and either change the brand yourself or leave it to us to make No. 1 stock out of it." This is not intended as an arraignment of all fruit shippers and handlers, and the honest men in the business (fortunately they are in the majority) will not take it as such. There can be no good reason, however, for trying to hide the real state of affairs, and one learns with pleasure of a very radical change which has taken place this season in the methods of transacting business. Representatives of western firms have this year bought very largely in Ontario on the f.o.b. plan, subject to inspection by the buyer at shipping point. This method has given entire satisfaction both to the buyer and the seller. As evidence of the fact that the western consumer desires fruit of first quality and that a suitable article can be procured in Ontario, we may say that the Norfolk County and Forest Co-operative Associations have sold 14,000 and 15,000 barrels, respectively, in this way this season. Prices secured were very satisfactory, and in this connection the fact is worthy of note that the Westerner is a free buyer and is more willing to pay a good price for an article which suits him than is any other class of customers within our reach.

As further evidence of the wisdom of careful grading and honest branding, the following is quoted from a communication dated November 3rd, 1908, received from a Winnipeg firm: "We had three cars from the Georgetown Fruit Growers. The first car made them very little money; the second improved quite a little, the buyers getting next to the brand, and the third car sold to good advantage. It was fifty per cent. No. 2 and is going to net them back $2.35. We are using this to show what it means to the shipper to have stuff properly graded, packed and branded. We have other shippers who marked their stuff No. 1, and whose apples will average them from $1.00 to $1.50 per barrel. This is my best explanation regarding packing, grading and branding."

Other problems which relate themselves to this subject are those connected with transportation rates, express, and freight service and the customs tariff. In point of time Ontario is nearer Winnipeg than are California, Washington, Oregon, and British Columbia. The new route of the C.P.R. places Winnipeg within thirty-six hours of Toronto by express. British Columbia shipments reach the same market in three days. The same rate of charges is paid in either case, $2 per 100 pounds, in carload lots and $2.40 in part car lots. By freight the average time from Ontario points to

Winnipeg is five and three-quarter days, while from Oregon and British Columbia the time required is from six to eight days. The freight rate from points in Ontario to Winnipeg on fresh fruits in boxes, baskets or barrels and also on vegetables when shipped as part carload of fresh fruit is 66 cents per 100. To Brandon, the rate is 86 cents and to Regina $1.26. On straight carloads of apples in either boxes or barrels, the following rates apply from Ontario points to the West: To Winnipeg 55c., Brandon 68c., and Regina 83c. The foregoing tariffs are for all-rail shipments. By lake and rail, the following rates apply: To Winnipeg 48c., and to Brandon 61c. From points in British Columbia to Regina, Brandon and Winnipeg, I am informed that a flat rate of $1 per 100 pounds applies. From points in Washington and Oregon along the O. R. & N., the rate to Regina is $1.24 per 100 pounds. From these points to Winnipeg there is a competitive rate of $1.18.

Our Western competitors for the markets of the Prairie Provinces enjoy no advantages in the way of transportation facilities. The ventilated or "blower" express cars are in common use here as well as there and are very satisfactory. It is felt, however, that the rates charged on Ontario shipments are rather out of proportion to those asked of British Columbia shippers. For shipment by freight of summer and early fall fruits, including early apples, refrigerator cars are used. Excellent results have been secured by pre-cooling this class of goods, and for long distance shipments in warm weather this operation is coming to be regarded as essential. Mr. Robert Thompson, manager of the St. Catharines (Co-operative) Cold Storage and Forwarding Co., states that peaches handled in this way can be laid down in Winnipeg in good condition and at a moderate cost. Large quantities of apples go forward during favorable weather in the fall in ordinary box cars. After November 1st, however, there is danger of frost, and refrigerator cars are again resorted to. A sufficient supply of these is not available at this season, however, and as a consequence heavy losses often occur. From a circular issued by the C.P.R. to shippers and consignees, I quote the following regarding the handling of green apples, via lake and rail from Eastern Canada to Manitoba, Saskatchewan and Alberta:—

The Canadian classification provides for the carriage of green apples at owner's risk of freezing and prepayment of charges between 1st November and 30th April.

Notice is hereby given to connecting steamer lines, shippers and consignees that the railway companies will not assume responsibility for damage to green apples by frost, delivered to them at the above ports (Duluth, Fort William, Port Arthur, and West Superior), at the head of the lakes, on and after 1st November, nor will the railways guarantee to furnish refrigerator equipment for all such traffic, it being impossible to do this owing to the practice of combining the shipment to a short period late in the season. Railways will, however, as far as possible, supply refrigerator cars and permit the owners of such apples to equip these cars with their own means of heating. When box cars are used, the owners will also be permitted to line and place stoves or other means of heating in them, providing that in so equipping the cars with heating apparatus, damage will not be caused to cars. The railway companies will also furnish free transportation for attendants accompanying cars for the purpose of looking after the heating and will return such attendants to the starting point free of charge.

As a matter of fact, a shortage of cars usually exists by the all-rail route as well. It is, of course, practically impossible to equip a box car with heating equipment sufficiently to render shipment in cold weather reasonably safe. Refrigerator cars themselves are not safe in severe weather, and it will be one of the problems of the future to devise methods of avoiding frost injury to the late fruit intended for distant markets.

Mr. A. C. Macpherson points out that at the present time the export trade is receiving favors in the way of relief in icing and cold storage charges from the Dominion Government, and that interprovincial trade would also seem to merit similar encouragement.

Following is a statement of the customs tariff at present in force on fresh fruits entering Canada from the United States:—

Bananas, plantain, pineapple, etc., free.
Oranges, lemons and limes, free.
Blackberries, gooseberries, cherries, strawberries and currants, the weight of the package to be included in the weight for duty, 2c. per lb.
Cranberries, plums and quinces, 25%.
Peaches, weight of package included, 1c. per lb.
Grapes, 2c. per lb.
Pears, apricots and nectarines, 50c. per 100.
Apples, per barrel, (3 boxes estimated at 1 bbl.), 40c. each.

From a letter recently received from Mr. E. D. Smith, I quote the following:—

"The west is an outlet which enables us to very largely increase our acreage in many lines of fruit. Our chief difficulties are the high express rates and the low duties. If we had high duties or low express rates, we could capture nearly the entire western trade for peaches and plums, which would amount to hundreds of thousands of dollars annually; but betwixt the low duties and the excessively high express rates we are seldom able to compete with California peaches and plums laid down there by freight under a low duty. In grapes we have a high duty amounting to practically 200 per cent. What is the consequence? The consumers are able to buy grapes as low as 1½c. per lb., so they are not hurt very badly by the prohibitory tariff. The consequence is, however, that we are able to grow sufficiently broad acreage to supply the entire want of the Canadian public from ocean to ocean. That is the way it should be in peach and plums. On articles such as grapes, pears, and apples, which we can lay down by freight in the Northwest, we have no difficulty in competing except in the early part of the season. Even in these fruits with higher duties we would secure a greater share of the market, which would mean our ability to plant increased acres and not hurt the consumer one iota if our fruits are in the market."

A careful summary of western market conditions, competition, and transportation problems cannot but lead one to the conclusion that the western market logically belongs, in great measure at least, to Ontario. It only remains for Ontario men to come to an appreciation of the opportunities which are opening to them in that vast new country, and to make united and intelligent effort in order to secure their proper share of that important trade.

REPORT

OF

FRUIT BRANCH

Department of Agriculture

ONTARIO

1908

Published by the Ontario Department of Agriculture, Toronto

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To the Honourable JOHN MORISON GIBSON, K.C., LL.D., ETC., ETC., ETC.
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Fruit Branch of the Department of Agriculture for 1908.

Respectfully submitted

JAMES S. DUFF,
Minister of Agriculture.

Toronto, 1909.

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REPORT OF THE FRUIT BRANCH.

1908.

To the Honourable Jas. Duff, *Minister of Agriculture.*

Dear Sir,—I beg to transmit herewith for your consideration my first report of the work carried on by the Fruit Branch of the Department of Agriculture. Up to March of last year the horticultural and agricultural work was supervised by myself in connection with other Departmental business. At that time I was acting as secretary of the Fruit Growers' Association, the Bee-Keepers' Association and the Ontario Horticultural Exhibition and in charge of the inspection work under the San Jose Scale Act and any other horticultural work coming under the charge of the Department. The work had grown so rapidly, however, that it was felt that a special branch should be established in March, 1908, to which I was appointed Director.

The expenditure under this Branch during the past year as given in the Public Accounts of the Province was as follows:

Salaries	$ 1,833 29
Contingencies	1,198 17
Association grants	5,950 00
Experimental Fruit Stations	16,446 33
Grants to Spraying Associations	4,240 54
Inspection of Apiaries	2,085 21
San Jose Scale	3,363 66
Exhibitions	2,457 20
Canadian National Exhibition	770 02
Royal Horticultural Exhibition	2,453 65
Capital Expenditure, Ontario Horticultural Experiment Station	18,909 00

These items of expenditure will give some idea of the lines of work undertaken during the season and will be elaborated upon in the following pages, where details are given of their carrying out.

Your obedient servant,

P. W. HODGETTS.
Director.

REPORT OF THE FRUIT BRANCH.

FRUIT GROWERS' AND BEE KEEPERS' ASSOCIATIONS.

Under the item of grants, these two associations are allowed for their work the sums of $1,700 and $450, respectively. The money is spent chiefly for the promotion of organization among the fruit growers and the bee-keepers and for the holding of annual meetings of these two bodies of agriculturists to which are brought the best speakers in America. These gatherings are of great importance, bringing the producers of various parts of the country into touch one with another.

Realizing the necessity for awakening our apple growers to the value of more thorough spraying for the Codling Moth, the Fruit Growers' Association, through this office, issued a small pamphlet entitled "Success in Spraying." This was very widely distributed throughout the country, and from reports received during the year, a great deal of interest was awakened by the information contained therein.

The formulae and spraying methods in use by three of the best apple growers in the Province were given in full, with a brief comparison at the end as to the differences between them. Mr. Jas. E. Johnson, of Simcoe, uses the following formula:

"First spraying when buds begin to swell with 20 lbs blue vitriol; 70 lbs lime; 200 gallons of water;

Second spraying just before buds break open, and third spraying just as soon as the blossoms fall, with 16 lbs. blue vitriol, 12 ozs. Paris green, 12 ozs. white arsenic, 2½ lbs, sal soda, 70 lbs. lime, 200 gallons water.

"Fourth spraying, if troubled with Tussock Moth, when the young begin to feed upon the new wood, spray same as in second and third sprayings, except use 12 lbs. blue vitriol instead of 16 lbs. to 200 gallons water."

Mr. D. Johnson, of Forest, uses the Paris green only for poisoning the liquid, and the ingredients are mixed in the following proportions:

200 gallons water, 16 lbs. copper sulphate, 24 lbs. lime, 16 ozs. Paris green.

Mr. Harris, of Ingersoll, the third party whose methods were outlined uses the following formula:

160 gals. water, 24 lbs. copper sulphate; 28 lbs. lime, 32 ozs. Paris green.

While it is found that these mixtures differ somewhat, the results were uniformly good. There is no doubt whatever that the success of these men has been due to the thoroughness with which the mixture has been made and applied. There has perhaps been too much emphasis in the past put upon the necessity for getting a very fine, mist-like spray, and in consequence neglecting to apply enough of the mixture to get the desired results.

In speaking of the amount of material required, Professor Melander, of Washington, who has been very successful in his spraying, states that a well-grown tree will absorb from 5 to 10 gallons of the mixture at a spraying.

Realizing that the co-operative fruit shipping associations, organized by the Provincial association would require every assistance possible for the marketing of their fruit, the Directors of the Provincial Association organized what is known as the "Co-operative Fruit Growers of Ontario." This

association differs from the other Provincial association in that its aims are entirely commercial. It is supported by a small fee from each association, and endeavors to keep the local associations in the various parts of the Province in close touch with each other during the fruit season, from July to December. During that time a weekly report is issued giving lists of sales, prices being obtained for apples and other fruits, amount of fruit available from the different associations and from other parts of the country, general conditions existing in the important apple markets of the world, etc. In addition, special price lists are sent out in the spring giving wholesale prices for chemicals, spraying supplies, ladders, boxes and barrel stock and made-up packages, ets. Through this association, we believe that a great number of the smaller organizations have been helped to reap a larger profit from the sale of their fruits than would otherwise have been the case.

In the reports of the Fruit Growers' and Bee-Keepers' Associations, which are issued separately by the Department will be found further information in reference to the work carried on.

EXPERIMENTAL FRUIT STATIONS.

A detailed statement of the work carried on at the individual stations will be found in the following pages of this report. The work of inspection was undertaken by Mr. H. S. Peart, Director of the Horticultural Fruit Station at Jordan Harbor, and myself as such times during the year as we thought best.

In addition to the regular experiment stations, some special investigations were carried on by Mr. A. McKenney, district representative at Essex, in connection with tobacco, onions, and spraying mixtures for the San Jose Scale. A detailed account of the experiments with onions and spraying mixtures is given in this report. The tobacco experiments were not conclusive and this work has since been taken up by the Dominion Government which has established a special tobacco experiment station in Essex county. Further tests in reference to the effect of fertilizers on onions and other vegetable crops will be made the coming year in a special piece of ground on the Leamington marsh leased by the Department.

These spraying experiments will be continued by Mr. McKenney, so that definite announcements can be made as to the effect of the various chemicals, both home-made and commercial, which are being advocated throughout the Province.

The cranberry experiments, a report of which follows, were begun in the spring of the past year. As it will take three years for the bushes to come into bearing, nothing definite can be decided as to the value of this crop from the Ontario standpoint for two seasons. In the meantime, it is the intention of the Department to make further plantings at other points which may be thought suitable for the growing of these crops. From Mr. McMeans' report it will be found that a great deal can be saved to the Province if the fruit which we are now importing can be raised here.

The following is the report on the individual stations:—

G. C. Caston, Craighurst.

This station, known as the hardy apple and cherry station in Mr. Woolverton's list, was visited during the apple picking season. Mr. Caston has a large farm with a lot of good fruit set out for experimental and commercial work. His soil is light and sandy and seems to be specially well

adapted for the raising of early, hardy apples, such as Alexander, Wolfe River, etc. He has also raised large quantities of blackberries and raspberries and has a big plantation of these at the present time. His farm was in good condition and showed signs of careful tillage. The experimental cherries have been pretty well weeded out so that there are practically none left except the very hardiest, such as Russian 207, and Orel 24. The apples are in rather better shape, although a great many have been killed out. Here, too, the hardy apples are the only ones that are showing up well. Mr. Caston has great faith in top-working varieties and has some very healthy Spy and other kinds coming on at the present time in this way.

A. E. Sherrington, Walkerton.

This station was also visited during the apple picking season. Although he is supposed to experiment with raspberries, gooseberries and plums, we find that his apple plantings are at the present time his best experimental work. The experimental raspberries are about done and any new plants which Mr. Sherrington has put out are for commercial purposes only. His plums are in rather better shape than any of the experiment stations that we visited and many varieties have survived here which were entirely wiped out at Clarksburg.

We found the experimental apples in fine condition, the trees being very vigorous and healthy and coming nicely into bearing, a great many of them having been planted from 10 to 12 years. As yet we have received very little records of yields from these trees and they are now at their best.

The pear orchard containing a collection of the French varieties is practically cleared out. A young cherry orchard of Early Richmond, English Morello and Montmorency was found to be in good condition. A new plantation of blackberries, raspberries and strawberries has been set out, but no further experimental work.

The condition of the whole farm was excellent. It is almost all planted in fruit with 8 or 10 acres in full bearing apple orchard. The section promises to be one of importance as an apple growing district, Mr. Sherrington should be able to render valuable assistance to his own and neighboring counties.

During the coming season he will carry out a number of special experiments in the use of commercial fertilizers for small fruits and various spray mixtures for control of the codling moth and scab.

J. L. Hilborn, Leamington.

This station was started two years ago to specialize with peaches. Owing to the very disastrous frosts in the Essex Peninsula, the orchards there which were of very great importance were almost completely destroyed, and it was felt that something should be done to encourage the growers to replant. We found Mr. Hilborn's farm in splendid condition and excellently situated for the purpose for which it was intended. Mr. Hilborn has shown his faith in the district by replanting peaches despite the unfavorable conditions of the past few years. His experimental orchards are, of course, just started, and no results from these can be expected for a short time yet. There was a very fine peach orchard of five years standing on the farm and this showed what could be done if the frosts can be evaded. In addition to the peaches, Mr. Hilborn has a small plot of experimental gooseberries and

currants. He is also largely interested in the forcing of early tomatoes. cucumbers, etc. An illustration is given of part of his houses which are built in such a way as to ensure efficient ventilation, ease in changing the soil in the benches and cheapness of construction.

A. W. Peart, Burlington.

Mr. Peart's specialties were blackberries and currants. We found there that he had given these complete tests and had cleared out his experimental plantations as nothing further could be obtained from them.

In addition to this fruit, Mr. Peart was given a large number of southern varieties of apples to test. These were top worked on his commercial orchard but have proved to be of very little value, most of them having fruited and have been reported as useless.

The farm is situated in one of the best fruit districts of the Province and was found to be in very good condition. The apple orchards showed up magnificently. In addition there were on the place, fine pear and cherry orchards and a good vineyard.

Mr. Peart states that he has come to the end of his experimental work with small fruits and does not feel like continuing it under present conditions. He feels that the Jordan Station could well undertake the work that he was carrying on with the experimental small fruits and has accordingly tendered his resignation. Mr. Peart deserves the highest praise for the careful and detailed reports which he has submitted, of the work carried on by him for the Department.

L. Woolverton, Grimsby.

This is what is known as the "Maplehurst" Station, and contains a general collection of cherries, peaches, grapes, pears and plums for comparative study and for use in preparing the "Fruits of Ontario." Mr. Woolverton's specialty was cherries. In a recent letter Mr. Woolverton states that he still has a complete collection of grapes and pears and nearly all of the peaches, but that he has taken out the plums. This place was visited by Mr. Hodgetts during the cherry season, and by Mr. Peart during the apple and pear season.

M. Pettit, Winona.

Mr. Pettit has devoted most of his time to the testing of grapes, although he has also been given some varieties of plums for testing. This station was seen at several times during the season, and was always in the best possible condition. Mr. Pettit is recognized as one of the best authorities on grapes in the Niagara Peninsula, and we believe that the results of his experiments have been of great value to that section. Mr. Pettit will conduct during the coming season some extensive experiments in the control of the grape rots and mildews.

H. Jones, Maitland.

This station, under Mr. Woolverton's list is marked for testing the hardy plums and pears. We find, however, that the plantings of these fruits have practically all been destroyed. Mr. Jones has evidently exercised a very great care in nursing all these varieties right up to the very last, but has

been able to hold very few of them over. This applies especially to the pears. The few varieties that are left are receiving every attention, and Mr. Jones hopes yet to make something out of them.

In addition to this fruit there are quite heavy plantings of apples of which there are a number now in bearing. Mr. Jones has been working with apples to secure a good winter variety and some of these that he has in bearing show considerable promise. The illustration shows a tree of Milwaukee which is probably one of the best of these varieties.

His farm as a whole was in good shape. The old commercial orchards of Fameuse and Scarlet Pippin show signs of the severe winters of late years, but despite this, the broken limbs and trunks bore a large crop of fine apples the present year. Mr. Jones has a number of young orchards also on the farm which are coming on nicely. Mr. Jones will co-operate in the future with Mr. Macoun, of the Central Farm, in the testing of the varieties which have been originated there.

E. E. Adams, Leamington.

This station was started two years ago for the testing of vegetables. The Leamington section has become noted for the area which is being devoted to truck crops, and Mr. Adams has made this largely his business. We found the farm nicely situated in the heart of this district and everything was in excellent condition. At the time of our visit Mr. Adams was shipping large quantities of melons to the upper lake ports. He seems to be specially fitted owing to his business training to market his crops to the best advantage. Everything was put up in neat form and was bringing the top prices in the market.

In connection with this work, we find that there are several of our most important districts entirely unrepresented at the present time. Among others, there is the section east of Toronto comprising the counties of York, Ontario, Durham, Northumberland, Hastings and Prince Edward, the finest apple section in the Province. Then west of Toronto, there is the district comprising the counties of Lambton, Middlesex, Oxford, Brant, and in the south that composed of Welland, Haldimand, Norfolk and Elgin. In the first section we would suggest that instead of starting new stations as in the past to test varieties, we utilize the services of the two Department representatives, Messrs. Hare, of Whitby, and Winslow, of Picton, for this work. If necessary, orchards in the vicinity of these places could be leased for this purpose. In the other sections, we would like to see the work carried on in the same way provided representatives could be appointed to some of the counties in each district.

We find that in very few cases have the surrounding districts shown much interest in the station and we would recommend that some special effort be made to bring the results of the labors of the experimenters before the people living in the immediate vicinity. These are the ones who should benefit most by such work, but up to the present have gained very little from it. We would suggest that the local fairs in the counties surrounding each station be arranged in a circuit and the representative in charge of the experiments be sent from place to place with instructions to hand out station literature and give as much information as possible to people inquiring for it.

SPRAYING OF ORCHARDS.

The bonusing of orchards sprayed under our system of inspection was continued this year with very gratifying increase in the acreage sprayed, and the number of parties taking advantage of the assistance rendered by the Department.

The regulations governing the grants for 1908 were somewhat changed from those of 1907. Instead of giving the bonus entirely to power spraying outfits, it was decided to distribute the money according to the acreage sprayed and the efficiency of the work done, regardless of the type of machine used. Those fruit growers who had participated in the previous year's grant were given only one-half of the amount given to parties spraying for the first time under our inspection last year.

The inspection of orchards in the Niagara district and eastern part of the Province was carried on by my assistant, Mr. T. B. Revett. Orchards in the western and northern counties were inspected by Messrs. M. S. Middleton and R. M. Winslow, of the Agricultural College. Two visits at least were

Steam Cooking Plant on the Farm of Alf. Griffith, St. Catharines.

made to every orchard and separate reports made on the spraying, the cultivation, and general care of the orchard, and the condition of the crops. In November, a special report blank was sent out to all of the parties who had sprayed, asking for further information as to the spraying, the crops produced and prices at which the various fruits were sold, and the insects or fungous diseases which had caused material damage during the season.

In the districts infested with the San Jose Scale, the bulk of the spraying was done with the lime sulphur mixture. This remedy is now used almost entirely for the treatment of the scale and better results are being obtained than when the mixture was first introduced through the advice of Mr. Geo. E. Fisher. The general difficulty lay in the boiling of the ingredients. Mr. Fisher advocated, with splendid results, the use of the traction engine to furnish steam for this boiling. Such method was followed very largely until the past two seasons, when simpler devices were used. A number of illustrations are given in this report showing a few of the forms adopted. These are very efficient, boiling the mixture in less time than formerly and mak-

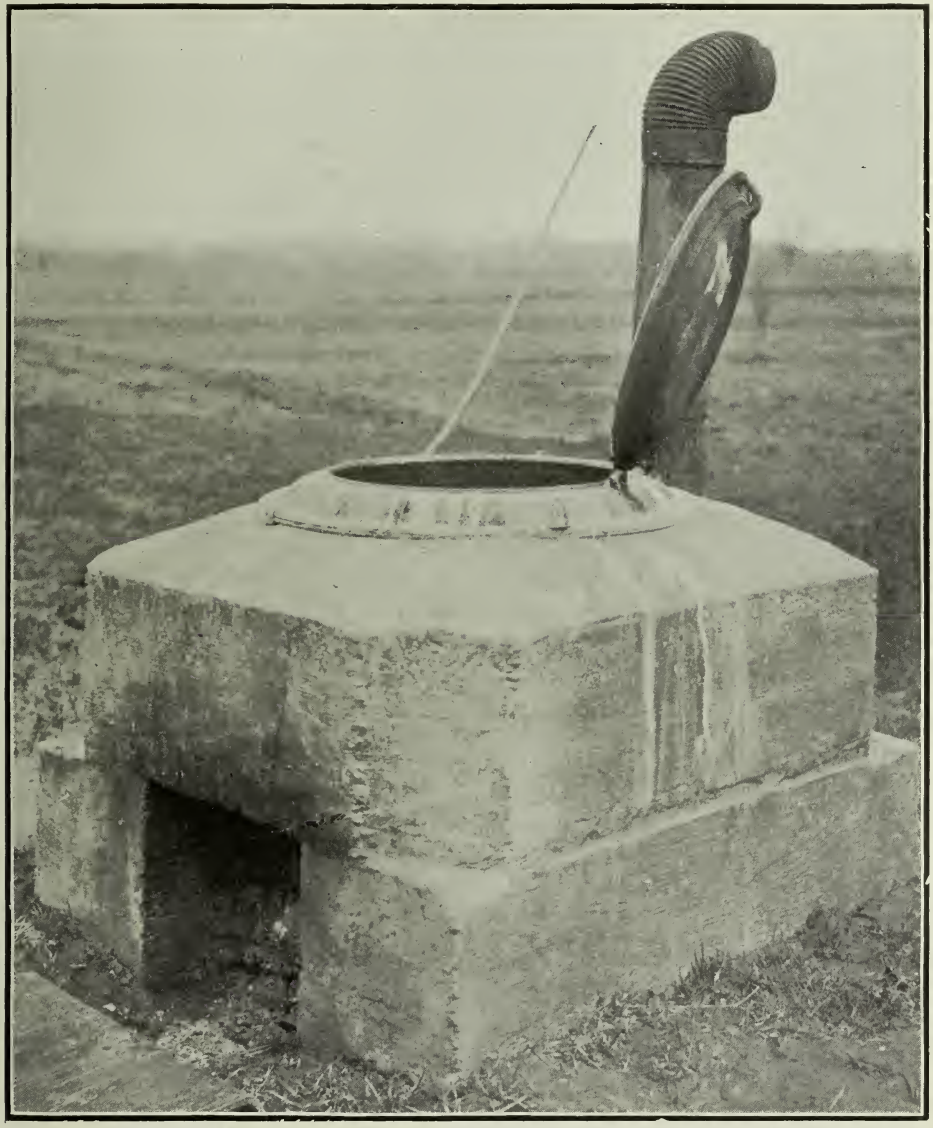
ing use as fuel of the prunings of the orchard which would otherwise be wasted.

The simpler outfits for a plant holding from 100 to 200 gallons can be erected for from $10 to $15. These are constructed with a brick or cement foundation covered by a box made of 2-inch plank. The bottom of the box is made of sheet iron, 16 guage or thicker, double nailed to the frame work. An outfit 6x2½x1 ft deep will hold 100 gallons giving plenty of room for

Handy Cooking Plant of 200 Gal. Capacity on Farm of E. Hack, St. Catharines.

the boiling. There is not the violent boiling and spluttering of the mixture with these outfits that there is with the steam plant, and the same allowance need not be made for this in the depth of the sides. An outfit for making 200 gallons is also illustrated. This is 6½x4x1 ft. deep. Two iron rods are run across the ends in all cases to hold the frame work rigid.

Where a man has a great quantity of fruit to spray, or intends to supply his neighborhood with the mixture, the larger outfits using steam for the cooking are still the most commendable. Illustrations are given of three of these plants at different points throughout the Niagara district. That on the Sanford estate at Hamilton has a capacity of 290 gallons in the two tanks.



Small Cooking Plant, 20 Gal. Capacity, on Farm of Robt. Locke, St. Catharines.

The boiler outfit cost $100. The capacity of the other machines can be guaged through the number of barrels in use. With these machines, the necessity of having convenient access to a supply of water is very essential. On Mr. Bunting's farm, a wind-mill and tank give the necessary supply, while on the Sanford estate, a steam injector draws the water from a near-by

creek. In the other instance, a thresher's pump is mounted on a large tank and both the engine and the barrels are supplied with water from a near-by stream.

The Department of Agriculture first gave a bonus on spraying in 1907. In that year the grant was given at the rate of $50 for every power sprayer owned and operated by a co-operative society of five or more members spraying at least 25 acres to every machine. As a result of this bonus several associations were formed and power machines installed. $4,000 was distributed to 36 societies and the following acreage was sprayed: Apples, 1,478½ acres; pears, 167½acres; plums, 334½ acres; peaches, 604 acres; grapes, 574¾ acres; cherries, 43 acres, making a total of 3,201½ acres.

Serviceable Cooking Plant for Lime Sulphur on Farm of Robt. Thompson, St. Catharines.

In the Niagara district there were 45 spraying machines in operation, in South-western Ontario, 16; in Eastern Ontario, 13; Western Ontario, 6. 201,320 gallons of lime and sulphur wash (prepared from 76,551 lbs. sulphur and 104,922 lbs. lime) were applied and 261,280 gallons of Bordeaux, consisting of 33,760 lbs. copper sulphate and 32,058 lbs. of lime, 1,466 lbs. Paris green and 565 lbs. arsenate of lead. This makes a total of 462,600 gallons of spraying material used in the Province that came under the direct inspection of the Department through these associations.

It will be noticed that the greater part of the spraying was done in the Niagara district. This is due to the fact that the land there is given up mostly to fruit growing, and these fruit growers have realized that in order to protect their orchards from such pests as the San Jose scale, codling moth and the various fungous diseases they must spray. This awakening resulted in a general campaign in favor of spraying, and as a result the acreage of fruit sprayed has increased every year and the work is improving as the growers become more conversant with the mixtures.

The spraying on the whole was done very creditably. There were instances where the work was not very thorough, but in most of these cases the apparent neglect was due to a lack of knowledge in regard to spraying.

Under the regulations of 1908 there were 42 associations who received the grant. Their total membership consisted of 552 growers spraying a total acreage of 4,781½ acres of fruit, an increase of 1,580 acres over the

Steam Cooking Plant on the Farm of the Sanford Estate, Hamilton.

total amount sprayed the year previous. The increase chiefly took place in the Niagara, Norfolk and Kent districts.

Mr. Revett reports as follows in regard to the season's observations: The growers generally took greater interest in the work than in 1907, and where there had been mistakes they took every precaution to prevent their recurrence. They seemed also to appreciate the fact that they had the opportunity once or twice during the season of discussing with the officers of the Department the different obstacles with which they were confronted. The greatest fault with which I met was that the fruit grower would in most cases apply too little mixture to his trees. This was partly due to the fact that they had been taught in the past not to put on too much to cause dripping. However, this error diminished as the grower became more conversant with spraying and realized that while economy was necessary, thoroughness should not be sacrificed for the sake of this factor.

Bordeaux Mixture. Bordeaux mixture was used more than any other spraying material. I found a great deal of variation in its preparation. Many of the growers had the idea that it was wisest and best to use a great excess of lime and in many cases large quantities were used. They contended that it minimizes the toxic effect of the copper sulphate, and increases the sticking powers of the Bordeaux. This idea is erroneous. An excessive amount of lime over the general formula is useless as it makes a coarser mixture, which is harder on the pump. It tends to delay the action of the copper salts which might happen at a time when this action is required, and is said to offer a greater mechanical resistance to the rain and in this way is more easily washed off. It is sometimes held that where the calcium arsenite is used as the poison that the lime in excess is an advantage, but there should be no excess of soluble arsenic if the poison is prepared properly and the excess of lime in the standard formula should be great enough to deposit the soluble arsenates as calcium arsenites.

We also find a varying percentage of bluestone used. The amount recommended in the old formula was 4 lbs to 40 gallons water, and while the greater number stuck to the formula, yet we find some growers using 5 lbs. to 40 gallons. The question of varying the strength of the copper sulphate has attracted considerable attention of late, owing to the russetting of apples which is technically known as Bordeaux injury, and it has been practically proven that the increase of degree of injury corresponds with the increase of percentage of $CuSO_4$ in the Bordeaux mixture. We find a large number of our fruit growers lessening the amount of bluestone and in some instances better results have been obtained where 3 lbs. of $CuSO_4$ had been used.

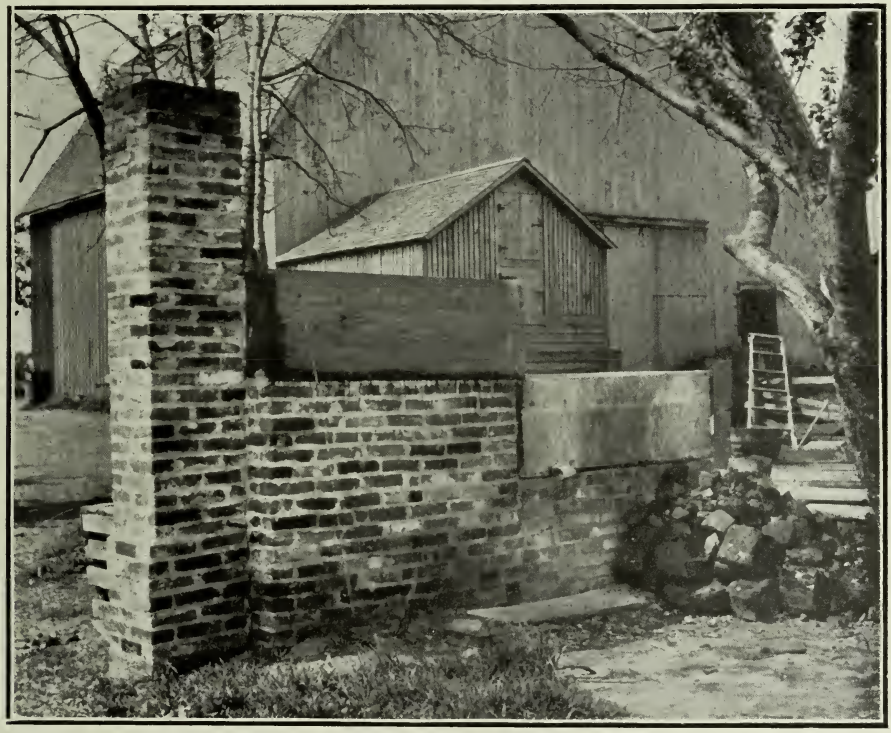
Bordeaux mixture was in most cases poisoned either by Paris green, arsenate of lead or calcium arsenite. Paris green was at one time universally used as a poison, but within the last two years, the growers around the St. Catharines district are using large quantities of the lead arsenate together with fair quantities of the other arsenical poisons, while the growers around Simcoe, in the County of Norfolk, use calcium arsenite almost entirely. Excellent results have been obtained by the use of these poisons. Paris green is still used, largely for the simple reason that the growers do not like to change from a substance they are familiar with to a new one. There is, however, a growing tendency to use the lead arsenate or calcium arsenite in place of Paris green. Lead arsenate has given splendid results. It is a trifle more expensive than Paris green, but the growers who have used it have had such good results that they prefer it to Paris green.

Calcium Arsenite. This poison is better known by the fruit grower as white arsenic. It is prepared by them on the farm by the use of sal soda, arsenic and lime. The general formula adopted is as follows: $\frac{1}{4}$ lb. arsenic, 1 lb. sal soda boiled for 45 minutes and precipitated with 2 lbs. lime to 40 gallons water, forming calcium arsenite.

Mr. James E. Johnson, Simcoe, poisons his Bordeaux by the use of calcium arsenite and Paris Green. He boils 12 oz. arsenic with $2\frac{1}{2}$ lbs sal soda in 2 gallons of water for 45 minutes. He then pours this mixture in 200 gallons of Bordeaux and then adds 12 oz. Paris Green. This method produces exactly the same result as a grower who only used the white arsenic to manufacture the calcium arsenite while Mr. Johnson's method is more complicated and expensive and attains exactly the same results. However, the results which have been attained by the Norfolk fruit growers have been very excellent in the treatment of the codling moth. Throughout the Province the general knowledge amongst the fruit growers of the pre-

paration of Bordeaux has improved wonderfully, more attention being paid to its preparation and application with the result that the degree of success has been more uniform than in past years.

Lime Sulphur Mixture. The use of lime and sulphur is chiefly confined to those districts in which the San Jose scale is found, namely the Niagara district and Southern Ontario. It is a splendid remedy for the scale and gives good results when used as an fungicide. Within the last three years the fruit growers of the Niagara district have carried on a vigorous campaign against the San Jose scale with the result that nearly every fruit grower uses lime and sulphur and knows a good deal about the preparation. The first step was made by the fruit growers in certain localities combining together to build a plant for the manufacture of this wash so as to produce a



Double Form of Cooking Plant on Farm of J. H. Broderick, St. Catharines.

uniform and economical mixture. Many of these plants sprang up in this district which had the immediate result of supplying the fruit growers' need and of inducing growers who would not make their own mixture to spray as the wash could now be had very conveniently. At these plants the wash was all boiled by steam generally supplied by a threshing engine. However, there were a few individual growers who made their own mixture by direct heat. This method is becoming very popular around St. Catharines, and I think it will eventually supplant the large boiling plants. Of course, the grower has to make his own mixture and to do it properly he must study and thoroughly understand the process and when this is the case, the grower generally does his own work more thoroughly and becomes a great believer in spraying and his results are more uniform and efficient.

This method has also the advantage of cheapness and does away with the waiting which would take place at a large co-operative plant.

The following is a description of a small lime and sulphur plant in which direct heat is utilized.

Two boxes 18 inches high, 4 feet 6 inches long; 2 feet, 9 inches wide using 1½ inch lumber. No. 16 iron plating is used for the bottom. 6 feet x 3 feet. This extra size allows the iron to be rivetted on the sides and in this way acts as a protection. These boxes cost $5.00 each.

The structure for holding the boxes may be made of brick or cement. The one shown is made of brick. It is made in two steps in order to allow the hot water to run from one box to the other. A fine grate which costs $2.00 is placed under the first box which is used to boil the wash, the heat striking this passes onward to the second and upper tank which is used to boil water.

Cost of plant.

2 boxes as per description, $5.00 each	$10 00
1 grate	2 00
Cost of building walls and finishing plant	13 00
	$25 00

Mr. J. H. Broderick, St. Catharines the owner of this plant writes as follows: "In making a batch of this lime-sulphur wash, I use 25 gals. of water, when boiling add 48 lbs. of lime and as soon as lime begins to slack well and the water boils freely, add 34 lbs. sulphur in paste form. Boil for an hour and add enough water from upper tank to make 80 gallons.

Cost of manufacturing 80 gals. of lime and sulphur wash with formula of 22 lime, 17 sulphur, 40 water:

Sulphur, 17 lbs. at 1.42 cts.	c.24 14
Lime, 22 lbs. at 25 cents bushel	7 85
Coal for fuel, 10 lbs. at $4.50 per ton	2 25
Labor	10 00
	c.44 24

In boiling this mixture, Mr. Broderick has only used the ordinary strength, but by doubling the solution a formula of concentrated solution could be made which when diluted from the upper tank would make 160 gallons of mixture which would lessen the cost of production about five cents per barrel of mixture, and if the lower box was found to be too shallow to allow the violent action of boiling, it could be made 22 inches deep, an increase of depth of four inches which would cost only a trifling amount.

This type of plant is a very economical one and gives excellent results. It should be located as near to the water supply as possible. The only drawback is that the mixture has to be baled out to the spraying tank. However, in some locations having a natural elevation of land this could easily be remedied. This drawback is not serious enough to detract from the value and suitability of such a plant to the majority of fruit growers.

The formula used for the lime and sulphur has changed a good deal. Three years ago the most used formula was 17 lbs. sulphur, 34 lime and 40 gals. water, but year before last and last year, the tendency was to equalize the amounts of lime and sulphur and the prevailing formula was 18 sulphur, 22 lbs. lime, 40 gals. water. The quality of the mixtures has greatly improved and a more uniform wash has been used with more satisfactory results. The lime and sulphur has been very effective on the San Jose scale and has been especially beneficial to peach orchards in the check-

ing of peach leaf curl, for while it does not entirely stop the curl in every case yet it checks the fungus, and the tree seems to come on very rapidly after the affected leaves fall.

One or two growers have used the home-made summer lime and sulphur wash in order to control fungus diseases. The formula used was 6 lbs.

Steam Cooking Plant for Lime Sulphur on Farm of W. H. Bunting, St. Catharines.

sulphur, 12 lbs. lime, 40 lbs. water, the mixture being self-boiled. In looking over this work I was unable to see any difference or any superiority of this mixture over the poison Bordeaux mixture.

There were several brands of the prepared lime sulphur sold in the Niagara district and a number of barrels of it used for experiment. The barrels were sold at $12.00 apiece and for winter spray were diluted either

1 to 11 or 1 to 12 which made the cost of material one dollar per barrel. Members of a co-operative boiling plant can produce their mixture at 75 cents per barrel which is 25 per cent. cheaper and those farmers that have their own plants, manufacture at a cost of 52 cents per barrel which is 48 per cent. cheaper. Under such conditions it is cheaper and just as effective for the growers to make their own mixture and save the difference. However, this factory prepared mixture has a place for there are many small growers who only having an acre or so of fruit and have no time to boil their own and will find this an excellent substitute. If the cost is reduced as has been promised, larger growers may also adopt this liquid spray in preference to the home-boiled.

Spraying Machines. In those districts where the fruit farms or apple orchards are of small acreage we find a tremendous increase in the number of hand pumps. These pumps are cheap, give excellent results and are very good for the small grower as he is able to get at his work at the right time and need not wait his turn as he would naturally have to do if three or four clubbed together to buy a power outfit.

Power Machines. There are several kinds of these machines, gasoline, gas and wheel power. In the gas machines the power is generated from carbonic acid gas in iron tubes and as these are somewhat expensive and hard to get, this kind of outfit is not being used in the province as much as when first introduced. The gasoline and wheel power outfits are quite numerous and the farmers who use them think them very satisfactory. The small wheel powers (80 gal. capacity) are chiefly recommended for grape spraying.

Insects. The San Jose scale (Aspidiotus perniciosus) is still one of the most destructive in Ontario, but owing to the better understanding of the preparation of the lime-sulphur wash and the more organized development of spraying we find the progressive fruit growers do not look upon this pest as a dangerous one. It is, however, doing a great deal of damage in south western Ontario especially in the apple orchards of Kent and Essex Counties, but the farmers of these districts have not taken up spraying thoroughly and the pest will increase until we have a development of spraying as we now find it in the Niagara district.

The Oyster Shell Bark Louse. This insect, although the easiest of the scales to treat his increased at a tremendous rate in eastern Ontario and has done inestimable damage to the apple orchards. Those growers who have realized the loss that would be caused by delay have taken the precaution to spray thoroughly with lime and lye solution (formula 30 lbs. lime. 40 gals. water, 2½ Gillett's lye) and have had excellent results.

The codling moth is still at the front and causes tremendous loss in southern and western Ontario and although it is found in eastern Ontario, yet it only has an early brood and is more easily combatted.

The cigar and pistol case bearers have been quite prevalent in some sections of eastern and western Ontario. The bud moth appeared in great numbers in some orchards of the Niagara district. The blister leaf mite is increasing rapidly in eastern Ontario. I first noticed it at Wicklow, but this year could find it in every orchard between Whitby and Trenton, the worst case appearing in an orchard situated 5 miles north-east of Cobourg. In this orchard some of the Baldwin trees were so badly infected that they presented a burnt appearance. As yet no spraying has been done for this insect in eastern Ontario. The lime and sulphur and the miscible oils have been strongly recommended by the authorities.

The tussock moth appeared to a serious extent in the apple orchards around Simcoe in Norfolk County, but will be easily controlled with poisoned Bordeaux.

Fungus Diseases. The apple and pear scab was not as prevalent last season as usual and caused much less damage. The twig and body blights of the apple were quite bad in eastern Ontario. The pear blight was also injurious and continues to do severe damage to the pear orchards.

Apple canker. I notice this throughout the apple section of the province. In some cases the damage was quite serious especially on the Ben Davis in eastern Ontario. The disease invariably seemed to follow the body blight.

Black rot of the grapes only appeared in one or two vineyards in the Niagara Peninsula and did not spread to any extent.

The *downy mildew* was somewhat prevalent during the early season of the ripening of grapes, but it only appeared to any extent in unsprayed vineyards or ones that had been carelessly sprayed.

Brown rot of plum and cherry. This year was remarkable for the scarcity of rot on the fruit, and the plum crop was handled without any material loss from that source.

INSPECTION OF APIARIES.

The expenditure under this heading was entirely for the services and expenses of the 8 inspectors who were engaged in the work during the past year. A full account of their work is given in the annual report of the Bee Keepers' Association for 1908.

SAN JOSE SCALE.

Under this vote are included the amounts paid to the various municipalities which appoint local inspectors under the San Jose Scale Act. Under section 4, sub-section 5, the Department agrees to refund one-half of the remuneration of such inspectors and the following municipalities received aid last year:—Townships of Barton, Clinton, Louth, Mersea, North Grimsby, Pelham, Saltfleet, Thorold, and the towns of Leamington, Thorold and St. Catharines. There are still a number of townships in the Province where the scale is prevalent that should pay more attention to the location and eradication of this pest. Upon the petition of 15 rate-payers, the council must of necessity appoint one or more inspectors, and the matter rests, therefore, largely with the fruit growers in each municipality, as to whether the orchards are to be properly protected in this way.

The work of inspection in connection with the nurseries has again been carried on as efficiently as possible. Mr. J. Fred Smith of Glanford had charge of the inspection of the stock, while Mr. T. B. Revett, of the Department looked after the carrying out of the fumigation regulations.

To still further guard the fruit growers, it was decided to appoint sub-inspectors at the leading points in the Niagara Peninsula where the bulk of the nursery stock is grown. It was the duty of these men to watch closely during the present season and see that all nursery stock was properly fumigated before being shipped out, and also to report any instance of scale found in the nurseries. Mr. A. E. Jones of Fruitland, supervised the fumigation in the territory from Hamilton to Vineland. Mr. Harry Arnold of Pelham Centre looked after the different nurseries in the Fonthill district, while Mr. H. Bunting covered the territory from St. Catharines to the Niagara River.

There are several instances of scaly stock being located and destroyed and a general inspection should be ordered during the coming season. The scale has not been reported from any new section during the year, and there is no doubt that this is altogether due to the fumigation which has been carried on in the past. In the Niagara Peninsula, however, the insect is gradually extending the infested area to the south over the ridge of land running through the district. There was also a great increase in the number of scaly trees reported from Essex and Kent Counties where spraying is not so general as in the other districts.

LIST OF NURSERYMEN GROWING STOCK IN ONTARIO.

A list of the nurserymen who are growing stock in the province is given herewith. There are numerous other firms doing business which obtain their stock from parties mentioned in this list. Four firms are given who are largely engaged in the seed business. These, however, raise more or less ornamental stock and small fruits such as currants, raspberries and gooseberries.

NURSERYMEN :

Morris & Wellington	Fonthill	General stock of fruit and ornamentals.
Brown Bros	Brown's Nurseries	General stock, etc.
B. W. Secord	Pelham Corners	General stock, etc.
Jas. Page	Ridgeville	Fruits.
J. E. Crow	Ridgeville	Fruits.
A. G. Hull & Sons	St. Catharines	General stock.
J. E. McCombs	Pelham Corners	Fruits.
H. Cawker	St. Catharines	Roses.
C. E. Secord	St. Catharines	Peaches.
E. Morden	Niagara Falls	General stock.
W. O. Burgess	Queenston	Peaches and cherries.
Frank Walker	Virgil	Peaches.
E. D. Smith	Winona	General stock of fruit and ornamentals.
C. W. F. Carpenter	Winona	General stock of fruit and ornamentals.
J. W. Smith	Winona	Peaches.
W. B. Bridgman	Winona	Peaches.
J. E. Henry	Winona	Peaches.
J. E. Foran	Winona	Peaches.
G. M. Hill	Fruitland	General.
Jos. Tweddle	Fruitland	Small Fruits.
Brock Galbraith	Bartonville	Peaches.
Connon Floral Co	Hamilton	Ornamentals.
C. E. Woolverton	Grimsby	Ornamentals.
W. H. Bunting	St. Catharines	Strawberries.
H. P. VanWagner	Stony Creek	Dahlias and gladioli.
Thos. Rowley	Leamington	Peaches and grapes.
Frank McLean	Brigden	Fruits.
N. E. Mallory	Blenheim	Small fruits.
McDowell Bros	Tillsonburg	Small fruits.
John Downham	Strathroy	Strawberries.
J. Gammage & Sons	London	Ornamentals.
C. A. Baker	London	General.
R. C. Chrysler	St. George	Strawberries.
W. H. Vanderburg	Poplar Hill	Strawberries.
M. Milgau	Bright	Evergreens.
Hunter & Sons	Scotland	Fruits and dahlias.
J. McAinsh	Wellburn	Evergreens.
Mitchell Nursery Co	Mitchell	Evergreens.
Campbell Bros	Simcoe	Cannias, dahlias, gladioli, paeonies.
Jas. E. Johnson	Simcoe	Strawberries.
Wm. Fleming	Owen Sound	Small fruits.
J. H. Wismer	Port Elgin	Fruits.
Estate John Stewart	Ben Miller	Fruits.
J. W. Johnston	Campbellford	General.
L. K. Shourds	Wellington	Apples.
W. C. Reid	Belleville	Ornamentals.

LIST OF NURSERYMEN.—*Continued.*

NURSERYMEN:		
McIntosh & Smith	Mountain	Fruits.
J. W. Thompson	Napanee	Strawberries.
Ottawa Nursery Co	Ottawa	General.
David Tait	Iron Bridge, Algoma	Hardy fruits.
R. Brecken	Toronto	Small fruits and ornamentals.
Colin McDonald	Toronto	Small fruits and ornamentals.
Thos. Manton	Eglinton	Ornamentals.
SEEDSMEN:		
Steele Briggs Seed Co	Toronto & Hamilton.	
J. A. Simmers	Toronto.	
Wm. Rennie Co	Toronto.	
John A. Bruce & Co	Hamilton.	

Mr. Revett reports as follows in reference to this work:—

The planting of fruit trees and ornamental plants has been on the increase in Ontario where general prosperity amongst the farmers and good prices for their fruit has acted as a stimulus in encouraging the planting of more fruit, and with this demand the nurseries of Ontario have been able to do a large and flourishing business. There are in the neighbourhood of 59 nurseries located in the following districts:—Niagara Peninsula 26, Western Ontario 18, Eastern Ontario 12, Northern Ontario 3.

It may be seen from these figures that the greater number of the nurseries are located in the Niagara peninsula. This section is especially adapted in most localities for the production of nursery stock. In the neighbourhood of Fonthill there are six nurseries, two of which rank among the largest in Ontario. The balance are situated north of the height of land. Practically speaking, the Niagara Peninsula produces 85 per cent. of the nursery stock grown in the Province utilizing 1,145 acres for this industry.

There are 1,263 acres devoted to the growing of nursery stock. Of this area, three nurseries control 900 acres, leaving an acreage of 365 amongst the remaining 56 nurserymen. The business is practically then in the hands of these large firms.

A great quantity of nursery stock is imported into Ontario every year, and these imports are on the increase. The value of the stock imported through Windsor and Niagara Falls in 1904 was $12,724.50; In 1908, the amount imported through Niagara Falls alone was $21,497.00, showing an increase of $8,772.50 over the aggregate of the two points in 1904.

A great deal of this stock are seedlings for grafting and budding.

The total amount of nursery stock growing in Ontario is approximately as follows:—

Conifers, 557,000; deciduous ornamental trees, 534,500; apples, 1,924,500; pears, 215,450; cherries, 279,900; plums, 268,100; peaches, 409,100; grapes, 115,700; about 75 acres of small fruits and 50 acres of ornamental shrubs.

The fumigation houses are located on the nursery grounds and the nurserymen have to fumigate the stock before it can be sold. In the spring, every nurseryman is notified that the inspector will shortly visit his nursery and inspect his fumigation appliances. He is then supposed to examine it himself and test it making it as tight as possible. When the inspector visits the place, he examines the condition of the house and tests its tightness with smoke. This is done by building a smudge and closing the doors. If the house is tight no smoke will escape, but should it be leaky the smoke will indicate the leaks. These are marked, and the nurserymen told how

remedy them. Should the leaks not be mended before the inspector leaves, he returns to see if his instructions have been carried out. All the fumigators in the province have been examined this year as usual and found in very good shape. Slight alterations had to be made, but in every case the nurserymen willingly complied with our instructions.

One or two houses were condemned and new ones built. In the majority of houses the method of generating the gas is very simple. In every case possible I have instructed the nursery to put in such appliances as are used in the Dominion Fumigation House at Windsor, modifying them to suit conditions. The chief feature in this method is the convenient way of putting the cyanide into the diluted ulphuric acid. The plan adopted is to place a little tray which will hold the required dose imediately over the jar with the acid. To this tray is attached a lever or string which passes through the wall of the house. The doors are then firmly closed and the string pulled. This empties the cyanide into the acid starting the generation of gas.

The formula which is being used is potassium cyanide, 1 oz., sulphuric acid 1 oz., water 3 oz. to every 100 cu. ft. of space. The chemicals have to be purchased wherever the Department requires, although under special conditions they will allow the nurseries to purchase their chemicals at the nearest place. This precaution is taken to insure an even standard of chemicals used. The nurseryman sends the cubical contents to the firm directing them as to how many doses he will require. The packages are made up so as to contain the required amount of material for one dose. In this way the nurseryman has no weighing to do and runs very little chance of making mistakes.

The Dominion Government has two fumigation houses in Ontario situated at Windsor and Niagara Falls and all nursery stock coming from the United States into Canada through Ontario have to pass through these ports and are fumigated there. Through the courtesy of the Dominion Department of Agriculture, our Department inspector visits these places from time to time in order to satisfy himself that the stock being distributed in Ontario is properly treated. I visited these two houses several times and found that the work was being properly performed, and that the stock was being as quickly and carefully handled as possible.

WINNIPEG INDUSTRIAL EXHIBITION.

The exhibit made at the above show in 1908 was a decided improvement upon that of 1907, the first year Ontario was represented. Previous to this date for a number of years, British Columbia made annual exhibits of her fruit products. The main idea was to secure settlers for her vacant lands and in this she has been very successful. As the fruit lands became productive the further idea was evolved of opening up markets for the berries, cherries and apples raised thereon. The western people began to talk of the fine fruit grown in British Columbia while Ontario was losing what little prestige she had, and of course to the great majority of the newcomers was practically unknown. To overcome this state of affairs, and to push the sale of Ontario's fruit products, has been the object of our exhibits. At the same time if we can induce some of the men of the west who are giving up the growing of grain, to come east and settle in Ontario, we will be helping to make up for the terrible drain on our rural population from the east to the west.

Ontario's Principal Fruit Market in the West—Winnipeg.

The accompanying illustration will give an idea of the exhibits at Winnipeg. The fruit is shown in a building 50 feet long by 75 feet wide, finished in the natural wood inside. Only the two provinces were represented, the British Columbia Government exhibit taking up all of one end, while the Ontario exhibit occupied the centre and one half the other end. The land selling companies occupied the balance of the building.

The centre space was taken up by a pyramid 20 x 30 ft. the base holding a double row of boxed apples of the following varieties:—Spy, Ontario, Greening, McIntosh, King, Baldwin, Canada Red, Stark, Ben Davis, Golden Russet, Swayzie, and Tolman.

Above this were two shelves with bottled fruits, cherries, berries, plums and peaches, while on top were pyramids of apples. Between were two rows of fruit scenes, enlargements from photos of farms in various parts of the province.

Part of Ontario's Exhibit at Winnipeg, 1908.

The end space was in the form of a triangle with arms 22 and 38 feet long and 6 feet wide. Here were displayed 3 large pyramids of honey, buckwheat, clover and basswood in fancy glass jars, besides several dozen of comb honey in the case. Interspersed were packages of tomatoes, cucumbers and cherries with boughs of apples, peaches, cherries, plums, pears and various nuts in the green stage. The whole exhibit was surrounded by a railing and suitably decorated.

The exhibit was in my charge with Mr. J. W. Crow of the Agricultural College, Guelph as assistant. In addition to answering many questions in reference to fruit conditions in Ontario, we distributed copies of the pamphlet issued by the Colonization Branch on "Opportunities in Fruit Growing in Ontario" and the marketing circular issued by the Ontario

Fruit Growers' Association giving the names of the shipping associations, their secretaries and their probable output for 1908. We found a great deal of interest was shown in our exhibit and many inquiries in reference to the shipping of our softer fruits such as berries and sour cherries to the western markets.

To show the importance of these markets, I give below some statistics collected by Mr. Crow covering the seasons of 1907 and of 1908. The enormous growth of the west has been a matter of general comment and little need be said here further in reference to it. These people are large consumers of fruit. They cannot raise any themselves as is done by many of our Ontario people and are dependent on British Columbia, the north-west States or Ontario for these articles. The market is a valuable one and the fight for its control will be keen. This Branch feels justified therefore, in doing everything possible to encourage our Ontario growers in gaining a foothold there.

"Fruit received in Winnipeg in car lots from all points during 1907:—48 cars of strawberries; 430 cars of tomatoes; 680 cars of peaches, pears and small fruits other than strawberries; 600 cars of oranges, and upwards of 1,000 cars of apples. Large as these receipts may appear, you can judge that the receipts will be even double in a very few years, as the population of Winnipeg has grown from 67,000 in 1904 to 118,250 in 1908. Over seventy per cent. of these receipts was consumed locally."

The proportions of fruit received from different points and handled in Winnipeg are estimated by the McNaughton Fruit and Produce Exchange as follows:—

California, Oregon, and other northwestern States	50 per cent.
Ontario	35 per cent.
British Columbia	15 per cent.

Mr. A. Mallinson, who has this season bought very largely in Ontario for western firms, estimates the total quantities of fruit shipped to the West from Ontario this year as follows:—

83,500 barrels apples, including a few boxes, estimated at three boxes per barrel.
220 car-loads of grapes, estimating 2,400 six-quart baskets as one car-load.
73 car-loads of tomatoes, pears and canteloupes.
Included in the last item would in some cases be a few baskets of plums, and a few peaches went forward also.

Mr. A. Gifford states that fully 20 per cent. can be added to the above estimates of total shipments. Mr. A. Mallinson states further that shipments of fruit from Ontario to Winnipeg have increased fifty per cent. during the last five years, and fully one hundred per cent. in the last ten years.

From a communication received from Mr. A. McNeill, Chief of the Fruit Division, I quote the following, with reference to the apple trade of 1907:—

The North West Transportation Co. handled	100,253 bbls.
The C. P. R. handled	18,720 "
Other boats handled about	10,000 "
	128,973 "

The G. T. R. and American lines not known,—probably half the C. P. R.

ONTARIO HORTICULTURAL EXHIBITION.

The above Exhibition was managed for the first time from this office. In previous years, as secretary of the Ontario Fruit Growers and the Bee Keepers' Associations, I had acted as general secretary of the fruit and honey displays of the Exhibition. Last year Mr. Cowan who had previously acted as general secretary of the show moved to Peterboro, and I was elected as general secretary in his stead.

Part of Table Display of Apples at Horticultural Exhibition, Toronto, 1908.

The Exhibition was held this year in the St. Lawrence Arena. It was felt that Massey Hall where the show had previously been held was inadequate for the growing number of exhibits. The transfer proved to be a wise one in this respect as the exhibits of fruit, honey and vegetables were away ahead of any past show. The entries in the flower sections were somewhat behind previous years owing to the fact that the season was a poor one for the growth of plants under glass. Notwithstanding this difficulty, the floral men made a very creditable display and are to be congratulated on their exhibits of the various ornamental plants and flowers.

Very heavy expenditure was required to place the St. Lawrence Arena in shape for a show of this kind. At that season of the year when tender plants are shown, a certain amount of heat is required to prevent injury from frost. To this end it was necessary to place special heating apparatus in the Arena. A complete canopy of cotton was also required overhead and the necessary lighting to show off the fruit, flowers, etc., to advantage, cost in the neighbourhood of $675.00 for the one item alone. These heavy expenditures caused a deficit of about $300.00. This was met by paying only 85 per cent. of the prize money. The Association holds an asset for something over $300 in lumber, etc.

At this exhibition, the Fruit Experiment Stations have usually made a display of apples and other fruits in glass. Owing to lack of funds, it was thought unwise to put up as large a show as in past years. The stations at Walkerton, under Mr. Sherrington, Leamington, under Mr. Adams, and Craighurst, under Mr. Caston, furnished most of the material. In addition, Mr. McKenney, district representative in Essex, put up a display of apples from that county.

The display made by the Central Experimental Farm, Ottawa, under Mr. Macoun, was specially worthy of notice. The C. E. F. seedling apples and the various crosses obtained from their orchards attracted a great deal of attention. The showing of hardy varieties of grapes also proved what could be accomplished by the fruit growers in the eastern part of the Province. The illustrations shown give some idea of the various exhibits.

Among the counties making special exhibits, Norfolk certainly put up the best display. There is no doubt that Mr. Johnson and his assistants succeeded in giving this county the best advertisement as an apple growing section that it has ever received. It is the intention of this county to continue the exhibit at the next show, and there is no doubt that other counties will follow the splendid example set by Norfolk.

CANADIAN NATIONAL EXHIBITION.

At the request of the Directors of the Canadian National Exposition in Toronto, a special appropriation of $800 was made for the getting together of a display of fruit for this exhibition. The end of the main hall in the new agricultural building was allotted to this Province and it was divided equally between the displays of minerals and fruits. The fruit was shown on six large pyramids especially erected for this purpose. The illustration shows in the foreground one of these pyramids containing samples of peaches. Other pyramids contained plums, pears, apples, grapes, etc., together with small fruits and cherries under glass. Every thing was put up in attractive form.

As the show lasted for two full weeks, it was found necessary to replace the fruit every two or three days. The peaches specially required frequent

Part of Box and Barrel Exhibits at Horticultural Exhibition, Toronto, 1908.

changing, and we have to thank the growers in the Niagara district who took pains to send in shipments from day to day to keep up this display. We would specially mention Messrs. Carl Fisher & Sons, Queenston, W. C. McCalla, St. Catharines, J. W. Smith & Sons, Winona, H. Fleming, Grimsby, C. L. Parmeter, Grimsby.

Most of the plums were obtained from Mr. J. E. Henry, of Winona, who is the owner of one of the best plum orchards in the Niagara Peninsula.

In addition to that part of the exhibit already mentioned, one large table was given over to a special exhibit of package fruit illustrating the very latest methods of packing and shipping fruits to long distance markets. The various packs used with the standard apple box were shown, also those for pears, plums, peaches, etc. These goods were put up through the kindness of Mr. Robt. Thompson, the manager of the St. Catharines Cold Storage and Forwarding Association, who has always done everything possible to advance the cause of fruit growing in the Province. The Directors of the St. Catharines Cold Storage Association also deserves the thanks of the fruit growers for aiding Mr. Thompson in his work.

ROYAL HORTICULTURAL EXHIBITION.

Acting on instructions from the Honorable Mr. Monteith, a large collection of fruits and vegetables was gathered together for display at the Colonial Show of the Royal Horticultural Society in London, England. In 1907, a small collection was sent over from the Ontario Horticultural Exhibition, but reached London in poor condition. As a result of his visit to the Old Country, Mr. Monteith decided that it would be in the interests of the Province that a creditable showing be made this year.

The Royal Horticultural Society is one of the oldest and most prominent horticultural organizations in the world, and its shows are considered to be the best of the season in England. Sometime ago the society inaugurated a number of special exhibits for the display of fruits, vegetables, etc., grown in the colonies and dominions of the Empire. Of these, the most successful was the one held in the latter part of November in the Society's Hall, London, England. Ontario exhibited at this show for the first time five years ago, when she received a gold medal. The fruit was at that time contributed by the Provincial Fruit Growers' Association and forwarded through the kindness of Mr. A. McNeill, Chief Fruit Division, Ottawa. In 1907, the Fruit Growers' Association again contributed the fruit. In 1908, at it was necessary to secure much greater quantities, special packers were sent out from the Department to pack the apples, pears, etc. The whole was collected in cold storage at Toronto and forwarded to England on the 5th of November in charge of my assistant, Mr. Revett, and Mr. P. P. Farmer, of the Institutes Branch.

Mr. T. B. Revett, reports as follows on this exhibit:

In preparing the exhibits for the Colonial Show held by the Royal Horticultural Society at London, England, we aimed at having an exhibit that would show as much variety, and represent as many branches as possible connected with the horticultural interests of the Province. The displays consisted of fruit, vegetables, preserved fruit in glass, canned fruit and canned vegetables. In collecting the exhibits of fruit and vegetables, we endeavored to visit all the best fruit and vegetable growers in the Province in order to find where we could get the varieties and quantity required. To those that we did not have the opportunity to visit, we wrote requesting them to keep any of the varieties required, with instructions how to pack

Part of Ontario's Exhibit at Toronto Industrial Exhibition, 1908.

them, but whenever it was possible, we sent someone to do this work or attended to it ourselves. In every instance the growers gave us every assistance and co-operation in collecting and locating the produce, and in some instances even gave us samples they had intended to show at the different exhibitions.

Apples. We had a splendid collection of apples, consisting of 250 boxes, containing about 80 varieties, a list of which is as follows: Grimes, 2: Fallawater, 2; Greening, 3; Pearmain, 5; Wolfe River, 1; Gano, 1; American Pippin, 1; Pewaukee, 1; Cranberry, 2; York, 2; Minkler, 1; Ontario, 9; G. Russet, 10; Baldwin, 22; Spy, 27; Stark, 32; Scott's Winter, 4; Ben Davis, 20; Canada Red, 11; Tolman, 1; Western Red, 2; Scarlet Pippin, 8; Pomme Gris, 2; Blush Pippin, 1; Fameuse, 14; Phoenix, 8; Mann, 4; Blenheim, 2; Bellefleur, 8; MacIntosh, 8; Baldwin Stark, 1; Wagner Baldwin, 3; Seek, 3; Salome, 1; A.M. Pippin, 1; King, 13; Spitzenburg, 4; Vanderveer, 1; Wealthy, 3; miscellaneous varieties, 6.

The apples were collected at Oshawa, Bowmanville, Newcastle, Trenton, Stirling, Maitland, Ingersoll, Forest, Chatham, St. Catharines, and Fonthill. Mr. Morris, of the Fonthill nurseries, who has an experimental apple orchard of some 500 varieties, very kindly allowed us to make a collection of plate fruit from this orchard, and we were thus enabled to get some forty varieties which are not grown extensively but which added a great deal to the display of fruit.

The apples were carefully picked, graded and wrapped and packed in boxes, a cushion pad being used at bottom and top to prevent bruising. In the case of tender skinned varieties, such as those belonging to the Fameuse or Snow family, we took special precaution in wrapping, using two papers, first a soft manilla and an outside wrapper of parchment. In wrapping the other varieties we used three papers on different lots in order to test the difference. The papers were parchment, very thin manilla, and a coarse grade of manilla. The parchment and coarse manilla seemed the best. The parchment is the best of the latter two for long distance shipments, and exhibition purposes. As soon as the fruit was packed, it was shipped to Toronto Cold Storage, which was made the central point for collecting before final shipment.

Pears. The pears were secured chiefly in the Niagara district and at Burlington and Newcastle. They were double wrapped and packed in the large pear case, the fruit being shipped into cold storage at Toronto as soon as possible. We found in every case that the fruit packed somewhat green kept better. This brought out the fact that in long distance shipments and storages, enough attention has not been paid to the degree of ripeness. The following is a list of the varieties exhibited: Anjou, Bosc, Clairgeau, Flemish Beauty, Goodale, Hardy, Howell, Keiffer, Le Conte, Louise, Manning, Pitmaston, Seckel, Winter Nelis, Wilmot, Duchess, Sheldon.

The Duchess stands out as the most suitable variety for the English market. It arrived in beautiful condition and stood up for three weeks on exhibition tables. The flesh was very fine and juicy, the only drawback being the tendency of the skin to discolor even though the fruit be perfectly sound. The Keiffer and Le Conte were excellent and seemed to be selling well on the English market, but Le Conte although in perfect condition has a very poor flavor and the color is too pale.

The Bosc, Clairgeau, Howell, Goodale, were in about the same condition, but not so good as the Duchess and Keiffer, and did not last as long, the Bosc having slightly better quality, appearance and texture than the Clairgeau, Howell and Goodale.

Portion of Ontario Fruit Exhibit, awarded the Gold Medal at the Royal Horticultural Society's show, London, England.

The Seckel, Winter Nelis, Wilmot, Louise and Sheldon were good, the flavor and texture being excellent. Of these the Wilmot lasted the longest. This pear was originated at Newcastle by Mr. A. C. Beman, and showed excellent shipping qualities. It took on a very pale yellowish color, but was extremely uniform, of very firm texture and fair flavor. The Seckel, Winter Nelis, and Louise were in good condition. The Seckel, however, shrank a little and although perfectly sound and of a beautiful flavor was not attractive looking.

The Sheldon attracted perhaps more attetion than the other varieties. We had about twenty of these pears on plates. They were very sound, juicy, of fine flavor and appearance, which, together with their uniformity seemed to suggest that it would be an admirable variety for the first-class trade. The percentage of loss through decay was about 4 per cent. The Flemish Beauty, Hardy, Manning, and Pitmaston lasted during the exhibition, but had practically lost their flavor and were somewhat dull in color.

Plums. We took over about fifteen pounds of Reine Claude and Monarch plums. The Monarch started to go off before the exhibit left Toronto and were completely rotten when opened in London. The Reine Claude, however, were very much better, and we were able to get about three pounds of good fruit to show on plates.

Peaches. Six cases of peaches were shipped, two Elberta, two Smock, two Fitzgerald. The Elbertas were very large specimens, and all rotted except five, which did not last long and were completely discolored throughout.

The Smock were somewhat better, and were of a medium size, and in better condition, although we only could procure about ten perfect specimens.

Fitzgerald were very good, the color was good and the flavor was not completely lost and we showed about twenty good peaches.

The peaches were wrapped in parchment paper and padded with cotton batting and packed in the regular peach case.

Grapes. The grapes were put up in boxes 22 x 12 x 12 and packed in cork dust. These boxes held about twenty pounds. The cork dust was procured from dealers in Malaga grapes. This dust was in some cases very dirty, containing a lot of dry grapes and foreign matter, so it required cleaning by being seived. After being cleaned it was treated with a ten per cent. solution of formalin as a preventive to mildew and moulds. A layer of cork about 1½ inches thick was placed in the bottom, a layer of grapes and another layer of cork until the case was full, the case being shaken from time to time in order to settle and tighten the pack.

In case of three packages, the bunches were wrapped individually in parchment paper. This kept the cork dust from getting into the bunches. The plan worked admirably. The following is the list of varieties shown and their condition: Agawam, very good; Brighton, good; Catawba, good; Campbell's, not good, berries fell off bunch; Delaware, very good; Lindley, good; Moyer, very good; Niagara, fair; Vergennes, good; Worden, good;

In a good many cases it was found that while the grapes were quite sound, yet the formalin which was used to disinfect the cork dust seemed to have had a bleaching effect on the color and the grapes in many instances had faded considerably. This was perhaps due to the fact that the dust was treated immediately before being used, while it should no doubt be exposed to the air for at least twelve hours after treating.

Vegetables. The vegetables were all collected in the vicinity of Toronto with the exception of corn, pumpkins and potatoes. Corn was procured from Leamington and potatoes from Parry Sound. There was a full col-

lection of vegetables and in every case the leading varieties were represented as will be seen from the list. These vegetables were sent to cold storage, where they were carefully packed in boxes made for the purpose. The potatoes, turnips, winter radish, horse radish, parsnips, carrots, salsify, artichoke, and corn were wrapped in a coarse manilla paper and packed in boxes. In the bottom and on top we used excelsior in order to tighten the boxes and prevent bruising.

All the rest of the vegetables were shipped in slatted crates. The cabbage and cauliflower were packed in long crates. In packing, the crates were lined with coarse paper and padding of excelsior, each head of cabbage being wrapped in parchment paper and placed carefully and lightly in crate. The cauliflower were treated the same way. except that additional precaution was taken to protect the head by wrapping this in parchment also.

The Kale and Brussels sprouts were also shipped in long crates, each specimen being wrapped in thick paper and carefully packed.

The celery was packed in cases 18 inches by 24 and 24 inches high. The bottoms were made of board and the first slat was 6 inches broad. This was

Portion of Ontario Fruit Exhibit at London, England.

done in order to protect the roots and to keep the sphagnum from falling out. Each bunch was wrapped in paper as far down as the roots. Then they were carefully laid on end with moist sphagnum around the roots. This was done to keep the celery fresh. The following is a list of vegetables shown: Artichokes, Borecale, Curly Kale, Brussels sprouts, Cabbage, red; Cabbage, Savoy; Cabbage, flat; Cauliflower, Erfurt; Cauliflower, Snowball; Celery, White Plume; Celery, Paris Golden; Celery, red; Carrots, ox heart; Carrots; Cucumber; Citrons; Egg Plants; Onions, White Globe, Yellow Danvers, Red Wethersfield, Red Globe, Prizetaker, Rocca, White pickling. Parsnip; Peppers, a collection of about twenty varieties; Radish, winter; Salsify; Squash; Potatoes, Delaware, Crown Jewel, Late Rose, Beauty Hebron, Rural New Yorker, Ontario Beauty; Turnip, white; Turnip, Swede; Vegetable Marrow; Horseradish.

Canned Fruit and Vegetables. The canned fruit and vegetables and preserved fruits were collected from some of our large canning and preserving factories. This exhibit consisted of a complete collection of all our

fruits and vegetables. There were 100 cases of vegetables consisting of tomatoes, corn, peas, corn on cob, beans, asparagus, beets, pumpkin.

There were fifty cases of all kinds of canned fruits, preserved fruits in glass, jams and jellies in glass, etc.

The whole exhibit was collected at the Toronto Cold Storage and was shipped from there in an iced refrigerator car, to Montreal on the 5th November. This car arrived in Montreal on the 7th and the contents were placed in the refrigerating chamber on the Dominion Line S. S. Kensington on the 8th. The cases were packed firmly, five high and with dunnage between every layer to allow for circulation. The Dominion Department of Agriculture through the courtesy and instructions of Mr. J. A. Ruddick, caused a thermograph to be placed in the centre of our exhibit which would enable us to have a correct idea of the temperature maintained throughout the voyage.

The Kensington sailed on the 9th of November and arrived at Liverpool on the nineteenth, and as soon as the ship docked, the exhibit was unloaded and sample cases examined. It was found that peaches, plums and tomatoes were rapidly decaying and that the cabbage and cauliflower showed a slight discoloring of the leaves. The thermograph showed that atmospheric temperature was quite cool, being about 38 deg. F., and the average temperature maintained throughout the voyage was 36.5 deg. F., from Liverpool, the exhibit was shipped to cold storage in London until the opening of the show on November 27th.

The Exhibition was held in the Royal Society's own hall, which was crowded with exhibits from the various provinces and colonies of the Empire. The Department had cabled for enough space for the entire exhibit, but we were 200 feet short of the space required. The position and general outline of the exhibit is shown in the illustration.

The time allowed for placing of a large exhibit is too short as we were only allowed from 7 o'clock p.m. of the evening preceding the opening of the exhibition.

The fruit was found to be in splendid condition, while the vegetables were just as good as when packed with the exception of the cabbage and cauliflower, the leaves of which were frost bitten. In the case of the cauliflower all the leaves fell off, but the heads were in splendid shape, not the slightest degree discolored, nor did they discolor for at least six days after exposed. It seems almost impossible to trace definitely when and where these vegetables were frozen, but it seems probable that they might have been slightly touched with frost in the field or in transit to Montreal.

For the entire exhibit Ontario was awarded a gold medal, while the Provinces of Nova Scotia and British Columbia also received one each, and a number of individual growers who had shown under the auspices of the Provinces were also awarded other medals. As an explanation of this the secretary of the society explained that any exhibitor who had received a gold medal could not receive any further recognition for any other of his exhibits. He explained that this show was not competitive and that all the exhibits were judged by their standard of excellence. The displays which were put up by the Provinces of Nova Scotia and British Columbia were practically and wholly made up of these individual exhibits and the Governments were awarded a gold medal for their trouble in transporting and displaying the exhibits. Had our entries been made along the same lines, mentioning the names of the associations and individuals supplying the fruit, Ontario would have received the same treatment.

Our exhibits were in splendid condition. The fruit especially showed no bruises and looked very fresh, being as good, and in many cases better than that in the other exhibits. Ontario had a greater collection of varieties, and was the only exhibitor to show fresh vegetables, preserved and canned fruits and vegetables.

After this exhibition was over, the exhibit was divided into two parts, Mr. Farmer took one portion and made three displays, one at Norwich, and two at Ipswich. One of these was held at the Cattle Show and the other at the Butter Market in an office that was hired for the purpose. I took the other portion and made two displays, one at Bristol and another at Exeter. These were all under the supervision and with the assistance of Ontario Colonization Branch for the purpose of advertising the Province and giving

Ontario Fruit Exhibit at Ipswich, England.

the people in those sections of the country an idea of what the Province of Ontario can produce.

These shows were very successful, thousands of people visiting them. Many were greatly surprised at the size and quality of our vegetables. This was about the first occasion that any of our fruits or vegetables have ever been shown in England as distinct products of Ontario, while the Provinces of British Columbia and Nova Scotia have been exhibiting in various parts of the British Isles for some years. Such an advertisement is not only valuable in attracting the attention of the most desirable class of people who wish to emigrate but also assists our fruit growers who engage in the export business by bringing to the notice of the best class of both wholesale and retail buyers the kinds of fruit which we are capable of producing.

After studying all the conditions in the old country, I would suggest that in future we brand all our fruit packages with the word "Ontario" in large type. At the present time, our fruit is designated as Canadian while British Columbia and Nova Scotia fruit receive their distinctive titles.

In closing this report I wish to state that wherever Mr. Farmer and myself went we were given every assistance possible by the people with whom we came in contact.

FRANCO BRITISH EXPOSITION.

At the request of the Colonization Branch of the Department of Agriculture a collection of apples was made for the above show, which opened

Part of Ontario's Exhibit at Ipswich, England.

in Sheppard's Bush, London, England early in May. Advantage was taken of the offer made by the Grand Trunk Railway System to make use of the centre of their building for our Exhibit. A large pyramidal case was specially constructed to hold plates and cones of fresh fruit under glass on shelves above, with samples of our other fruits modelled in wax in cases below.

A complete collection of our standard winter varieties of apples, comprising one hundred and fifty cases, was shipped by Dominion Express, from cold storage in Toronto, late in April via St. John. The shipment was in cold storage the entire journey, except from Liverpool to London, and was of course again placed in cold storage on arrival at its destination. I gave the handling personal supervision, until the cases were safely deposited in

the storage chamber of the ship at St. John, N.B., and this combined with careful treatment on the other side enabled the Grand Trunk officials to preserve intact the exhibit of fresh fruit until the close of the show in October. Some of these apples were of the same lot that suffered so badly in transit to the Royal Horticultural Society Exhibit of the previous November. The difference in treatment en route represented a difference in keeping quality of almost a year.

CO-OPERATIVE ASSOCIATIONS.

For the guidance of prospective berry shipping Associations there is given herewith in full the constitution and by-laws of the Neosho Fruit Growers and Shippers Association, a prominent strawberry shipping company in Tennessee; also some of the leading clauses in that of the Knox County Berry and Truck Growers' Association of the same state.

Ontario's Fruit Exhibit at Franco-British Exposition, London, England.

CONSTITUTION AND BY-LAWS OF THE NEOSHO FRUIT GROWERS' AND SHIPPERS' ASSOCIATION.

Preamble.

For the purpose of co-operating in the marketing of fruits and vegetables, and in providing packages for same, we, whose names are hereto annexed, adopt the following constitution and by-laws:

Constitution.

1. The organization shall be known as the Neosho Fruit Growers' and Shippers' Association.

2. The officers of this association shall be president, vice-president, recording secretary, treasurer, business manager, and a business committee consisting of five members, including the business manager, all of said officers to be elected by ballot in July of each year. The Business Committee to be elected first. A majority of all ballots cast shall be necessary to elect. No member of this Association shall hold more than

one office in the Association at one time, except the Business Manager, who is also required to be member of the Business Committee. An habitual frequenter of a saloon or a gambler is not eligible as a member of the Business Committee.

3. This Association shall meet on the second Saturday of each month at the Court House in Neosho, at 2 o'clock p.m., unless adjourned to meet elsewhere.

4. Any person who is a horticulturist or agriculturist may make application for membership (in writing) and must be recommended by two members of the Association. The membership fee of one dollar, and the annual dues of one dollar, must accompany the application and be offered at a regular meeting by some members of the Association. The application will then be referred to a committee of three members and laid over to next regular meeting, when if report of committee is favorable it shall be balloted upon. An applicant to be elected must receive two-thirds of all votes cast. Applications for membership must be filed not later than the March meeting in order to enable the applicant to ship with the Association the current year.

5. When growers in this Association ship berries as a firm or company, each individual member of the firm or company must become a member of the Association. No firm or company will be allowed to vote by proxy on any proposition before the Association.

6. The annual dues of this Association shall be one dollar, payable July 1st each year.

7. A quorum shall consist of seven members to do business.

8. In case of a vacancy in office the vacancy shall be filled at the first regular meeting or in case of emergency at a called meeting.

9. This Constitution may be amended at any regular meeting by a three-fourths vote of the members present, provided the proposed amendment shall have been written and in the hands of the secretary and read by him at two regular meetings previously.

By-laws.

1. All officers of this Association shall assume the duties of their respective offices at the August meeting and perform the duties required of them by the rules of the Association. The President shall call special meetings when requested to do so by the Business Committee or on petition of five members of the Association.

2. The Vice-President shall, in the absence of the President, perform the duties of the President. In the absence of both President and Vice-President, a temporary chairman may be elected by the Association.

3. The Recording Secretary shall keep an accurate minute or record of all the papers and records of the Association except his own bond. He shall collect all moneys due the Association for dues, fees, fines and forfeitures. He shall pay over all moneys coming into his hands to the Treasurer every month, taking the Treasurer's receipt therefor, and file said receipt with the auditing committee as soon as they are appointed. He shall give a bond of four hundred dollars, signed by two good securities. Said bond shall be kept by the President. He shall receive twenty-five dollars per year for his services.

4. The Treasurer shall receive all moneys belonging to the Association from the hands of the Recording Secretary, giving his receipt therefor; render a true account of all moneys received and paid out and to whom paid. He will pay out money on warrants ordered by the Association and signed by the President and Secretary. He shall give a bond of one thousand dollars signed by two or more good securities, and he shall receive twenty-five dollars per year for his services.

5. The Business Manager shall act as Secretary and Treasurer of the Business Committee. He shall keep a full and correct record of all transactions of the Committee and attend to all the correspondence of the Association. He shall receive all the returns from the commission merchants and other sources, and make disposition of same as quickly as possible as directed by No. 14 of the By-laws. When elected he shall execute a satisfactory bond in the sum of $25,000 to the Association as individual members, for the faithful performance of the duties required of him as Secretary and Treasurer. He shall receive for his services one per cent. of the gross sales of all berries shipped. He shall employ a bookkeeper and all other help needed at the shipping sheds at salaries which, in his judgment, are economical to the Association, and at the same time just to the one employed. The salary of the Manager, and other help, shall be paid out of a fund created for this purpose. He shall have full control of the shipping sheds. He shall present his books and accounts to the auditing committee when said committee is appointed to examine the accounts of this Association as provided by No. 18 of the By-laws.

5. (Sec. 1). TheBusiness Committee as soon as they shall have been elected, shall organize by electing one of their number chairman. They shall meet at the call of their chairman. They shall have power over the actions of the Business Manager as a

whole, and in case of sickness, death or any other disability of the Manager during the shipping season, shall select a temporary manager. The chairman and each member of the committee, excepting the Business Manager, shall receive two dollars each meeting of the committee, for members in attendance. It shall be the duty of the Business Committee to select the commission merchants who shall handle the berries of the Association.

5. (Sec. 2). For the purpose of paying the Business Manager, bookkeeper and all other help and expenses incurred in the shipment of berries, there shall be set aside two per cent. of the gross sales of all shipments. After all salaries and expenses have been paid, the remainder of this fund to be pro-rated to the growers as other receipts. All of the bonds given by members of this Association shall be approved by the Association.

6. Each officer, committee, agent, or any other members shall present to the Association an itemized account of any expense to which he may have been, that a warrant may be issued in his favor on the Treasurer.

7. Nothing shall be so construed as to hold any member responsible for the provisions of the Constitution or By-laws, who shall voluntarily withdraw from the Association or quit the business of fruit growing.

8. Any member withdrawing from the Association shall be entitled to receive his dividend of the unexpended rebate, but shall forfeit to the Association all other money belonging thereto.

9. A voter in this organization shall be a member who is a grower of berries. No members shall have more than one vote on any subject.

10. All members of this Association must buy all of their crate material through the Association.

11. All members obligate themselves to turn over all berries to the Business Committee, to be shipped by them, except those they may need to supply home demand, or for shipment to friends. In no case shall any member be allowed to sell berries for shipment, unless he obtains consent of the Business Committee to do so. Upon complaint of any one that a member violates the above obligation, the Business Committee shall make an investigation at once, and if found guilty, the Secretary shall be notified to drop his name from the membership list. It is of great importance that the growers deliver all fruit to the management, that commission houses arranged with may not at any time be disappointed by not receiving expected shipments. Each grower must deliver or be in line ready to deliver at the shipping sheds all berries he has to ship each day not later than ten (10) o'clock p.m.

12. The grades of strawberries will be two, designated as "A" and "B" (the "B" grades blank). The "A" grade must be strictly choice, firm sound stock, of good size. The "B" grade must also be firm and sound, but may be somewhat smaller. Where the difference in selling price is not noted on account sales of receivers, the Secretary shall make division on a basis of a difference of 25 cents per crate between the two grades. Fruit that is too soft or otherwise unfit to grade "B" will be rejected. After inspection at shipping sheds berries that grade "A" will have the crates stamped on both ends with the Association's trade mark, which shall read as follows, viz: "The Original Neosho Strawberry. Grown by the Neosho Fruit Growers' and Shippers' Association."

13. It shall be the duty of the Business Committee to employ a man of good judgment and ability to inspect all fruit delivered by growers for shipment, and he shall be given as many assistants as are necessary; and he shall have power to change grades and reject any and all fruit which in his judgment, and the judgment of the Business Committee, is unfit for shipment.

14. Each grower shall receive the average price per crate of each grade each day. Should it be necessary to hold over berries from one day to the following day for shipment, then the number carried over shall be disbursed with that day's shipment. A clean-up shall appear as having been made each day.

15. The Secretary receiving berries must give each grower a receipt for the number of crates of berries deliverd, designating the number of crates of each grade.

16. All members obligate themselves to be governed by the decision of the Association in regard to the prices to be paid for picking berries, and they agree that they will not in any manner, directly or indirectly, such as by a gift, premium, or by counting more trays or quarts than has actually been received at the packing sheds, or through any member of the family, or any other individual, pay more than the price agreed upon by the Association. The penalty for violation of this obligation shall be the withholding of thirty-five cents a crate for all berries received in violation of the above named By-law. All complaints shall be filed with the field inspectors who shall investigate the matter and immediately report to the Business Committee, who shall act upon the matter promptly, and the funds accruing from fines shall be turned into the general treasury. A copy of this penalty clause shall be incorporated into the rules for the packing sheds.

17. The Business Committee shall have power to appoint a man as marshal if necessary, whose duty it shall be to see that each member shall be allowed to unload his berries in the order in which he may come to the unloading place. He shall see that no one drives out of his regular turn. Any dispute between growers shall be settled by the marshal. Any grower who shall refuse to abide by the decision of the marshal shall forfeit his place and go back behind every wagon present.

18. The President shall, at the regular meeting in June of each year, appoint the Auditing Committee, consisting of two members, whose duty it shall be to examine the books and accounts of the officers of the Association and Business Committee and report in writing at the regular meeting held in July following. The Auditing Committee shall each receive two dollars per day as compensation for the time required to examine the books and accounts submitted to them.

19. On any motion the vote shall be yea or nay unless some members shall request the vote being taken by ballot; and upon such request being made, the President shall appoint two tellers to take the ballots, and when the voting is by ballot every member present shall vote unless he is excused by the President, provided he is entitled to a vote. Any voter refusing to vote, who has not been excused by the President, shall forfeit to the Association fifty cents. A voter shall be a grower of berries.

20. Any member who shall be in arrears for dues three months shall forfeit his or her vote and all benefits of the Association and when six months in arrears shall stand suspended from the Association.

21. Any member who shall have been proved guilty of fraud or immoral conduct, or failed to meet his just obligations, or of any other act so as to affect the credit and good standing of the Association shall be barred from membership.

22. All members must acquaint themselves with the Constitution and By-laws and annex their names thereto.

23. These By-laws may be amended in accordance with Article 9 of the Constitution.

Knox County Berry and Truck Growers' Association.

Article II.

The objects of this Association are to encourage the better cultivation and increased acreage of strawberries, melons and other fruits and vegetables suited to this district. To secure better shipping facilities, find other markets for the above mentioned products when the local market is unable to handle the same at remunerative prices to the grower; also to secure prices on fertilizers and packages and to purchase same for Association. To secure rates and routes for transportation and anything necessary to the successful raising and disposal of any product which members of the Association may have.

Article VI.

Section 3. The Governing Board shall require anyone handling Association funds or moneys received from the sale of products belonging to members of the Association to give a satisfactory bond.

Section 4. The Governing Board shall appoint an Auditing Committee, who shall examine the Treasurer's accounts and report at the monthly meetings of the Association.

Section 8. The Governing Board shall furnish printed instructions to members about growing, packing, shipping, etc., the various products for foreign markets.

Article IX.

For the purpose of providing a fund for salaries and operating expenses (not including shipping charges and commissions), a charge shall be made which shall in no case exceed 7½ cents per package for crates, hampers and bags, or $12 per car for bulk goods, such as watermelons, cabbage, etc. After all salaries and expenses have been paid the remainder of this fund, if any, shall become the property of this Association.

Article X.

Section 1. All members obligate themselves to turn over their pledged products to the Governing Board to be shipped by them. Upon complaint of any member that a member violates the above obligation the Board shall investigate at once and if found wilfully guilty the Secretary shall be notified to drop his name from the membership list.

Section 2. Any member who shall have been proved to the satisfaction of the Board guilty of any act liable to affect the credit, good standing or in any way work against the interests or welfare of the Association may upon due notice be dropped from the roll and barred from membership.

A simple set of by-laws suitable for any apple shipping association is given herewith. Changes may easily be made to suit local conditions, etc.

By-laws of the Fruit Growers' Association, incorporated under The Ontario Companies Act.

1. This Association of fruit growers shall be known as the Fruit Growers' Association.

2. The objects of the Association are for the packing and selling of the fruit grown by its members, the purchase of supplies, packages, spraying materials, machinery, etc., also buying and selling such other fruit during the season as opportunity presents itself.

3. The annual meeting of the Association shall be held on the first Thursday in May in each year.

4. Special meetings may be held at any time upon call of the President by written notice mailed to each member five days before the meeting. Special meetings shall also be called by the President whenever required to do so in writing by any ten members.

5. At any meeting of the Association ten members shall constitute a quorum for the transaction of business.

6. At the annual meeting five Directors shall be elected, of whom three shall constitute a quorum at any Board meeting.

7. The officers shall consist of a President, Vice-President, Secretary-Treasurer, Manager and two Auditors.

8. The President and Vice-president shall be chosen by the Directors from among themselves at the first Board meeting after the annual meeting. The other officers shall also be chosen at this time, but not necessarily from among the Directors.

9. All elections shall be by ballot, plurality electing, conducted by two scrutineers appointed by the chairman.

10. The President shall preside at all meetings. He shall call meetings of the Board of Directors and members when necessary and shall advise with and render such assistance to the Manager as may be in his power. In his absence, the Vice-President shall have and exercise all rights and powers of the President.

11. The Secretary-Treasurer shall keep a record of the proceedings of all meetings and of all the receipts and disbursements, and report the condition of the finances annually or as often as the Directors shall desire.

12. The Manager shall have charge of the business in detail under the supervision of the President.

13. The Manager and the Secretary-Treasurer shall give bonds in such sums as shall be acceptable to the Association.

14. The Directors may select three of their number to act as an Executive Committee (the President to serve as chairman) to have general charge of the affairs of the corporation during the fruit season.

15. When a vacancy shall occur through any cause in any of the offices established by the By-laws of the Association, it shall be filled at the next regular or special meeting.

16. The annual dues of this Association shall be one dollar, payable on or before the date of the annual meeting.

17. Any fruit grower in county shall be eligible to become a member by a two-thirds vote of the members at the time application is made.

18. Any member may withdraw at any time between January 1st and April 1st. Notice of such withdrawal must be given in writing to the President or Secretary of the Association.

19. All apples grown by the members shall be delivered to the Association's packing house in prime condition for grading, packing and shipping. Other fruits may be delivered for sale on commission.

20. The books of the Association shall be audited before the date of the annual meeting each year. At this meeting a printed statement of the receipts and expenditures as audited shall be presented to each member.

21. These By-laws may be amended at any regular or special meeting by a vote of the members present in the affirmative. Notice of such amendments must be given each member by letter or otherwise at least five days previous to the meeting.

Some of our Associations may desire to make individual contracts with the members for the disposal of their fruit. A form in use by the Hood River (Oregon) Apple Growers Union is given below.

CONTRACT.

In consideration of the terms of this agreement, made and entered into this day of , 190 , I, hereby bargain and sell to the Hood River Apple Growers' Union my entire crop of merchantable apples of every grade and every variety for the year 190 , the said terms being as follows: All fruit shall be graded and packed under supervision of the Hood River Apple Growers' Union at the expense of the grower, and delivered by him at the ware house of said Union in the City of Hood River, Oregon, at such time as may be designated by said purchaser who shall give notice to the grower for such delivery. In further consideration of this agreement the said Hood River Apple Growers' Union has this day paid said the sum of $, the receipt whereof is hereby acknowledged. And in further consideration of this contract, said Hood River Apple Growers' Union agrees to pay the balance of the market price obtained by it (less a box for handling) to the grower within days after the delivery of fruit as aforesaid.

In witness whereof we have hereunto set our hands in duplicate this day of , 190 .

HOOD RIVER APPLE GROWERS' UNION,

By , *President.*

By , *Secretary.*

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Witnesses.

INSTRUCTION IN PACKING.

At the request of the Co-operative Fruit Shipping Associations a special instructor and inspector Mr. Jos. Backus of St. Catharines was appointed to visit these associations during the fruit packing season to give information and advice on the proper grading and barreling of fruit. There are some 35 associations in existence at the present time as follows:

	Manager or Secretary.
Ingersoll Fruit Growers' Association	J. C. Harris, Ingersoll.
Burgessville Fruit Growers and Forwarding Co	Arthur Frain, Burgessville.
Burlington F. G. A	W. F. W. Fisher, Burlington.
Georgetown Co-operative Association	F. J. Barber, Georgetown.
Georgian Bay F. G. A	J. G. Mitchell, Thornbury.
Owen Sound Fruit Co. Ltd	Adam Brown, Owen Sound.
Brant Packing Association	F. M. Lewis, Burford.
Bruce F. G. A	M. G. Dippel, Walkerton.
Forest F. G. A	A. Lawrie, Forest.
Canadian Apple Exporters, Ltd	W. H. Dempsey, Trenton.
St. Catharines Cold Storage and Forwarding Co., Ltd	Robert Thompson, St. Catharines.
Oakville Fruit Growers' Ltd	Thos. Garner, Palermo.
Newcastle Fruit Growers' Ltd	W. H. Gibson, Newcastle.
Chatham F. G. A	W. D. A. Ross, Chatham.
Belleville F. G. A	F. S. Wallbridge, Belleville.
Ilderton F. G. A	E. T. Caverhill, Ivan.
Grimsby Co-operative Fruit Growers	The Manager, Grimsby.
Arkona F. G. A	T. A. Lampman, Arkona.
Norfolk F. G. A	Jas. E. Johnson, Simcoe.
Oshawa F. G. A	Elmer Lick, Oshawa.
Paisley F. G. A	A. L. MacKinnon, Paisley.
Orono F. G. A	E. J. Hamm, Orono.
Arran and Amabel F. G. A	J. Davidson, Skipness.
Jordan F. G. A	J. A Wills, Jordan.

	Manager or Secretary.
Watford F. G. A.	D. G. Parker, Watford.
Erie Fruit Co.	W. W. Hilborn, Leamington.
Thedford F. G. A.	Wm. Tudor, Thedford.
Hatchley Station F. G. A.	W. F. Robinson, Hatchley Station.
Cobourg F. G. A.	S. W. Staples, Baltimore.
Mt. Nemo F. G. A.	R. M. Spence, Nelson.
Grafton F. G. A.	J. G. Wait, Wicklow.
Dunnville F. G. A.	S. S. Smith, Dunnville.
Sparta F. G. A.	J. A. Webster, Sparta.
Norwich Gore F. G. A.	B. J. Palmer, New Durham.
Clarkson F. G. A.	W. G. Horne, Clarkson.
Alvinston F. G. A.	E. F. Augustine, Aughrim.
Arkwright F. G. A.	A. Gammie, Burgoyne.

Owing to the shortness of the season and the number of the associations wishing for his services, Mr. Backus was unable to give the time to the packers in each association that he would liked to have done. It would seem necessary another year to appoint at least two men for this work. The managers of the associations report very favorably at the close of the season on the instruction which they had received, stating that a more uniform pack was obtained than would ordinarily have been the case. There is no doubt that every head packer has his own ideas as to what constitutes a No. 1 and 2 apple. As these men do not come in contact with one another there is no other way of unifying the grades. Mr. Backus reports as follows in reference to his work.

In submitting my report to you there are a few things I would like to bring to your notice. The first is that there is really too much ground to be covered by one man to give any kind of satisfaction to the packers or instructors. About all a man could do was to pay a flying visit to each. All that I could do was to see the pack they were putting up at the time and could not get a good idea of the pack in general.

Outside Buyers. This is really one of the worst drawbacks that the Associations have, especially the weaker ones. These men try by every means to break up the membership. There is one way to get around this and that is through the use of the central packing house where it is at all possible. Too much cannot be said in its favor and as a general thing you find the best packing done there. The pack is then under the personal supervision of one competent man. In packing in the orchard it is necessarw for two or three gangs to work, hence two or three different packs, and not the uniform pack that the Associations are aiming at. In the central packing house you can employ women who do just as much work for less money and do not idle away their time.

The Packer. To be a successful packer a man must use some judgment as to what he is going to do with a lot of apples when he sees them and not wait until he has half of them packed to find out that his No. 1. grade are not up to standard so spoiling No. 2. It were far better if he had packed all No. 2 in the first place and have one good grade instead of two inferior ones. There was one case of a head packer who claimed to have had thirty years' experience and knew the game from A to Z and who did not believe in some of the new fangled ways. If I had been a Dominion Inspector at the time I think that he would have stopped and considered some of those new fangled ways. I referred him to the Fruit Marks Act, but I doubt if it did any good. Out of four specimens taken as a sample from a barrel of No. 1 apples, two were an inch in diameter and the other two about four inches. I found a case also of overpressing. The packer would hardly believe me when I told him. He was not tailing at all, so that some of the apples were in a very broken condition.

Well tilled apple orchard, owned by W. H. Gibson, Secretary Newcastle F. G. A.

Branding. This is one of the best ads that an Association can have and some of the managers are very particular about it (especially Simcoe, Oshawa, Forest, Georgetown and Owen Sound), as it is a very important item in the make up of a package. In one case the identity of the Association was lost altogether, due to the lack of a distinctive brand.

Proper Management Of The Orchards. This, I find, is the whole secret of success. Those Associations who follow out faithfully the three principles in apple growing, namely, spraying, pruning and cultivation, are the ones who are packing the highest percentage of No. 1 apples. A few men still say that spraying is of no use. Well, let them think it, but from what I saw last fall I would advise the ones that are doing these things to keep them up.

Pack Of Fruit. In travelling from place to place I always tried to see the work of the local packers, and am pleased to say that all of the Association packers, with the exception of two cases, were a little better than the average, and in some cases were much superior.

INCORPORATION FOR CO-OPERATIVE ASSOCIATIONS.

At the Short Course in fruit growing at the Ontario Agricultural College, Guelph, Mr. Mulvey, Assistant Provincial Secretary, outlined the requirements of the Ontario Companies' Act as applied to fruit shipping associations. He stated that the Act was very broad in the powers conferred upon associations incorporating under its provisions, and that a special rate of fees for each incorporation had been provided. These were as follows: Initial fee for taking out charter, etc., $10.00; annual fee thereafter in making returns $1.00. There were practically no restrictions as to the by-laws etc of such associations but he suggested various points which might be incorporated in the article of agreement which has to be submitted to his Department in applying for a charter. Copies of the forms required are submitted herewith. These differ in cases of companies taking out capital stock from those where no stock is required. The clauses of the agreement may be arranged to suit the requirements of different associations, and only the important bylaws need be included in the draft submitted in asking for a charter. Subsequent changes may be made without reference to the Department. Copies of these forms can be procured on application to this branch. All applications for incorporation, annual fees and returns, etc., must be sent to the Provincial Secretary's Department, Parliament Buildings, Toronto.

(For Associations Without Capital.)

Petition.

To His Honour J. M. Gibson, K.C.,
Lieutenant-Governor of the Province of Ontario.

The petition of .....
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.....humbly sheweth as follows:

1. Your petitioners are desirous of obtaining by Letters Patent under the Great Seal a charter under the provisions of The Ontario Companies' Act, constituting your

Dwarf pear orchard, owned by W. F. W. Fisher, Burlington F. G. A.

petitioners and such others as may become members of the corporation thereby created, a body corporate and politic without share capital under the name of , or such other name as shall appear to your Honour to be proper in the premises.

2. Your petitioners have satisfied themselves and are assured that the corporate name under which incorporation is sought is not on any public ground objectionable, and that it is not that of any known association, incorporated or unincorporated or of any partnership or individual, or any name under which any known business is being carried on, or so nearly resembling the same as to deceive.

3. Your petitioners have satisfied themselves and are assured that no public or private interest will be prejudicially affected by the incorporation of your petitioners as aforesaid.

4. Your petitioners are of the full age of twenty-one years.

5. The object for which incorporation as aforesaid is sought by your petitioners is: (*a*) To carry on a co-operative association for the handling, marketing and otherwise disposing of fruit, vegetables, cereals and all other produce of the farm; (*b*) For the purchase and distribution of machinery, implements, utensils and all articles used on the farm; (*c*) For providing cold storage, refrigerator warehouses, wharves and all means of handling and dealing with farm produce, and for packing, preserving, manufacturing or otherwise dealing with farm produce.

6. .....

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are to be the Provisional Directors of the Corporation.

7. Your petitioners have subscribed to a memorandum of agreement in duplicate, setting out the purposes and objects of incorporation and provisions for administering the affairs of the corporation.

Your petitioners, therefore pray that Your Honour may be pleased by Letters Patent under the Great Seal to grant a charter to your petitioners and such others as have or may become subscribers to the memorandum of agreement of the Corporation thereby created, a body corporate and politic for the due carrying out of the undertaking aforesaid.

And your petitioners as in duty bound will ever pray

Signatures of Witnesses. ..... Signatures of Petitioners.

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Dated at ..... this ..... day of ....., 19...

(For Associations Without Share Capital.)

Memorandum of the agreement of the Association, made and entered into this day of .

1. We the undersigned do hereby severally covenant and agree each with the other to become incorporated under the provisions of The Ontario Companies' Act as a corporation without share capital for the purposes and objects following:

(*a*) To carry on a co-operative association for handling, marketing and otherwise disposing of fruit, vegetables, cereals, and all products of the farm;

(*b*) For the purchase and distribution of machinery, implements, untensils and all articles used on the farm;

(*c*) For providing cold storage, refrigerator warehouses, wharves and all means of handling and dealing with farm produce, and for packing, preserving, manufacturing and otherwise dealing with farm produce.

2. The subscribers to the agreement shall be the first members, and it shall be determined by by-law the terms and conditions on which subsequent members shall from time to time be admitted.

3. The following shall be the first Directors of the Corporation: .....

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4. The first general meeting shall be held at such time not being more than two months after the incorporation of the Corporation, and at such place as the Directors may determine.

5. Subsequent general meetings shall be held at such time and place as may be prescribed by by-law of the Association.

6. Special meetings of the members may be held at any time upon call of the President by written notice mailed to each member five days before the meeting. Special meetings shall also be called by the President whenever required to do so in writing by any five or more members.

7. At any meeting of the Association ten members shall constitute a quorum for the transaction of business.

8. At the annual meeting of the Association, five Directors shall be elected of whom three shall constitute a quorum. There shall also be elected two auditors who shall hold office until the next annual meeting unless previously removed by a resolution of the members at a general meeting.

9. The officers of the Association shall consist of a President, Vice-President, Secretary, Treasurer, Manager, who shall be elected by the Directors at the first Board meeting to be held within a week after the annual meeting.

10. The Directors may select three of their number to act as an Executive Committee to have general charge of the affairs of the Corporation.

11. When a vacancy shall occur through any cause in any of the offices established by the by-laws of the Association, it shall be filled at the next meeting of the Directors.

12. The members at the annual meeting or at a general meeting may by by-law agree to pay the officers of the Association for their services.

13. Other by-laws for the guidance of the Association may be adopted, or the present by-laws may be amended by a majority vote of the members at any regular or special meeting of the Association.

In testimony whereof we have hereunto set our hands and affixed our seals.

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Dated at ..... this ..... day of ....., 19.....

(For Associations With Share Capital.)

PETITION.

To His Honour, J. M. GIBSON, K.C.,
Lieutenant-Governor for the Province of Ontario.

The petition of .....

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..... humbly sheweth as follows:

1. Your petitioners are desirous of obtaining by Letters Patent, under the Great Seal, a charter under the provisions of The Ontario Companies' Act, constituting your

petitioners and such others as may become shareholders in the Association thereby created, a body corporate and politic under the name of The , or such other name as shall appear to your Honour to be proper in the premises.

2. Your petitioners have satisfied themselves and are assured that the corporate name under which incorporation is sought is not on any public ground objectionable, and that it is not that of any known company, incorporated or unincorporated, or of any partnership or individual, or any name under which any known business is being carried on, or so nearly resembling the same as to deceive.

3. Your petitioners have satisfied themselves and are assured that no public or private interest will be prejudicially affected by the incorporation of your petitioners as aforesaid.

4. Your petitioners are of the full age of twenty-one years.

5. The object for which incorporation as aforesaid is sought by your petitioners is (*a*) to produce, purchase, sell and deal in fruit and other food, farm and dairy products and the various materials entering into the production thereof; (*b*) To manufacture, lease, purchase and sell all machinery, tools, implements, apparatus and all other articles and appliances used in connection with any or all of the purposes aforesaid or with selling or transporting the manufactured and other products of the association; (*c*) To carry on the business of refrigeration, cold storage, warehousemen, wharfingers, forwarding agents and preservers and packers of provisions of all kinds.

6. The Head Office of the Association will be at .

7. The amount of the capital stock of the Association is to be dollars.

8. The said stock is to be divided into shares of dollars each.

9. The said .....
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are to be Provisional Directors of the Association.

10. By subscribing therefor in a memorandum of agreement, duly executed in duplicate, with a view to the incorporation of the Association, your petitioners have taken the amount of stock set opposite their respective names, as follows:

Petitioners.	Amount of Stock Subscribed for.
.....	$.....
.....	$.....
.....	$.....
.....	$.....
.....	$.....
.....	$.....

Your petitioners therefore pray that your Honour may be pleased by Letters Patent under the Great Seal to grant a charter to your petitioners constituting your petitioners and such others as have or may become subscribers to the memorandum of agreement and stock book of the Association thereby created a body corporate and politic for the due carrying out of the undertaking aforesaid.

And your petitioners as in duty bound will ever pray.

Signatures of Witnesses.

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Signatures of Petitioners.

Dated at ..... this ..... day of ....., 19...

REPORTS FROM EXPERIMENT STATIONS.

SOUTHWESTERN FRUIT EXPERIMENT STATION.

By J. L. Hilborn, Leamington.

The season of 1908 was on the whole very satisfactory to the fruit growers of this locality. The past winter was very favorable for fruit trees, practically all of which came through in good condition, the only exception being peaches of the Crawford type, the fruit buds of which did not survive.

The peach trees planted at this station this season for experimental purposes, as also those planted in the orchard, made a very satisfactory growth. I now have trees of many varieties that have never been fruited here that are well started, and I hope some of them will prove of much value.

One block of peach trees, consisting of about 285 trees, planted in 1904, containing Golden Drop, Banner, Kalamazoo, and Engol, produced a good crop this season, the first three varieties yielded about equal in quantity, averaging about seven baskets per tree. The Kalamazoo was largest in size, followed by Banner, while Golden Drop was a little smaller. The Engol was larger and more handsome than any, but the trees were not loaded so well. One block of about 100 trees of Brigden, six years old, yielded about ten baskets only on the entire block. A few trees of New Prolific eight years old yielded a fair crop of peaches of very fine quality. A few trees of Lemon, Banner and Barnard yielded a full crop.

Varieties fruited this season as follows:

Dewey. First picking August 6th, last picking August 14th; grows somewhat like Triumph, but a much better peach in every way. Garfield began ripening August 28th, finished September 4th; produced just a few scattering specimens of very large size and fine appearance. Barnard began ripening August 31st, finished September 7th; tree a great bearer and fruit second to none in quality, but must be well pruned and well cultivated to get sufficient size to sell well. New Prolific ripened from September 2nd to 12th, an excellent variety. Engol ripened from the 7th to 14th of September; the best all-round peach I have seen. If I could have only one variety I would choose this one.

Kalamazoo ripened from September 14th to 24th; a heavy bearer of exceedingly uniform fruit of good size, and scarcely any culls among them; a good shipper, but not as well coloured or as good quality as some of the above varieties.

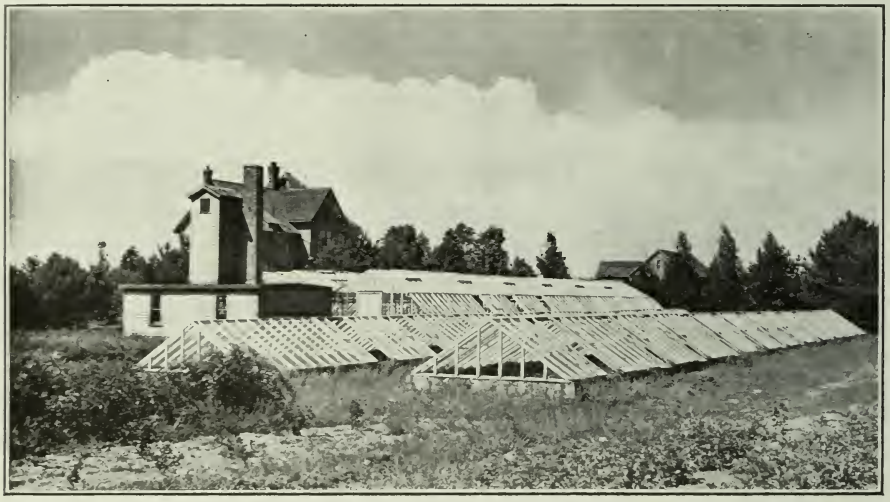
Banner is usually a little ahead of Golden Drop, but this season they ripened together, picking from September 20th to October 1st. Both varieties do well here if properly cared for and thinned when they require it. Lemon comes in with the last pickings. Of the two former varieties the latter is an excellent variety to grow for canning purposes.

Prices received for peaches this season, while only medium, were satisfactory, considering the yield. Nearly all the peach trees at this station made an excellent growth the past season, and those old enough to bear are well set with healthy buds. I still follow the practice of mulching every peach tree with old straw, and so far am well pleased with this method for this vicinity.

A portion of one young orchard was sown to Hairy Vetch on July 24th, which made an excellent stand, and is the most complete cover crop I have yet grown. Oats were sown in the bearing orchards as heretofore, but owing to the unusual dry weather did not grow well.

All my peach trees were sprayed during April with the lime-sulphur wash, except four rows in the centre of one orchard, which was treated same day with V 1 Fluid. The lime-sulphur gave excellent results as a preventive of curl leaf on peach trees, also in destroying San José scale on plum trees. The four rows of peach trees on which the V 1 fluid was used suffered much from curl leaf, and the portion of plum orchard that was treated with it to destroy the scale was quite badly infested on both wood and fruit, while the portion of the orchard that was treated with the lime-sulphur wash was comparatively free, and scarcely a scale could be found on the fruit.

Of the eighteen varieties of plums that were planted, all but two or three are growing well and should soon show some fruit. Of the various



Forcing Houses on Farm of J. L. Hilborn, Leamington.

varieties of cane berries, also currants, planted, most of them made a good showing for this, the first fruiting year, but require another year to be old enough for a report to be of any value.

The varieties of strawberries sent me were not suited to this soil and climate as we had a very severe drouth when they were ripening. They were almost an entire failure, and of little value as a test. Sample did best of any. From its behaviour this season, I think it is well worth a place among market varieties.

Vegetables.

This season was a very favorable one for the varieties of vegetables that are grown here. I have about 10,700 feet of glass used for vegetable growing purposes, part of which was planted to tomatoes and cucumbers early in March with good sized plants, the seed for which was sown early in January. The tomatoes grown were Chalk's Jewel, Dreer's Best of All,

and Frogmore, did best, in order named. The crop was hardly so good as it was the previous season, but was fairly satisfactory.

Four varieties of cucumbers were tested, Burpee's Extra Early, White Spine, Arlington, Satisfaction, and Telegraph. The latter is one of the long English varieties growing from 20 to 26 inches long. It is a heavier yielder than any of the others but does not take well in market. All the varieties of White Spine type did well. The cucumbers were trained upon woven wire trellises, while the tomatoes were tied to wire stakes.

In June I visited quite a number of the large greenhouses about Grand Rapids, Michigan, where they are well informed on this line of work, and are engaged in it on an extensive scale, and are certainly far in advance of anything I have seen before, especially in forcing cucumbers. I secured seed of the leading sorts grown there, and as I have put in a new and more up-to-date heating system, I hope to be able to report something more interesting another season in this line.

Early cabbage, tomatoes, and musk melons were all quite extensively grown, and were quite satisfactory crops this season. We grew a few Prizetake onions this season by starting the seed in the greenhouse about March 1st. These were transplanted in the field early in May, two rows, one foot apart, then leaving a space of three feet to admit of using a horse and cultivator. These grew well and produced a crop that astonished visitors. They were carefully harvested, and as they were larger and of as good quality as the imported onions found upon the market, they were crated and sold in competition with them and turned out satisfactory to all concerned.

An asparagus field of some three acres was started at this station last spring. 4,000 plants and a quantity of seed was secured from an asparagus specialist in New Jersey, who claimed to have a strain of extra quality. The roots were planted in early spring in rows four feet apart, plants 22 inches in the row. The seeds were sown in trays in the greenhouse the second week of March, and transplanted into permanent rows in the field the second week of June. Almost all the plants did well, and when killed by the frost in the fall, had produced five to seven shoots, each of which reached a height ranging from one to two feet, while the plants grown from roots had made about the same number of shoots, which ranged from three to four feet high.

WENTWORTH STATION.

By Murray Pettit, Winona.

Grapes.

The grape crop was below medium in quantity and much above in quality.

Fungus diseases were less harmful than usual. Although the quality was excellent, prices ruled lower than usual.

The financial depression, the proposed French treaty, and the temperance wave, each had an influence in lessening the demand.

Another year's experience proves that a great many of the varieties tested at this station are of little or no value. Even Campbell's Early,

Vineyard on Farm of Murray Pettit, Winona.

that gave promise of being a reliable early market grape, is lacking in hardiness, vigor, and productiveness. It does not ripen early enough to take the place of Champion, and not nearly as productive. The few vines planted in the experiment vineyard promised to be profitable. In 1902 a few hundred vines were planted with Champion, Concord, and Agawam, all getting the same treatment, and it has proved to be quite below the other varieties in profit.

In the experimental vineyard about 200 vines have been taken out. The following are the varieties with some reasons given for discarding them:

Amber:	Ripens too late for our climate.
Arnold's:	Black grape; productive; poor quality; sour.
Alvey:	Small black grape; poor quality.
America:	Vigorous vine; not productive.
Black Delaware:	Good quality; vine lacks vigour.
Black Eagle:	Early; does not fertilize well.
Black July:	Winter killed.
Beauty:	Light color; fair quality; not productive.
Canada:	Black; productive; poor quality.
Carman:	Vigorous vine; not productive.
Cottage:	Resembles Concord; drops badly from bunch.
Cynthianna:	Wine grape of Clinton type.
Cunningham:	Wine grape; not profitable.
Dracut Amber:	Productive; poor quality; very musky.
Duchess:	Small white; good quality.
Eldorado:	Vigorous vine; good quality; not productive.
Esther:	Weak vine: of no value.
Etta:	White; productive; poor quality.
Elvicand:	Black; vigorous; no value.
Early Ohio:	Tender; lacks vigour.
Early Golden:	Winter killed.
Elvira:	Very productive wine grape; bursts badly.
Eumedal:	Tender; winter killed.
Faith:	Small; weak; no value.
Florence:	The earliest grape; small; sour.
Green's Golden:	White; poor quality.
Golden Drop:	Very small; no value.
Geneva:	Winter killed.
Grayson:	Weak vine; no value.
Hays:	White; too tender.
Herbmont:	Small black wine grape.
Herman:	Wine grape; small berry; very late.
Ives:	Black; poor quality.
Jefferson:	Winter killed.
Janesville:	Black; early; sour.
Jessica:	Early; good flavor; lacks vigor.
Lady Washington:	White; large cluster; very late,
Lady:	White: early; good; lacks vigour.
Lutie:	Large; productive; very musky.
Martha:	White; good quality; weak vine.
Mo. Beisling:	White; productive; wine grape.
Marion:	Black; productive; sour.
Monroe:	Black; vine lacks vigour.
Montefiore:	Black; wine grape; sour.
Noah:	White; large; very productive; poor quality.
Norton's, Va.:	Small wine grape.
Oleite:	Winter killed.
Opal:	White; productive; poor flavor.
Ploughkeepsie Red:	Winter killed.
Pearl:	White; productive; poor quality.
Ronnell:	White; no value.
Rebecca:	White; good quality; not productive.
Taylor:	White, small; not productive.
Triumph:	White; large; too late for our season.
Transparent:	White wine grape.
Ulster Prolific:	Winter killed.

The following varieties are of some value and will be compared with the profitable varieties for a few years more:

Alice,
Amber Queen.
Anderson,
August Giant.
Cambridge,
Campbell's Early.
Concord Chassalas,
Concord Muscat,
Croton.
Dr. Collier,
Early Victor,
Eaton,
Empire State,
Eurelan,
Green Mountain,
Kensington,
Mason's Seedling,
Mills,
Moore's Diamond
Moyer,
Northern Light,
Pocklington,
Prentiss,
Rog No. 28 (Regal),
" 43 (Barry),
" 44 (Herbert),
" 39 (America),
Woodruff's Red,
Wyoming Red.

The profitable varieties:

Agawam,
Catawba,
Champion,
Concord.
Delaware,
Lindley,
Niagara,
Vergennes,
Wilder.
Worden,

Plums.

About forty varieties of plums have been tested at this station. Bradshaw, Lombard, Reine Claude, and Monarch have proved to be the most profitable.

General Hand, Washington, Satsuma, Ogon, Weaver, Desoto and Wickson are the least profitable.

Pears.

Pear blight has continued the work of destruction again this year. Anjou and Duchess have suffered very little. Bartlett, Flemish Beauty and Gifford have suffered the most.

The celebrated Pear Blight Remedy from California was experimented with, but with no very definite results. One Anjou tree planted in 1881 gave a yield of fifty-seven eleven quart baskets of good. clean, even sized pears.

BURLINGTON FRUIT EXPERIMENT STATION.

By A. W. Peart, Burlington.

Previous to and since this station was opened, in 1896, the kinds of fruit under test have been as follows:

Apples	67 varieties	Blackberries ...	22 varieties
Pears	46 "	Raspberries	29 "
Plums	54 "	Currants	30 "
Peaches	13 "	Gooseberries ...	6 "
Cherries	11 "		
Grapes	30 "	Total	308 varieties

Since 1896 several varieties have died, while others have been removed after a fair trial. Only a few pears, currants, and apples remain without a complete test, these having been planted somewhat recently. The comparative values of these so far is indicated by the reports of this year and 1907.

The aim of this report is to give the results and conclusions reached here at the present time, based upon a close and careful review of the past.

Apples

Of the older varieties (22 in number) the following appear the most desirable:

Commercial: Astrachan, Duchess, Wealthy, Ribston, Blenheim, King, Baldwin, and Spy.

Domestic: Astrachan, Sweet Bough, Gravenstein, Wagner, Seek, Tolman and Golden Russet.

Among the southern varieties (34 in all top-grafted in 1901) there is only one variety of promise, the Ozark, which during the past three years has averaged one bushel each year. It is a handsome winter apple, and is described in report of 1906. The remaining 11 varieties were grafted on Roxbury Russet stock in 1905, and have borne only an odd apple or so as yet.

The J. E. Johnston system of spraying was tried here on one acre of Spys and one acre of Baldwin, Ribston Pippin, and Duchess pears mixed. The results were encouraging. In sorting we found four-fifths of the Baldwins and Ribstons, and three-fifths to three-quarters of the Spys free from the codling worm and scab. The pears were practically clean, while those unsprayed in an orchard alongside were badly spotted.

Perhaps never in the history of the district has the codling moth done so much damage. In September, weather conditions were peculiarly favorable, and in some orchards apples were riddled with the worm. Young bearing trees suffered more than old ones, and as the season advanced the ravages were cumulative, late varieties being injured more than early sorts.

While conditions were extremely favorable to insect life, they were opposed to fungous growth, with one notable exception, the Greening apple, which in late September developed a grayish mould and rot that ruined it for all purposes except evaporation, etc.

Pears.

These seem suitable for this district:

Commercial: Wilder, Clapp, Bartlett, Boussock, Louise, Duchess (dwarf), Anjou, Kieffer, Lawrence, Nelis, Josephine.

Domestic: Wilder, Bartlet, Seckel, Louise, Anjou, Nelis.

In regard to "blight," the following observations may be of interest. Three trees of each variety were planted in 1896 on a sandy gravelly loam, fertile and under cultivation.

All the trees blighted: Idaho, Petite Marguerite, Howell, Souvenir de Congress, Summer Doyenne, Clapp's, Easter Buerre and Osband's Summer.

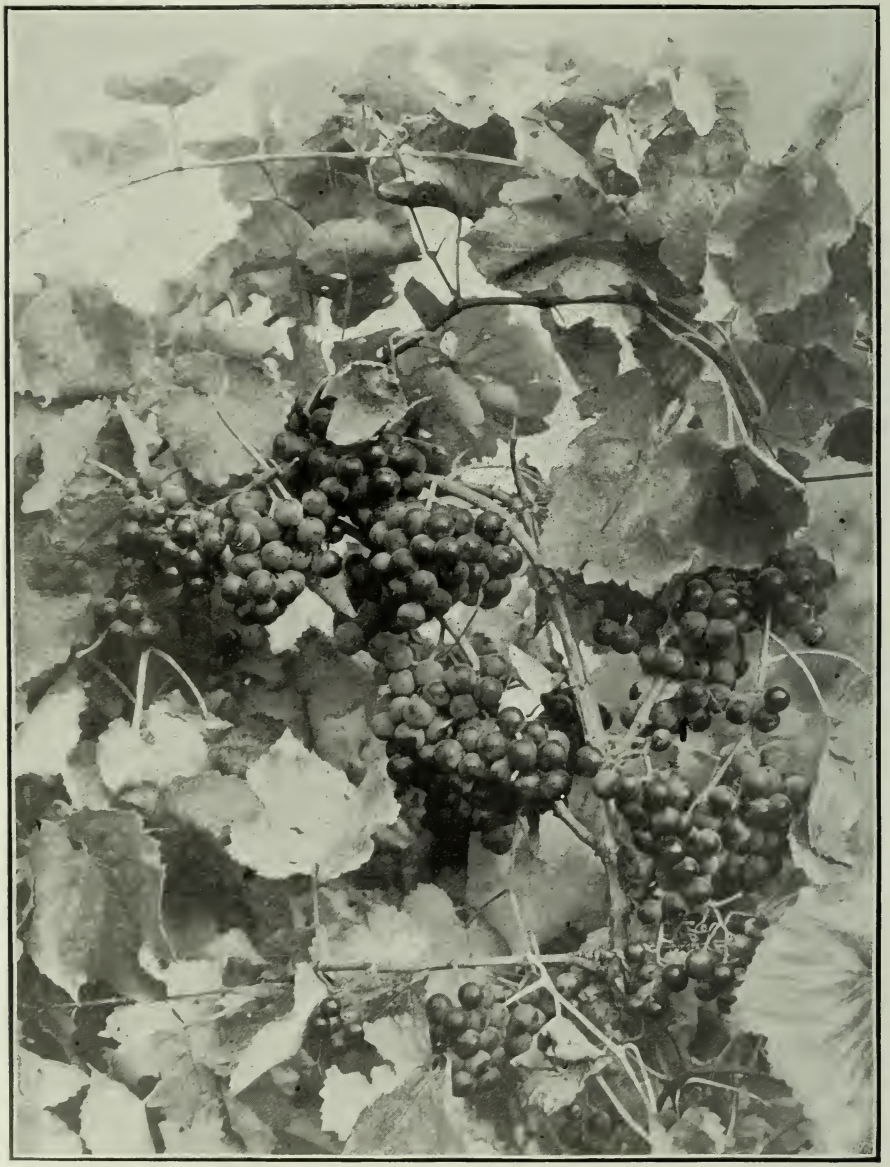
Some blight: Lawson, Josephine, Sheldon, Boussock, Vermont Beauty, Anjou, Bartlett, Duchess, Hoosic, Louise, Buffam and President Drouard.

Practically free from blight: Lawrence, Clairgeau, Nelis, Bosc, Wilder, Keiffer, Giffard, Tyson, Sudduth and Seckel.

Note.—Bartlett, Anjou, Duchess and Sheldon growing on heavier soils have blighted but very little, so that those in first and second columns might make a different showing if grown on clay soil. Rapid growth induces greater blight, while some varieties are constitutionally susceptible. The Kieffer pear, and perhaps some others seem to prefer a sandy loam, but for most pears, a heavy soil appears to be their natural home.

Plums.

The following do well: Bradshaw, Niagara, Imperial Gage, Lombard, Yellow Gage, Prince of Wales, Glass, Reine Claude, for European varieties; and Red June, Abundance, Burbank and Satsuma of the Japan type.



Concord Grapes in Bearing at A. W. Peart's, Burlington.

Relative duration of life. These might be classified as long-lived: Bradshaw, Niagara, Yellow Gage, Glass, Purple Egg, German Prune, Shipper's Pride, General Hand, Munro, Gueii, Pond's Seedling, Weaver, Shropshire, Damson, Chabot, Burbank, Ogon, Abundance, Prince of Wales

and Peter's Yellow Gage. Short-lived: Imperial Gage, Reine Claude, Lombard, Purple Egg, Yellow Gage, Smith's Orleans, Satsuma, Moore's Arctic, Grand Duke, Czar, Saunders, Spaulding, Fellenburg, Wickson, Willard, Washington.

As the Reine Claude gets older it seems to ripen earlier—a transition from a late to a medium season. The Weaver, Mariana, Italian Prune, and General Hand are practically useless, bearing little or no fruit. As the Ogon and Wickson become older the bearing habit appears to desert them. If you want plums quickly you might plant some of these varieties that die early but in the long run you will get good satisfaction from the Bradshaw, Niagara, Hudson River, Shipper's Pride, etc. When we go to pick the German Prune most of them are found lying on the ground.

Peaches.

Of the trees planted in 1897-98, these varieties are living and fruiting: Crosby, Steven's Rareripe, Longhurst, Tyhurst, Sneed, Champion, Hortense Rivers, Yeusti Triumph, Greenboro, Captain Ede, Connecticut, Alexander and Early Crawford.

Commercial: Sneed, Alexander, Early Crawford, Champion, and to judge of reports from others in the district, the St. John, Elberta and Smock.

Grapes.

Commercial: Black—Moore's Early, Worden, Concord; Red—Delaware, Massassoit, and Lindley; White—Diamond and Niagara. Perhaps the most satisfactory all-round grape grown here is the Worden. It is earlier and larger than the Concord, yields nearly as well, is very hardy and of excellent quality. The skin is thin, but for nearby markets that cuts very little figure.

In regard to the keeping qualities of different grapes, the writer made a test some years ago of twenty varieties. They were picked well ripened in September and October, and kept in baskets hung up in a cool dry cellar.

The following table shows their record:

Variety.	Tested Jan. 1. Scale 0-10.	Tested March 15. Scale 0-10.	——
Agawam	9	9	Wilted, good flavor, nearly sound.
Brighton	9	5	Partly decayed, partly sound.
Catawba	10	10	Wilted, good flavor, sound.
Concord	3	....	Entirely decayed.
Delaware	5	....	" "
Eldorado	7	1	Nearly all decayed.
Eaton	4	....	Entirely decayed.
Hartford	6	6	Partly sound.
Isabella	7	1	An odd sound berry.
Jessica	7	2	A few sound berries.
Lindley	9	8	Wilted, fair flavor, nearly sound.
Lady	2	....	Entirely decayed.
Moyer	7	2	A few sound berries.
M. Diamond	7	....	Entirely decayed.
M. Early	3	....	" "
Niagara	3	....	" "
Worden	1	....	" "
Wyoming Red	7	....	" "
Wilder	8	8	Nearly sound.
Vergennes	10	10	Wilted, good flavor, sound.

This test would go to show that the Catawba, Vergennes, and the Roger varieties, Agawam, Wilder and Lindley are the best keepers.

Cherries.

Commercial: Sour, Dyehouse, Early Richmond, Montmorency, and English Morello; Sub-acid, Windsor. Two varieties, Louis Phillipe and May Duke, planted in 1900, are still practically barren. It is possible that, like the Spy apple and the Tyson pear, they may require age before beginning to fruit.

Blackberries.

Commercial: Snyder, Agawam and Western Triumph. The Ancient Briton promises well, but appears to be weak in self-fertilization, and would require to be planted with other varieties. Description of varieties will be found in report of 1904, and for average yields, from 1903-1907 inclusive, see table in report of 1907.

Currants.

Commercial: Red—Cherry, Fay, North Star, Prince Albert, Victoria, Wilder. Black—Collin's Prolific, Lee, Naples and Saunders (with some growers Champion takes a first place in this district). White—Grape and Imperial.

Yields of Currants in Quarts per Bush for Years 1902-1908, Inclusive, with Average per Year.

Variety.	1902	1903	1904	1905	1906	1907	1908	Total in 7 years.	Av'ge per year.	Remarks.
Baldwin	.....	.....	.....	¼	1	½	½	2¼	.32	Planted 1903.
Belle St. Giles	2½	1½	1	1	2	2	1	11	1.57	
Black Victoria	.....	.....	.....	½	1½	1	½	3½	.50	" "
Boskop's Giant	.....	.....	.....	¼	1	1½	2	4¾	.67	" "
†Brayley	3	4	2½	4	2	3½	3	22	3.14	
*Beauty	.....	.....	.....	⅓	1	2	2	5⅓	.76	" "
Champion	.....	.....	.....	.....	½	1	1½	3	.42	" 1904.
Comet	.....	.....	.....	½	1	3	¾	5¼	.75	" "
Cherry	4½	5½	4	5	3	4	3½	29½	4.21	
Collin's	2½	5½	4	4	3	2½	2	23½	3.35	
Crandall	4	4½	5½	4	3	3½	3	27½	3 92	
Fay	3½	4	2½	3½	1½	3	1½	19½	2.78	
Lee	3	4	2½	3	1½	2½	2	18½	2.64	
Naples	3	4½	3	4	3½	3	3	24	3.42	
New Victoria	4½	5	5	5	3	5	2½	30	4.28	
North Star	4½	5½	2½	4	2	5	3	26½	3.78	
Perfection	.....	.....	.....	½	1	2	½	4	.57	
Pomona	4½	4	3¼	4	3	4	3	25¾	3.67	
Prince Albert	4	4½	4	5	3	4	2	26½	3.78	
†Raby Castle	5	6	4	5	3	5	3	31	4.42	
Red Cross	4	4½	3¼	2	1	3½	2	20¼	2.89	
†Red Dutch	6½	7½	4	3½	2	4	3½	31	4.42	
Red Victoria	6	7	5	5	3	5	3	34	4.85	
Saunders	3	5	4	4	2	2	2	22	3.14	
Standard	.....	.....	.....	½	1½	1½	1½	5	.71	" 1903.
Success	.....	.....	.....	¼	1	1	1	3¼	.46	" "
Versailles	3	4	3	2½	2	4	2	20½	2.92	
White Grape	4	5	2½	3	2	3	1	30½	2.92	
White Imperial	3	4	1½	1½	1	2	½	13½	1.92	
Wilder	4	5½	4	5	2½	5	3½	29½	4.21	

*These yields taken from bushes recently planted.
† Rather small, yet they give a heavy yield.

Raspberries.

Commercial: Red—Marlboro, Cuthbert and possibly the Herbert, which is said to be promising: Black—Smith's Giant, Kansas and Older; Purple—Columbian and Shaffer: Yellow—Golden Queen.

Gooseberries.

Commercial: Pearl, Downing, and Red Jacket.

Comments. It should always be borne in mind that the fruit industry of this Province is essentially in an experimental stage, and that conclusions we reach to-day are subject to revision. Considerable light has been thrown upon some problems, such as varieties of fruits, care of trees packing, marketing, etc., while others are still rather obscure, as the most suitable soil for a given kind of fruit, variation in soils for different varieties of the same fruit, the proper fertilizers to use for the several fruits on a given soil, etc.

The following impressions are submitted: Fruit growing demands first-class drainage. Perhaps apples and plums are the most cosmopolitan of our staple fruits and flourish over a wider range of soils. Apples thrive best on sandy, gravelly and light clay loams; pears on clay loams; plums on sandy, gravelly and light clay loams (about the same as apples), peaches on rich sandy loams; grapes on clay loams; cherries on high, sharp, gritty, gravelly soils; blackberries and raspberries on sandy loams with a damp, but not wet sub-soil; currants on light clay or heavy gravel loams; strawberries on rich, soft, mellow sandy loams.

The adaptability of some fruits is limited to a very narrow area, due to soil, exposure, elevation, climate, atmospheric causes and the inherent special needs and peculiarities of the fruit itself.

MAPLEHURST FRUIT STATION.

By Linus Woolverton, Grimsby.

Cherries.

The season has been on the whole favorable. The early rains gave the trees vigor, and dry weather after the setting of the fruit prevented the spores of the cherry rot from developing, so that the fruit was bright and clean. Some seasons, such varieties as Napoleon and Tartarian must be picked on the green side to carry at all, and even then will show many moulded and rotted fruits if left standing over night. But this season our cherries could be picked in perfect maturity and shipped long distances in safety.

Spraying with lime and sulphur any time previous to the opening of the buds is becoming more and more practised every year in the Grimsby district. This is not for scale, for we have no scale, but as a preventive of rot, scab, aphis, and other evils. Our growers find this spray so useful that they cannot afford to omit it; some even claiming that where orchard and vineyard is thoroughly sprayed with the lime-sulphur spray in spring, it is unnecessary to use the Bordeaux afterwards. Of course, it was the fear of the San José Scale that led us to begin the use of this spray, but now we have ceased to fear it, for it is an effective preventive.

The time of ripening of the various kinds was much earlier than in 1906. Governor Woods began last year the beginning of July, whilst this year they began the 20th of June, and other varieties relatively early.

Prices have not ruled as high for cherries as in 1906, but have been satisfactory. The following is a record of prices according to dates, the fruit being sold in eleven quart baskets by the Manager of our Grimsby Co-operative Fruit Growers:

Prices of Cherries. June 22, white, 60c.; June 23, 54c.; June 26, 57½c.; June 29, 70c.; June 29, bla k, $1.00; June 30th, 75c.; July 1st, 74c. July 1st, white, 60c.; July 2nd, 80c.; July 2nd, black, 80c.; red, 67c. July 3rd, black, 87c.; July 6, $1.00; July 6, white, 66c.; red, 70c.; July 7, red, 73c.; black, 96c.; white, 74c.; July 8, white, 70c.; black, $1.05; Windsor black, $1.05; July 9, Windsor black, $1.11; red, 77c.; July 10, red, 82c.; Windsor, $1.21; July 13, black, $1.19; red, 79c.; July 14, red, 79c.; Windsor, $1.27; July 15, red, 83c.; July 16, red, 83c.; July 20, red, 97c.

The above are net prices to the grower. The baskets are the regular eleven quart; we have given up the half basket as doubling the package bill without any advantage in selling price.

The cost of picking cherries has been higher than usual for two years past, owing to scarcity of pickers. The usual average price paid in previous years was 15c a basket or by day work, if picking were bad; but last year many growers paid 25c. a basket for picking and this year 20c. was the ruling price.

Cultivation and pruning of the cherry are more and more practised, because where grown in sod the trees are less fruitful; indeed, the care and cultivation of the orchards has wonderfully improved during the past few years, and the orchards here about are showing signs of prosperity and attracting much attention from our many visitors. Fruit land is wonderfully increasing in value, especially in the peach and cherry districts.

Notes on Varieties.

Choisy: Duke; trees twelve years planted, showing signs of age, one tree dead; not very productive; a small crop of fruit, very sweet and delicious for eating; ¼ crop, season, June 24th to July 6th.

Cleveland: Heart; no crop, tree in grass; ripe June 20th.

Coe: Heart; very small crop.

Downer: Harvested, July 10th; small crop, not worth gathering for market, sweet and excellent for dessert; tree very vigorous, strong growing spreading habit; not recommended.

Dyehouse: Kentish Pie; very fine and tree very productive; picking just before Richmond.

Eagle: Heart; fairly productive this year, of beautiful large sweet black cherries, but went too soft at maturity for shipment; unprofitable; not recommended for even the home garden; gathered what were fit for shipping on July 6th; closely follows Tartarian.

Elton: Bigarreau; full crop of good fruit, without any sign of rot, which is unusual for this otherwise excellent dessert cherry; recommended for home garden.

Eugenie: Duke; trees twelve years old, showing signs of debility; about a half crop, free of rot, harvested June 24th.

Grenner Glas: Tree not very productive; no crop.

Griotte de nord: Tree strong grower, fruit ripe July 2nd; productive, but not equal to Richmond.

A well tilled orchard in the Niagara District.

Hortense: Duke; no crop; of other trees planted in 1896, one is dead; the finest and largest of the Dukes; very spreading and very strong; needs further trial on different soil and under other conditions.

Knight: Heart; tree the largest and most healthy in my experimental plot; about thirty feet high, and about fifty years planted; very productive; yield this season, 15 baskets or about 165 quarts, of very fine black cherries, which sold at about $1 a basket.

Koslov: I imported from Russia about ten years ago some fifty trees of this variety, and gave a part to the Central Experimental Farm. My trees have never grown more than five or six feet high, and I believe they could be grown profitably planted by the acre in rows about six feet apart, or about six or eight feet apart each way. Certainly their dwarfish habit would much facilitate spraying and harvesting. The fruit much resembles that of the English Morello.

Late Duke: Duke; a small crop of very fine cherries; excellent for sauce and pies. Plainly one must not depend on any one variety of cherries for profit. For two successive years these were the most productive of the Duke, but for two seasons now they have given a very small yield.

Magnifique: Duke; small crop; season about August 1st.

May Duke: Duke; trees healthy, usually productive, but this year no crop.

Mezel: No crop; has not sustained its reputation; I should now be inclined to rank it second class in market value as a variety.

Montmorency: Usually the finest and most productive of the Pie cherry class; this season the crop is only medium, and the trees do not show quite their usual thrift, perhaps owing to being planted too closely.

Morello: Trees beginning to recover from weakening effect of over production three years ago; a fair crop of nice marketable cherries.

Napoleon: Bigarreau; tree productive; gathered July 2nd; full crop; no rot; still a leading market variety.

Orel: Pie; ripe July 6th; fine load of fruit; much like Purity or Dyehouse; very hardy.

Olivet: Duke; tree not very productive; very moderate crop; fruit fine and large, dark red; gathered July 6th.

Purity: Pie; ripe 6th July, along with Dyehouse, probably identical with the latter.

Russian 207: Morello; still gives promise of being valuable (See preceding reports.)

Red May: Too unproductive.

Royal Duke: No crop.

Richmond: Pie; ripened early in July; trees not quite as vigorous as Montmorency; very full crop.

Spanish: The strongest grower of the Bigarreau class; usually subject to the cherry rot, but this season quite free; fruit very large and very attractive; ripe beginning of July.

Schmitz: Bigarreau; a beautiful large black cherry, and the tree is a wonderful grower, but though planted twelve years in my experimental plot, it has never yet borne more than a few scattered specimens. I therefore conclude that it is valueless as a commercial variety.

Strauss Weichsel: Pie; tree bearing a medium crop, fruit red, mild acid, not as large as Richmond, not worthy of a place in our orchards.

Tartarian: Heart; trees have made a fine vigorous growth; some trees in my experimental plot are about fifty years planted, and though now

beginning to fail, have this season yielded a fine crop of very fine marketable cherries without a sign of rot or curculio. Harvested July 30th.

Windsor: Bigarreau; trees very vigorous; I have topped them from 15 to 20 feet high, lest they grow out of reach of spray and picking basket; productive; fruit large, firm, dark, very saleable, shows the benefit of the lime sulphur spray; unfortunately this cherry has a tough skin when cooked.

Wood: Heart; old trees, fifty years planted, now failing; not so productive as formerly; fruit ripe about the 20th of June. The best early cherry for all purposes.

Classification of the Cherry.

There is so much confusion in nurserymen's catalogues of the varieties of cherries that some more careful classification is desirable. The best I have met with during the past ten years of my study of fruits, is that of Professor Bailey, of Cornell University, which is as follows:

Sour Cherry Class.

1. *Amarelles* (Kentish or Pie), this latter being a term used by Downing for these varieties; a type with pale red fruits, which are generally flattened at the ends, and an uncolored juice. Here belong the Montmorency, Richmond, etc.
2. *Morellos*, with very dark red fruits, which generally vary from spherical to heart shape, and a dark colored juice. This type includes the Morellos, Ostheim, Wragg, etc. (The word Morello is from the Italian, and means blackish, and evidently should not be applied to such varieties as Early Richmond.—L. W.)

Sweet Cherry Class.

1. *Mazzards*, as the seedlings used by nurserymen.
2. *Hearts;* such as Tartarian.
3. *Bigarreaus*, such as Yellow Spanish, etc.
4. *Dukes*, such as May Duke, etc.

REPORT OF SIMCOE FRUIT EXPERIMENT STATION.

By G. C. Caston, Craighurst.

There was no new stock planted this year here for experimental purposes. Fruit trees and small fruit came through the winter in fairly good condition. Strawberries were a fair crop and raspberries and blackberries much better than last year. There was a medium crop of cherries on the few sound trees that are left. Pears were only a light crop, and it is doubtful whether they will ever pay as a commercial orchard fruit here, although they are remarkably free from blight. But yet they do not bear here as they do in more favorable sections. Plums of the European class may be regarded as a failure here. I have tested about 40 varieties, and they have practically all failed, although I have had a few good crops from some of them, yet as soon as they reach bearing age they fail, and the only way to have a few good plums here would be to keep continually planting as they die off, and this would not pay.

Duchess apples were a full crop and of good size, and of very fine quality. The early and fall apples seem mostly all shipped to the west, and although the very warm weather prevailing during the harvesting of their varieties made the shipping somewhat risky, yet they landed in good condition. The shipping qualities of our northern apples are extra good.

My plantation of strawberries is now very small, as I was not satisfied with the varieties I was growing, and am continually testing new ones. I have also been raising some seedlings of my own, and some of these I thought very promising, yet on further trial did not come up to expectations. Out of a good many tested, there are none I think worthy of propagation. I have one of very superior quality as to flavor, but it is not productive.

Of the new varieties sent here last year, the most promising by far is the Three W's. This is a fine healthy vigorous plant, evidently productive, and the fruit is large and fine. If this variety on further trial comes up to expectation, it will be one of the leading commercial varieties. Next in order of merit are Senator Dunlap and Glen Mary. For the last few years Williams has been the best all-round berry.

Blackberries were a very good crop here, better than for some years past. The dry season previous prevented a rank growth of canes, so that they wintered well. This would be a great section for blackberries if the climate was just a few degrees milder in winter. In all other respects they thrive wonderfully. If we could get a variety as good as Eldorado and as hardy as Snyder, it would be a great acquisition here. I tried bending the canes down with poles, leaving the poles on top of them, and while it gave the necessary protection, the canes were badly broken. Blackberry canes would not stand the bending like the raspberry. The next best plan is to keep the canes headed low and trust to the deep snow to give the necessary protection.

I have tested a new variety sent out last year named the Mercereau. It fruited this year, and the fruit is very fine to look at, but so strongly acid as to put it out of the list as a dessert berry. How it would class for canning I do not know, but would require a lot of sugar, I fancy, to make it at all palatable. So far, I would not recommend it at all. If I could not grow a better flavored berry than that I would not grow blackberries at all.

The Agawam is the best all-round of the good varieties tested here so far, very tender and very subject to anthracnose. So I would place Agawam first.

Raspberries were very good this year, and the Cuthberts did not suffer from winter injury as much as usual. This was no doubt owing largely to the severe drouth in 1907, which prevented the usual rank late growth of canes.

The Herbert raspberry, about which good claims are made as to hardiness, productiveness, quality, etc., I have applied for several times, and last year plants were ordered by the secretary to be sent to each of the stations, but none of them came here. However, I obtained 50 plants myself on my own account, and these fruited this year. The canes seem to be quite hardy. It is productive, the fruit is large, larger than the Cuthbert, but when they say it is of better quality they are wrong. In my opinion it will be many days before a better all-round berry than the Cuthbert is produced. It is just a little too tender for our northern winters, that's all.

But I am well pleased with Herbert. It will fill a long felt want on account of the hardiness, combined with good appearance, size and productiveness. I have one from Michigan, the Eaton. It is productive; the canes are short like Marlboro, and seems quite hardy. The fruit is rather

acid in taste. It will never figure as a dessert berry, but it is the largest berry in cultivation, probably. At least I have never seen any approaching it in size. The wild raspberries grow in such abundance that there is little local demand for cultivated ones; but they can be shipped at satisfactory prices to the large cities and towns.

There was sent to this station in the spring of 1907, several varieties of currants—Victoria, Naples, Champion, Fays, Cherry, Wilder, Versailles and White Grape. These were so carelessly packed that they arrived with the roots so dry that only a few of them lived. However, these varieties had all been grown before, and I may say that all of them can be grown well here. However, there was formerly no local demand for these fruits, but now they can be grown and shipped at a profit, owing to the higher prices prevailing the last few years. Anyone desiring to grow this class of fruit can grow any of them well by giving the proper care and cultivation. I would prefer for Red—Fays, Cherry, and Versailles; for White—the White Grape, and for Black—Naples, Victoria, and Saunders.

I have a few new varieties—Boskoop Giant, a new black currant, but it requires further trial. I fancy it will be no improvement on some of the older varieties.

Cherries.

I am very much disappointed with the results with cherries. I am now satisfied they will never be profitable as a commercial crop here, although there is a greater demand for them locally than for any other fruit. If the section of land planted to cherries had been planted instead with some good commercial variety of apple, I would be hundreds of dollars in pocket. Instead of a thrifty block of cherries, I have a lot of unsightly gaps, with here and there a few survivors. The gaps I am filling up with apples. Among the survivors which bore a crop this year are Russion 207, Orel 24, Bessarabian, Litham, Ostheim and Montmorency. A row of young Montmorency has fruited for the first time this year. The crop was fine, considering the age of the trees, but already several gaps are seen in the row. I would place Orel as the best of the dark colored varieties for this section, and Russian 207, Bessarabian and Montmorency as the best of the reds. But as regards cherries and plums, we may as well acknowledge that they can never be grown profitably in the northern parts of the Province very far inland from the great lakes, and the sooner we regard that as an established fact the better.

Out of a number of pears tested here, the Flemish Beauty and Clapp's have proved the hardiest and most thrifty. Flemish Beauty, however, is of little use unless thoroughly sprayed. It will bear well, but scabs badly. Clapp's, on the other hand, is remarkably clean in foliage and fruit, and all varieties tested so far have been very little troubled with blight. Bartlett does fairly top worked on Flemish Beauty stock. The Sudduth pear from Wisconsin thrives and bears well here, but is very small and of poor quality. Bosc, Wilder, Dempsey, Gifford, Idaho, Duchess, Clairgeau, Sheldon, Lawrence and a number of French pears have been tried here and cannot be recommended. I do not think it would be advisable for any one to plant a commercial orchard of pears in this locality, and any one wishing to grow a few for home use should plant Flemish Beauty, providing they will spray it well. And I might say right here that if there is any better pear in fruit or quality than the Flemish Beauty, when clean and well grown, I have never yet seen it. The list might include a few trees of Clapp's, Bartlett and Anjou.

Apples.

If there is any one thing I would like to impress more than another upon the people of the Simcoe district, it is the importance of top working Northern Spy and others of the best commercial varieties on hardy stock. And of these the Spy should have first place. For so far as the home market is concerned, the Spy is, and I believe always will be, the leading winter apple of Ontario. By the home market is meant, of course, our own Dominion, and especially the northern districts and the great Northwest; and the conditions usually governing the sale of car lots of winter apples for this great market, are that they shall consist of from 25 to 40 per cent. of Northern Spys. Everybody who wants winter apples want Spy, and we have not nearly enough of them in this district. I would say to intending planters, make your orchard ninety per cent. Spy, and do it by top working them on hardy stock—Tolman Sweet, Wolf River and such hardy kinds. I have some fine Spy tops worked on Yellow Transparent, and on some of the Russian varieties; but probably there is nothing better than Tolman Sweet for this purpose. I have not failed to notice that Spys from the Lake Erie district at the fruit show in November are, while richer in color and attractive looking, quite ripe and mellow in November, while ours, though not so rich in color will be found as crisp and firm and sound in March as when picked from the tree. Shipping and keeping qualities are bound to tell in the apple trade, and so I would earnestly advise our people to grow more Spys. It will do better here top grafted than King, Baldwin or Greening, and as it is always in demand, why not grow it?

While the Baldwin, King, and Greening can be grown here by top grafting, it would not be advisable to grow these so extensively as the Spy for the reasons already mentioned. However, if we are growing apples for export trade, we would require to have some Baldwin and King. But I believe our northwest trade will be the best one to look to in the future, and for that trade we require to have some good varieties of early and fall apples, and our section cannot be excelled in these. Then, for winter sorts, we require a good proportion of Snows and Baxter. These two go together, and may be called early winter sorts, good until January. After these we have Stark, Pewaukee, Canada Red, Seek, and Spy. These would make a good selection for a car lot of winter varieties, all of them late keepers, and eliminates Baldwin, King, and Greening. These last are rather tender and uncertain. I am doubtful if King will ever pay; although sure of a good price, it is such a poor bearer. Baldwin will bear well, but is so tender even when top-worked, that it is uncertain. Greening does fairly well here top-worked, and being a first-class winter cooking variety perhaps should not be left out, although inclined to be a little tender.

We had a splendid lot of fall apples in this section, and although nobody sprays their orchards, the fruit was fine and clean. The principal varieties were St. Lawrence, Colvert, Wealthy, Alexander, and Wolf River. Then there was a good crop of Snows of very fine quality, also a fair crop of Baxters, and these two were fine, clean and bright.

Snow. In my report last year I suggested the growing of Shiawassee Beauty instead of Snow, owing to the liability of the latter to scab. But after the experience of this year, I would hardly recommend that now. But if our people could be persuaded to prune and spray their Snows we could have them as prolific and of as fine quality as in the St. Lawrence Valley or anywhere else. The Snow is so well known and so universally appreciated as a dessert apple, that it is not likely to be supplanted by any other of its sea-

son, so long as it can be grown as fine as it was this year, and this can be done by proper attention to careful pruning, spraying and cultivation. It is quite hardy here, and I would advise intending planters to keep a fair proportion of Snows in their orchards, and, if well cared for, they will never go begging for a market.

One has to be very careful about recommending any new varieties of fruit until their qualities are thoroughly established by extended trial. The Boiken apple, that I had a good opinion of a few years ago is likely to be a very profitable winter apple on account of its very early and regular bearing. The apple had no decided flavor or quality, yet it was attractive looking and

Wolf River Apple in Bearing on the Farm of G. C. Caston, Craighurst.

a long keeper, but has turned out like most of the plum trees, bore a few crops and then collapsed. I cannot recommend it for the section at all.

Canada Baldwin. This is a promising variety, medium size, but bright red color, attractive, much better flavored than the old Baldwin. Tree a thrifty upright grower, sound and healthy so far. I think this apple will be an acquisition.

Baxter may be regarded as a standard here, comes in nicely with the Snow and shipped at the same time. A large attractive apple of good cooking quality; sells well everywhere.

Bismarck, fruited for the first time this year. Fruit large red, resembles somewhat Alexander. No dessert quality, coarse in texture, season late fall. The tree bears heavily while quite young, which is about its only advantage over other sorts of the same season.

Gano. Decidedly not recommended. I planted part of a new orchard with Gano three years ago. I would not do it again, and would advise intending planters here to have nothing to do with either Gano or Ben Davis. They are both tender and short lived in this section, and you should grow something of better quality.

McIntosh. Do not let any one be persuaded to plant this in preference to the Snow in this section, as it would be a great mistake. You need to keep a spray pump under the tree to keep it clean, and it bears so irregularly and withal so poorly. Far better plant Snow. McIntosh has been overestimated.

Stark. This variety continues to do well here, and may be regarded as one of the standard winter apples for this section. It does not need to be top-worked, as it is quite hardy.

Seek no Further. This is an excellent long-keeping winter apple, and ought to be more extensively planted; it seems to be quite hardy here.

Peerless. Some nurserymen are advertising this apple as a winter variety. It is nothing of the kind. Although in ordinary seasons it keeps well until November, yet it is a September apple, ready to pick and pack very soon after Duchess. This clean-skinned, bright, attractive apple, unequalled as a cooker, should work in well for the Northwest trade coming next after Duchess. The tree is hardy, not a fast grower but a regular bearer.

Ontario. Has failed as a tree. Doing fairly well top-worked, but I am somewhat disappointed in it, and do not recommend it any more.

Blenheim Pippin. This apple thrives well here. Seems to be quite hardy, but does not bear regularly. Bears well, however, in alternate years. Worthy of a place on list of fall apples.

Ribston Pippin. This apple produces the greatest amount of bloom and fewest apples of any variety I know. Practically useless here.

St. Lawrence. Any one who will spray thoroughly will find this old variety a profitable apple to grow. It has excelled itself this year. A splendid crop of clean, bright apples everywhere throughout the section. No one need be afraid to include a few trees of this variety in their list of fall apples.

Insects and Fungi.

The worst insect pests of late years are codling moth and oyster shell bark louse. Nothing is being done to check these pests and orchard and fruit suffer. I purpose using this lime sulphur wash for spraying with next year, as from what I can learn it is quite effective against the bark louse and one of the best fungicides as well. The principal fungous disease is apple scab, though some orchards of late years have been affected with twig blight, which seems worse in some seasons than others. There is also some canker in orchards too close planted.

Cultivation. I left my oldest orchard in sod for two years, and would not do it again. Orchards in this section where we are subject to such severe drouth as we had last year, should be continuously cultivated. They need all the moisture they can get and more during summer. A cover crop is not of much importance here as snow comes early and usually lies deep until spring.

LAKE HURON FRUIT STATION.

By A. E. Sherrington, Walkerton.

I have the pleasure to present herewith for your consideration my report of Fruit Experiment Station for 1908:

The Season.

The winter of 1907-8 was quite mild, with a good blanket of snow in this district; hence all plants came through in fine condition. The spring was somewhat backward and cold, but there was plenty of rain. When warm weather did set in, May 1st, growth was very rapid. The rainfall was quite heavy during the early part of the season, and up to August 19th; from that date no rain fell until September 28th. From April 1st to November 1st we had 16.6 inches of rainfall. The last killing frost occurred on April 30th, and the first killing frost was October 3rd. The highest temperatures were on June 22nd, 90 degrees in the shade, and on August 29th, 92 degrees in the shade. The lowest temperature during this time was on the 16th of April, 11 degrees of frost, and the lowest temperature up to December 25th was 13 degrees above zero. So on the whole the season has been a fairly favorable one for the fruit grower, with the exception of the hot dry spell during the latter part of September and October, which destroyed the keeping qualities of the apple.

No new work was taken up at the station this season, probably owing to the change in the management of the stations and the pressure of work at the new Experimental Station at Jordan Harbor. Sixteen varieties of Dr. Saunders' Hybrid currants were added to the collection. They were furnished by the kindness of Mr. Macoun, of the Dominion Experimental Farm, Ottawa. No other planting was done except a few apples, pears, plums, and cherries, and they were mostly where trees were damaged by frost, blight or were undesirable varieties. These were to replace others. Quite a number will be removed next spring and replaced by other sorts. This has been done at my own expense. Considerable top-grafting has been done with good results, but others were rather disappointing. The Keiffer pear as a stock for top-working other varieties on has not been as satisfactory as I expected, but further experiments are needed along this line before definite information can be given.

Owing to the increased interest being taken in the fruit industry, the volume of correspondence has been greater this season than ever before. Inquiries have been received regarding methods of cultivation, spraying insects, varieties and where to obtain them. These inquiries are not only from various parts of Canada, but from many parts of the United States. This is one part of the experimental work that is far reaching, and speaks well for the industry.

Insects.

Codling Moth, the most destructive insect that the fruit grower has to contend with, was not any more prevalent than other seasons. Where orchards are properly cultivated and sprayed, this insect can be controlled and nearly eradicated in a few years, if growers and farmers will co-operate and practice clean cultivation, removing all brush, grass, old fences, rough bark from the trees and rubbish around the orchard and spray thoroughly at the right time.

May Beetle. This insect is becoming quite a serious pest in this district. The larva of the insect is causing considerable damage, not only to the strawberry crops, but the potatoes as well. The mature beetle was especially numerous this season.

Tent Caterpillars, Tussock moth and all other insects are well under control in the district.

Fungi.

The apple scab or black spot was not so bad during the past season as some seasons previous. The pear or fire blight was very destructive, both to pears and a number of apples. The varieties of apples that appear to be subject to the blight are, Fameuse, Alexander, St. Lawrence, Colvert, and a number of the new varieties. It appeared to attack those in bloom much more so than the trees not in bloom. If this disease continues the pear industry will be wiped out in Ontario.

Very little rot or black knot was found on the plums or cherries at the station, but the plums and cherries throughout the district will soon all be destroyed by the black knot. We find very little trouble in controlling the knot. Both the plums and the cherries are treated alike. They are both sprayed before growth starts in the spring with either 2 lbs. of copper sulphate to 50 gallons or one barrel of water, or 20 lbs. of copper sulphate (Bluestone) 60 lbs. fresh lime to 200 gallons of water. Then before the bloom opens they are sprayed again with the Bordeaux mixture, and the third spraying is done when the cherries are about the size of peas, or just after they are out of the calyx, and if any knot is found on the trees during the growing season it is cut out and burnt.

Strawberries.

About two acres of strawberries are grown at the station as a commercial plantation. The varieties grown are about half Williams and Brandywine. Brandywine has been about the best berry here. It is a strong vigorous grower and healthy, and makes a good row; fruit large and of the finest quality. A heavy yielder. Williams is also a strong vigorous plant, heavy cropper, fruit large, quality good for canning; first-class shipping berry. The one fault is its green tip. A large number of varieties have been grown and tested here, but all discarded, but the two named appear to be the two best commercial varieties. But growers must understand that there is no fruit that varies so much and acts so differently on different soils as the strawberry. Brandywine does not do so well on light sandy soils as on clay or clay loamy soils, and on the other hand, the Williams does splendidly on light or loamy soils. Every grower must consider his location and nature of the soil.

Raspberries.

The raspberry crop last season was good and the demand was equal to the supply. Only three varieties of the raspberries are grown at the station now, all other varieties being discarded as not worthy of cultivation. The varieties grown are Marlboro. Herbert, Cuthbert, given in order of ripening. Herbert is still keeping up its reputation for the heaviest yielder, and the Cuthbert still maintains its place as first in quality. Marlboro is a good early berry, and has a place in the commercial plantation. Those are three

A 10-acre strawberry field ready for the pickers.

excellent varieties for either home or distant markets. Two varieties of black caps are grown, Conrath and Hilborn. Conrath is a strong vigorous grower, fruit large, quality good, early. Hilborn is a very hardy vigorous and healthy fruit, large, quality good, late, the best for northern districts.

A new plantation was put out last spring. The rows run north and south and are 40 rods long and six feet apart. They are grown like a hedge, the rows about two feet wide. By this plan we are able to get the best yield and a high grade of fruit. Stable manure is used as a fertilizer. The fruit is picked every other day and is marketed when fresh. Pruning is usually done in the spring by cutting out the old canes and thinning out the new one if too thick, and cutting back all canes to good strong buds. The young canes of the black caps are pinched back when about two feet high, and all laterals cut back in the spring to about 18 to 24 inches. Frequent and shallow cultivation is practised. This is necessary to maintain the soil moisture which is so necessary in the growing of small or bush fruits.

Currants.

The currant crop at the station was first-class this season. Nearly all varieties did well. There are about 30 or 35 varieties grown. Sixteen varieties of Dr. Saunders were furnished me last spring by Mr. Macoun, of the Dominion Experimental Farm, Ottawa. The currants are grown in the young apple orchard between the rows of trees. Plenty of stable manure is used to fertilize the currants and apple trees. Shallow and frequent cultivation is carried on throughout the growing season. The pruning is done by removing a number of the old canes, leaving as many of the strong young canes to take their place each year, thinning out all weak canes, and if growth is very vigorous some heading back will be found to pay. The varieties that are giving best results are:—Red Cross, bush vigorous and hardy, fruit large to very large, color red, quality first-class. Fays, bush strong and spreading, fruit large, quality good, red. Prince Albert, bush strong and vigorous, healthy and hardy, fruit large with good quality, red, a good late variety. Wilder and Perfection are also doing well. Raby-Castle is a heavy cropper, but the berry is small. There is not much demand for white currants. Grape and Imperial are the best varieties. Among the blacks Champion is one of the best, bush strong, vigorous, healthy and hardy, fruit large and of good quality. A heavy yielder. Naples an old standard variety, strong vigorous grower, healthy and hardy, fruit large and good quality. A number of other varieties have done very well, but the two mentioned are the best. Currants are not used in this country as much as they deserve. They are one of our best fruits.

Gooseberries.

There are nine varieties of gooseberries under test at the station, Champion, Crown Bob, Downing, Golden Prolific, Industry, Pearl, Red Jacket, Keepsake, Whitesmith. The American varieties have given the best results, owing chiefly to them being free from mildew; Pearl and Downing are the two best varieties, and there is scarcely any difference between them. Pearl carries a little more foliage than Downing, which is an advantage, as it protects the fruit from the hot sun, and in that way prevents the fruit from scalding. The crop this season was equal to last year with good quality. Pearl and Downing are about equal in every way. Red Jacket is also a good berry, but the bush is rather spreading, and inclined to lay on the ground. The English varieties are so subject to the mildew that they have not been

very profitable, but if the lime sulphur mixture will prevent the mildew as it is claimed to do, we will be able to grow the English varieties again. This remedy will be tested next season. Gooseberries delight in a cool, moist soil. Clay loam gives good results, well fertilized with stable manure. The bush should be kept thinned out by cutting out the old wood, and allowing new wood to take its place, and just before blooming, spray with Bordeaux with four ounces of Paris green to the barrel. This will destroy the currant or gooseberry worm, also keep the bush healthy. The fruit should be picked when fully grown, but not ripe, unless they are for home use. The average yield of the plantation for a number of years has been about five quarts per bush. Cultivation should be frequent, but shallow, so as to retain the soil moisture. This is very necessary in the growing of gooseberries and all fruits. If a few bushes are grown in the garden, a heavy mulch around the bushes will answer the purpose very well.

Cherries.

The cherry crop at the station was good this season, and the quality was first-class and sold for fair prices. The number of varieties has been greatly reduced the last two or three years, owing chiefly to the varieties being tender or undesirable sorts. These have been replaced by other varieties. The Yellow Spanish gave a very heavy yield of fine fruit and good quality this season, but could not recommend it for general planting as it is not reliable. Early Richmond was well loaded, but the birds usually take the bulk of the crop. Montmorency, the best of the Morello class, gave large yields of good quality. The tree is hardy and vigorous. English Morello has also been a profitable variety and annual bearer, a little slow in making a good orchard tree and I am afraid will not prove to be a long-lived tree. Fruit large, dark red, or nearly black when fully ripe; a good cooking cherry. Ostheim, of the Morello class, tree hardy, fruit rather small, color black, sweet, quality good, not profitable. Empress Eugene, Duke class, tree hardy, but a shy bearer, not profitable. Downers' Late, tree hardy, fruit small, red, sweet, not profitable. Of the twenty-five varieties tested here, the following three varieties are the best for the commercial orchard, Early Richmond, Montmorency, English Morello, given in order of ripening, and Montmorency is the best of the three. One hundred trees of this variety will be planted at the station next spring. The cherry orchard is given frequent and shallow cultivation throughout the growing season. For controlling the rot and black-knot on the cherries, the trees are sprayed before the buds swell in the spring with either 60 lbs. of fresh lime, 20 lbs. of copper sulphate (bluestone) to 200 gallons of water or 2 lbs. of copper sulphate to 50 gallons or one barrel of water. Just before the buds are open spray with the Bordeaux mixture and again when the cherries are about the size of peas.

Plums.

In plums we have about 45 named varieties, and 20 seedlings just coming into bearing. Quite a number of trees and varieties were damaged by frost during the cold winters a few years ago. These trees and the undesirable sorts are being replaced by either new or the same varieties. The crop this season was fine, quality good, very little rot. The Japanese varieties have all failed but the Burbank, and it is the only one of this class of plums that I would plant. It is a good cropper, fruit medium to large, quality very good for canning, and a good shipper. Among the European varieties that have done best here are Bradshaw, Purple Egg, Yellow Egg,

Imperial Gage, Field, Shipper's Pride, Gueii, Quackenbos, Monarch, Grand Duke, Lombard, Englebert, Pond's Seedling, and many other varieties have proved to be quite satisfactory. For controlling the black-knot and rot the plums are sprayed at the same time and with same mixture as the cherries. There are quite a number of varieties recently planted that have not come into bearing yet.

Pears.

There were about thirty-five varieties of pears planted at the station for experimental purposes, with a number of Keiffers for top-working other varieties on, to discover if some of the slow poor growers but good varieties could be improved in this way. None of this work has been so disappointing and discouraging as the pears. The eleven varieties of French pear planted in 1900 have been very subject to the pear or fire blight, and this season it was extremely bad, in fact, it has entirely wiped out the French varieties. Nearly all varieties have suffered more or less with the blight this season. Over thirty trees will have to be replaced this next spring. Unless some remedy can be discovered for this disease pear growing will have to be abandoned. The Keiffer stock has not proved to be a great success for working other sorts on as expected. They grow for about two years then the stalk dies. I cannot give any reason why, but more experiments will be conducted along this and other lines, both in grafting and the management of the soil.

Apples.

The apple crop this year was not large. The old orchard at the station did very well considering the yield for the past five or six years. There are only about 225 trees in the orchard, and about half are Golden Russets. The pick in 1906 was about 800 barrels: in 1907, 500 barrels, and this season a little better than 300 barrels. At blooming time the promise was for a bumper crop. I never saw a better bloom, but for some reason the fruit did not set, although the weather conditions seemed to be favorable for fertilization at the time. The early apples were a fair crop, and the quality of early and late apples was very good, but weather conditions at time of ripening was not favorable for imparting keeping qualities to the fruit. In the experimental orchard there were about thirty varieties, but there was very little fruit this season. There are quite a number of varieties that have not fruited yet, but so far, there is nothing equal to our old standard sorts. Some of the undesirable varieties are being top-grafted over to new or better sorts. I also find a number of trees not true to name, but Canada Baldwin, which promised to be of some value is showing weakness; also Wine Sap. The Yellow Transparent is of no value except for home use or nearby market. Bismark at one time gave promise of being a commercial apple, but after a few years test it has proved to be of little value. Tree very subject to twig blight. What we want is an apple equal to the Spy in quality, but a better shipper, and a tree that will come into bearing at an earlier date. This is work for the experiment stations. There is a greater demand for the Spy now than ever before. In fact, the supply is nowhere near the demand. The apple is the king of fruits; therefore, more attention should be paid to the improvement and cultivation of the apple than other fruits. About sixty-five varieties of apples are now grown at this station.

ST. LAWRENCE FRUIT STATION.

By Harold Jones, Maitland.

Character of the Season.

The winter of 1907-8 was much colder than the one preceeding, with a great depth of snow, but no frost in the ground. The first snowfall to remain on the ground fell on November 29, stopping plowing at that date. The snow increased in depth steadily until it reached a total of over 3 feet by February 9th. The coldest week of the season, February 3-9, was much below normal, the thermometer dropping to 36 below on February 5th.

April was cool with some heavy showers, fruit buds remaining dormant.

May was favorable, which advanced vegetation. Americana plums were in bloom May 20th. Fameuse apples in full bloom May 26th. Apple trees came through without injury except to some tender varieties. Cherries suffered to same extent, but gave a fair crop. Americana plums were uninjured, but Europeans suffered. Strawberries wintered well and gave a good yield.

Insects.

Insects were not numerous, and were easily kept under control by proper spraying. There was not two per cent. of codling moth in well sprayed orchards, although they did damage where not sprayed. Spot fungi was kept well under control by three sprayings, but in many unsprayed orchards both fruit and foliage were badly affected.

Sprayed orchards gave as high as 95 to 98 per cent. clean fruit, while unsprayed orchards gave as little as 20 per cent. clean fruit.

Cultivation.

Actual results have proved that it pays to cultivate our orchards, but the heavy losses we sustained about four years ago, brought the problem that confronts us: in how far dare we go in this matter of cultivation and save our trees from winter injury in the colder sections of Ontario. For years we have been told by successful fruit growers living in Western Ontario and New York State to give clean cultivation up to the first of August and then sow a cover crop, but we have found out by sad experience that such a practice leaves our trees in a quite sappy condition when winter sets in.

Since the freeze of 1903 it has made some of us think seriously of this matter of cultivation.

A few of the things noticed in the spring of 1904 were:—

1st. That young orchards not in bearing came through the winter in fair condition.

2nd. That trees heavily loaded the previous year suffered most.

3rd. That orchards in sod came through the winter better than those under cultivation.

4th. That trees in sod did not bear as heavily nor had as large fruit as those under cultivation.

5th. That young trees planted in sod do not flourish, but remain stunted and sickly, which leaves them subject to disease and the ravages of insects, particularly bark lice.

These observations lead us up to the question how to best treat our orchards so as to overcome the objectionable features of a tough sod and still have our trees with well ripened wood when winter sets in.

Since 1904 I have been preaching a modified system of cultivation in my bearing orchards that is giving very satisfactory results in well ripened wood and well colored fruit of large size.

To outline this system, I may say that instead of continuing clean cultivation until the middle of July or the first of August, as formerly, I plough as early in the spring as possible, and about the 20th or 25th of May I harrow the ground level and sow to some cover crop either red clover or oats, as I find the fertility and the condition of the soil warrants. This leaves the ground in a level condition for the mower which is used at intervals during the summer to check any weeds or tufts of grass that are bound to appear during the season. The last cutting is made just before picking. If oats are clipped during the summer in this way they will remain quite green until fall.

I find this system gives me an early, vigorous growth both in the wood and fruit buds, and the cover crop sown in this way does not draw any appreciable amount of water from the soil until the later half of the summer.

When cutting, allow the material to lie where it falls as it all aids in supplying humus for the year following and retards evaporation by wind and sun during hot, dry periods. We have got a much shorter growing and ripening season than our neighbors to the west of us and I find the system outlined above will give the early vigorous growth that is necessary, followed by conditions very similar to sod during the ripening season.

Fertilizing and barn yard manure every two or three years spread at the rate of 10 to 12 loads to the acre during the late fall or winter with an annual spring application of about 100 pounds muriate of potash keeps the soil up to a high standard of fertility and also in a good mechanical condition.

Six years ago I started a young orchard with the object in view of keeping the trees in a healthy, vigorous condition and at the same time harvest a crop from the land waiting for the trees to come into bearing. The year I planted the trees I prepared the land thoroughly, manuring with 12 cart loads to the acre and 2,000 pounds of muriate of potash; I then planted to potatoes, which I did not dig until all danger of starting late growth in the trees had passed. That fall I spread manure around the trees at the rate of one load to 10 trees for a cover crop. The next spring I plowed and planted corn which was cultivated until July 4th, when clover was sown in the corn, and then given a shallow cultivation. The third year I cut and harvested a full crop of clover about July 1st, and allowed the second growth to remain on the land, which gave a heavy cover. The fourth spring I plowed down the clover, planted to potatoes, and followed the same rotation to the sixth year. I find this system has given me six profitable crops and has left the trees in a vigorous, healthy condition, with fruit buds showing for next year.

The results of this experiment should be of value to the dairyman of Eastern Ontario, who realize the value of fruit on the farm, but hesitate in planting because they feel they cannot give up perhaps one of their best fields and wait 8 or 10 years for returns in fruit, with no profit or returns from the land in the meantime.

Apples.

My notes on varieties published in the reports 1904 to 1907 are in the main correct, but there will be some slight changes made in this report owing to a better acquaintance with some varieties and the greater age of the trees.

American Pippin: Top-graft, 1898, a moderate grower, subject to attacks by aphis on the foliage, an early, prolific bearer of fruit of no special value to this section.

Blunt: Planted in 1897, replanted in 1907, is a sound, compact, vigorous tree; hardy; this year the tree showed signs of weakness, and will probably die before it shows its bearing qualities.

Clayton: Planted 1897, a weak to moderate grower, came into full leaf and bloom in the spring and died of twig blight. The blight attacked the blossom first, and then spread through the trees, similar to pear blight.

Canada Baldwin: Planted 1896, a very tall, upright tree, vigorous and prolific. The fruit is attractive in appearance, but low in quality.

Milwaukee Apple in Bearing on Farm of Harold Jones, Maitland.

Gano: Planted in 1900; tree and fruit similar to Ben Davis; an early bearer, but showing signs of early decay. Evidently not hardy enough for this section.

Parling Beauty: Planted 1898; an upright, vigorous, healthy tree; fruit large and well colored; quality medium, may be of some value.

Trenton: Top grafted 1902; bore a few specimens for the first this year. May prove of value in this section as an early apple, as the wood seems hardy, and the tree vigorous and healthy.

Windsor Chief: Lacks vigor and productiveness and does not prove to be hardy here, as it has suffered to same extent every winter, but has not been killed out.

Winter St. Lawrence: Planted 1896, came into bearing 1907, and has given two light crops. Tree healthy, vigorous and apparently very hardy; fruit of good size and attractive color, showing up well in the packages. If its bearing qualities improve it should be a desirable apple; season December.

Milwaukee: On root graft, planted in 1896, has been giving annual crops since 1900 and proving a profitable tree to plant when there is a market for a cooking apple.

I have now Milwaukee fruiting as top-grafts on McMahon, Hibernal, Gideon, Longfield and Pewaukee. McMahon and Hibernal are proving very desirable stocks, the Milwaukee tops being strong, vigorous and healthy, producing full grown fruit. On *Gideon* the top is out-growing the stock and the fruit is undersized and inclined to overbear and shows some weakness in foliage.

On Longfield the results are not so satisfactory; the tops made vigorous growth for a few years, but this year there is a lack of vigor, and one tree died outright.

On Pewaukee the results are fairly good, but not equal to McMahon or Hibernal.

Pears.

Of the 40 varieties of pears planted at intervals since 1896, they are practically all dead except Flemish, Bessimianka, Victoria, and Ritson. Flemish does fairly well in sod and gives a light crop annually, but under high cultivation, it suffers in twig and bud every year and dies at an early age. Bessimianka and Victoria are worthless Russian varieties. Ritson is fairly hardy in wood, but not as hardy as Flemish in fruit bud.

Plums.

All the European plums are dead except Glass Seedling, Raynes, Mount Royal, and Lunn. Glass Seedling was planted 1897 and gave a few fruits this season for the first. The tree is healthy and vigorous, but first buds are evidently tender. Raynes and Mount Royal are perfectly hardy so far, and are just coming into bearing. Lunn is only one year planted.

The Americana plums planted in 1896 to 1898 were not true to name and proved in some cases to be wild thorns. I have planted this year 28 trees, one or two of a variety, which are all doing well, and possibly something will result from this planting that will prove valuable for this section.

Varieties planted in 1908: 4 Aitkin, 2 Odegard, 2 Golden Queen, 2 Bixby, 2 Cheney, 2 Mankato, 1 Swift, 2 Admiral Schley, 2 Smith, 2 Hawkeye, 2 Howard's Yellow, 2 Ocheda, 3 Lunn.

Cherries.

The cherry crop was fair, much better than was expected following the low temperature of the preceeding winter.

Orel produced about two-thirds of a crop, but the fruit was not quite up to its usual size, and not so good in quality as in preceeding years.

Montmorency gave one-half a crop, normal in size and quality. This cherry seems the best of any fruiting yet, but is not quite as hardy as Orel and E. Morello.

English Morello gave two-thirds crop, size and quality, a little below normal.

Early Richmond did not fruit with me this year.

Ostheim, a hardy, vigorous tree, but a very shy bearer. It sets an abundance of buds, but they are mostly injured during winter. Fruit too small to be of any value where Montmorency and English Morello will grow.

Vladimir, a worthless variety, but hardy.

Dyehouse, Gorwood, May Duke, Black Knight, Olivet, Reine Hortense, all varieties tender here, and die the second or third year from planting.

Strawberries.

My strawberry tests have been conducted on a loam soil, inclined to clay loam. The results obtained so far show Wm. Belt, Williams, Woolverton, Climax, Saunders and Miller to be very desirable varieties that can be planted with profit here.

Wm. Belt and Climax both catch the market on sight and they give good crops.

Gooseberries.

Golden Prolific produces a heavy crop of extra large fruit of good quality and is the best variety tested yet.

Downing stands second to Golden Prolific, a good old standard. Both varieties are free from mildew and are sure fruiters. The best varieties tested yet.

Raspberries.

I have tested six varieties of raspberries, and I have not found any of them except Herbert hardy enough to withstand the winters here without some protection. Herbert has proved perfectly hardy so far and gives every promise of being a variety that can be planted with profit here.

Fruit Growers' Homes:
A Model Cement Residence in the Leamington District.

REPORT OF ALGOMA FRUIT EXPERIMENT STATION, 1908.

By Chas. Young, Richard's Landing.

In submitting my report for 1908, I have little to report regarding the work here, as my attention has been largely directed in planting well known hardy winter varieties such as Hibernal and hybrids with a view to top-grafting in the coming spring of 1909. Notwithstanding the unfavorable spring, succeeded by a very dry summer, these have all done well, and here I may note that about half of them planted in similar ground, but heavily mulched with long strawy manure, have made a much better growth than those on bare ground given clean cultivation with a dust mulch during the summer. This may be acounted for by the exceeding dryness of the season. I would not like to recommend this practice of keeping the ground covered around the trees longer than the first or second year after planting with manure. I find it induces a long, sappy growth of top not matured. When winter sets in it has a tendency in keeping the roots too near the surface of the ground, which is not advisable if clean cultivation is to be kept up or if a very dry season like the past should occur.

All the fruit trees have ripened well, and have gone into the winter in good condition. Some which bore heavily in 1907 have shown signs of weakness, and oyster-shell bark louse is on the increase very noticeably. This I can see wants particularly to be attended to in the near future. Next to sunscald, it is the principal difficulty to be attended to. Scab, we are not much troubled with; curculio or codling worm is scarcely in evidence; but the bark louse is everywhere and on the increase. As spraying machines are not much used here yet, it is rather a difficult matter to get at the louse if left for a few years, and it gets up into the fine branches. But it has to be done, as it is a matter of killing the louse or the louse killing the trees.

I have had little experience in whitewash treatment, but believe it is good in the summer. I have found nothing cheaper or more effectual than good, strong tobacco water sprayed on early in the season when they make their first appearance about the beginning of June. The black aphis which attacks the cherry I find harder to kill.

A word of caution to those who may chance to come across a cure for the apple aphis as given in an agricultural paper by an expert. It reads: "A very fine spray on a bright, sunny day with pure coal oil." Well, this will certainly kill the aphis, but it may kill the tree too. With a little care sunscald is now easily controlled or prevented. Here in the north it is necessary to protect the trunk and lower portion of the top before winter. The best prevention I have found to be building paper, not tar-paper, wound around the trunk and the lower part of the top, secured by tying with a cord. After the tree gets its rough bark, there is little danger from sunscald. A good thick coat of whitewash in the fall is nearly as effective and easily put on.

These are the two principal difficulties we have to contend with and the remedy for both is simple and sure, and yet we find that in nine cases out of ten it is neglected. It is not hard to find a reason. Most of us in our young days came from Old Ontario when Kings and Spys were our best apples. So we planted them here. They all died. We planted again, but in the meantime had learned something, so did not confine ourselves to those two

winter varieties, but mixed them up with Transparent, Duchess, Wealthy, and a very liberal sprinkling of crabs. We did not take very good care of them, as the little orchard was near the house and served another purpose. It was handy to pen the young calves in, fruit growing being only a side line, anyway.

We saved a few of the second planting, mostly Duchess and crabs. About this time, the tree agent put in his appearance with his high class novelty. Mostly everyone bought and planted a few, but there was nothing big about them excepting the price. They all died. By this time, the average farm had about eight or ten trees, mostly crabs. A few men not easily discouraged kept on planting, taking fairly good care of the trees and found they were getting from two to four barrels of apples from those first planted trees which were sold off the tree at 25c to 35c a pail of 10 quarts. Now, present conditions are that those who planted and took reasonably good care of their orchards are making more money from the three or four acres than they do from the rest of the farm. This is from fall apples. Winter fruit, so far, I may say, has been a failure. We have nothing that will keep longer than Wealthy;—that is, that will sell in the markets. With eastern growers of fruit that is not so great a grievance as would appear. Our northern grown fruit has much better keeping qualities than that grown to the south of us. Wealthy will keep until March, Alexander I have kept until the end of February. This year, for some reason, the keeping qualities are not so good. Still, locally, we can sell our fall apples for 50 cents a barrel more than can be obtained for eastern fruit. Our fruit is firmer and keeps longer.

The question is sometimes asked, will fruit growing ever be a success commercially in Algoma? I can answer this best by pointing out several orchards planted on suitable ground, and that have been given fairly good attention, that bring their owners more money every year for fruit sold from first of September up to Christmas by 25 per cent. at least than is usually obtained on a similar piece of land in the best apple districts of Ontario. I have been very careful in obtaining this information. Of course, we save something on freight, on the other hand an apple tree grown in the north will not live as long or grow to the size that it will farther south.

There are a few conditions necessary to observe in order to insure success. They are: Avoid planting on the stiff, red clay common in Algoma, if possible. If this cannot be done, first ridge up the land with at least two plowings and plant on the top of the ridge, say 25 feet apart. That is none too close. Plant low headed trees from the top, say two feet from the ground, for ordinary winters. Some of spreading habit, such as Longfield, may be of the usual height as sent out from the nursery. From the head as close to the trunk as possible, give clean cultivation until the tree comes well into bearing and do not prune quite so close as it is usual in the south. We do not go heavy into winter fruit until we find something better suited to our climate. We are on the road to success in this respect with such varieties as Milwaukee, Boiken, Patten Greening, but they are not fully tested here yet. Select a location just a little elevated with a north or north-western exposure, and last but not least, a windbreak, not on the north, but on the south, although it is desirable on both sides; but not too close,—allow plenty of room for air to circulate. For several years I have paid attention, and have made inquiry, in regard to giving clean cultivation after the trees came into bearing, and have no hesitation in saying that for the ordinary farmer

who has an acre in fruit it is not necessary. I would recommend seeding down with red clover, to be cut and left on the ground, or the old sow and her pigs may be turned in. This will hold out for perhaps six years when June grass will begin to take the place of clover, when the ground may be well disked up and seeded down again.

This may not be sound advice for one making a speciality in fruit or whose orchard gets his attention first, but for the average farmer with his fifty or a hundred trees who has other work to attend to in our short springs, I think it will be found preferable. In my own case I have about two acres that have always been kept clean with the cultivator and the plow, and the percentage of loss has always been much heavier than on that part in grass, chiefly on acount of the wood not ripening in the fall, and root killing along with the damage likely to occur in the chafing of the trunk by the whiffletrees.

This part of Algoma, St. Joseph Island, is gaining a reputation for fruit growing, not from any particular advantage in soil or climate, but from the fact that many of us refused to believe the often repeated assertion that we are too far north to grow fruit. I have it from the best authority that the money value of fruit shipped from the port now considerably exceeds that of any other commodity raised on the farm.

Apples.

Of fall apples we have quite enough, and unless something extra good turns up, there is no need in increasing the numbers. Among winter apples, not extensively planted yet, but which promise well and have fruited, are Pewaukee, Winter St. Lawrence, Baxter, Peter, and improved Wealthy. Others extensively planted, but not yet fruited, Milwaukee, North-west Greening, Peerless, Ontario. This last I have fruited, but the winter of 1903 and 1904 pretty well killed them out. Among the undesirable kinds which have been recommended and tried are Ben Davis, which is entirely out of its climate here, a poor, dirty colored apple and worthless to eat. Scott's Winter has been extensively planted, but has not been satisfactory. Fair sized fruit may be obtained from young trees, but it seems too small to take the market, and is disappointing when you come to pick and barrel. The tree is not quite hardy and the fruit in an ordinary house cellar is apt to shrivel up during the winter.

Pears.

Although fairly good specimens may be met with grown under favorable circumstances, they had better be left alone. I have never succeeded in getting a remunerative crop. Russian pears seem to be quite hardy, but the fruit is very poor. Of other kinds, Flemish Beauty is perhaps as hardy as any.

Plums.

Several years ago if any one had asked me what plums to plant, I would have said, plant Japans; now, I would advise to let them alone. They made a remarkably fine growth for some years after planting, but no fruit. They were budded on the Peach, which is, I think, a mistake, at any rate for our

climate. Among all the varieties I have tried, there is only one of the domestic class that is perfectly hardy, Glass Seedling. Lombard is a good second, but is inclined to overbear. Next year quite likely the tree will be dead. Americanas have given much better satisfaction, but the color of the fruit does not take in the market. Still, the quality when preserved is fairly good. Most of them I planted were on peach stock, and are dying out. A few planted out three years ago (Russians) had a few plums last year, the trees so far are hardy and the fruit good. They are very promising.

Cherries.

Cherries have always done well here, or anywhere near the influence of the water. Further back on the mainland, they are not a success, they blossom but form no fruit or if fruit does form it drops off prematurely. I have never missed a crop here. For those going into a quantity for market, Early Richmond, Montmorency, and English Morello will fill the list. Montmorency is the best of the three, but it will take them all to lengthen out the season. Ostheim is a very good cherry to eat out of the hand when fully ripe, but not so profitable as the others.

Grapes.

Grapes may be grown for home use, but we cannot compete with Southern Ontario either in quantity or quality. Janesville I have found the most satisfactory.

Strawberries.

Strawberries have without doubt been the best paying fruit crop here. The climate seems just to suit all small fruit except blackberries. We have some 35 varieties of strawberries under test here, but soil moisture, and cultivation make such a difference that I do not care to recommend any one variety as the best. Some, as the Haverland, are very susceptible to dry weather, while Bubach or Glen Mary do not suffer so much. The Williams and Saunders I discarded years ago on account of their green tips and being no better otherwise. Yet these two are favorable berries with many. Clyde, which did poorly in 1906 and 1907, got back this year to its old place as a No. 1 berry; Splendid, Bubach, Glen Mary are all good. I plant in rows four feet apart and two feet in the row. Formerly I used to take only one crop, but latterly take two, as some varieties give a larger yield the second year. We do not cover in winter as it is not necessary here on account of the snow.

Currants and Gooseberries.

These always do well. In black currant, Champion and Saunders are among the best; Versailles and Fay's Prolific among the red.

For the second year in succession the English gooseberries have out done the Americans as a class. The very best yields here from Red Jacket and Golden Prolific.

The local demand has never been nearly filled with currants and gooseberries. Keeping the old wood cut out, along with plenty of cow manure, clean cultivation, meet all requirements.

Raspberries.

Raspberries are not in much demand, the wild fruit is plentiful, and by many preferred to the cultivated. Loudon, with me, is the best to yield. When we get a crop of Cuthberts they are certainly better, but this variety is tender and not to be depended on. Blackcaps I have given up growing. They were not a success. Brinkler's Orange is a favorite for quality, but the canes are not healthy. Herbert I have not tried yet.

Fruit Growers' Homes:
A Neat Residence in the Burlington District.

VEGETABLE STATION.

By E. E. Adams, Leamington.

This season has been a very favorable one for forcing vegetables, tomatoes, cabbage, peppers, melons, and cucumbers being splendid crops. Tomatoes were planted in the field about the 24th of May, and the first pickings were made on June 20th, but good picking did not commence until July 1st, and the early crop was all off by August 11th on my land. The growing season was all that could be desired, plants having made a heavy growth by June 20th, and those plants having been given a small quantity of nitrate of soda (100 pounds to the acre) gave fruit very early, and the bulk of the crop ripened up quickly and in season when prices were at their best. I have been using soda for several years, and from results obtained, I am of the opinion that one application of 100 pounds to the acre, scattered around the plants in small quantity, as soon after planting as possible, and worked in either with the hoe or fine-toothed cultivator at once, with good culture following, will produce a much larger quantity of earlier ripened fruit than where not used. I have tested the use of two applications of soda in a sea-

son, the last being applied about ten days after the first, but found such method to produce more vine, and not any more fruit, and with a tendency to delay ripening.

Early cabbage did not turn out this season quite as well as usual on account of a dry spell just at heading time. The usual applications of soda were used, but owing to too little moisture, the results were not as marked as in seasons when there is plenty of rain at the right time. Musk melons were perhaps the largest crop ever grown here. There was very little blight. No doubt the dry weather in August helped to keep it down. We find blight very bad in seasons where there is plenty of rain or heavy dews during time of ripening. Spraying for the blight did not appear to produce any marked results, as those unsprayed were as good vines as those sprayed. The spraying material used was three pounds of sulphate of copper, 5 pounds stone lime, and 40 gallons of water, applied when plants were set in the field, followed again in about two weeks, and again in two weeks; the one application of ammoniacal carbonate of copper at the end of the following two weeks. Paris Green was added to the first application (three ounces to 40 gallons) to kill the striped beetle. This was the quickest way to finish this pest.

The market demand appears to be in Ontario for green fleshed melons, although there is a growing demand for something better. This season the Paul Rose, Burrell Gem, and Fordhook, all salmon fleshed varieties, were in splendid demand. The Burrell Gem is one of the finest melons, if not the finest quality grown, and can be shipped across the continent and arrive in good condition. They have been shipped from their home in Colorado to New York by freight without refrigeration, which certainly speaks well for them. Some were sent to Brandon from here this season by express in baskets, and arrived in first-class condition, and they were ripe when picked. The one trouble with this melon is that it will split at the blossom end if too wet when ripening.

Early potatoes were a small crop, those on sandy soil being very light, while on lower soil they were much better.

The tomatoes tested this season, along with those tested again from last season's list, were Burpee's Earliest Pink, Stirling Castle, Frogmore, Select, Wealthy, Bonny Best, Jack Rose and Acme, Among these, the Wealthy is decidedly the best and most profitable to grow for a crop, not alone as to quality, but as to quantity. It cannot be called an extra early, but for a mid-season crop it cannot well be equalled. For canning purposes it is desirable as to quality, being sweet, and fairly solid, much better than Earliana for that purpose. The Earliana still holds supremacy as the earliest cropper here, not only for earliness, but for productiveness. The Maule's Earliest of All is also a good cropper, but is a little later than Earliana, and of very fair quality for an early tomato. Rennie's First of All is also quite satisfactory. Stirling Castle is of no market value whatever for this district, nor in fact for any other shipping district, but would be a nice small tomato for selling on large markets in quart berry boxes from market gardeners' stalls. It is too small for basket use, but is smooth and of good quality. Frogmore Select is a fair tomato, but is of no value as a shipper. It may be satisfactory under glass for a certain season, but it cannot be recommended for outdoor culture. Earliest Pink is a good cropper, but is not as smooth as the Red varieties, and is somewhat soft. Bonny Best is a very fine looking tomato, being of good size, smooth as an apple, but too soft for a shipper. Jack Rose is considered a very early, and productive variety, but from its showing this year it is of no value for quality or market or as a shipper. Success is a very nice tomato, but far too soft on our soil

to be of any value either early or late. The quality for home use is satisfactory. Acme is not profitable on our soil, which is sandy. In fact, very few of the pink or purple varieties are of any use here. The only one that pays well is the Plentiful, which is a good cropper, and of the finest quality, and a very good shipper.

Some work was done with potatoes. These were spread in a room where they had good light and sprouts allowed to grow to about an inch in length and were planted on sandy loam May 25th and dug on September 30th. One-half were cut and the balance planted whole. The table below shows the resulting crop in pounds. The Bovee and Burpee's Extra Early gave the larger crops. The whole potatoes ripened a little ahead of the cut. Medium sized potatoes were used in all cases. A dry spell overtook these in August, and they did not turn out as well as expected. Fifteen pounds to each variety were planted; one-half being cut; one-half being whole.

——	Quantity from cut potatoes when dug.	Quantity from whole potatoes	Per cent. of small potatoes.	Marketable Potatoes.	Quality when cooked.
Early Ohio	26½	22	10	90%	Fair
Burpee's Extra Early	28	23	12	88	Good
Triumph	18	13	15	85	Fair
Bovee	27	24	10	90	Good
Norton Beauty	16	13	15	85	Fair
Irish Cobbler	17½	11½	17	83	Fair
Extra Early Eureka	15¼	12½	16	84	Fair

Sweet Potatoes Tested in 1908.

Sweet potatoes turned out splendid. The specimens were very fine, and where the season is warm enough they can be grown quite as well as in Southern States, and fully as good in flavor and quality.

Vineland Bush: Short and chunky grower; quality good.

Jersey Sweet: Rather longer in growth than Vineland Bush; good quality.

Yellow Mansemond: Medium size; good quality.

The last two mentioned are best croppers.

EXTENT OF THE VEGETABLE INDUSTRY IN THE LEAMINGTON DISTRICT.

(Special Report by A. McMeans, O.A.C., Guelph.

The following was shipped from Leamington during the season of 1908:

	Express, %	Freight, %		Express, %	Freight, %
Tomatoes, 32,000 11-quart baskets	75	25	Melons, 750 11-quart baskets	95	5
Peppers, 1,000 11-quart baskets	95	5	Melons, 8,500 crates or bushel baskets	85	15
Cucumbers, 1,900 11-quart baskets	90	10	Cabbage, 2,100 crates	50	50
Beans, 800 11-quart baskets	95	5	Cabbage, 2,000 bushel baskets	55	45
			Corn, 4,250 dozen	85	15

The above percentage of freight is approximate.

The following is about the approximate average prices received for the vegetables shipped:

Tomatoes	35 cents per basket.	Melons, Musk	$1.00 per crate or bushel basket.
Cucumbers	40 "	Cabbage	75c. per crate or bushel basket.
Peppers	25 "	Corn	About 11c. per doz.
Beans	25 "		
Melons, Musk	40c. per 11-qt. bskt.		

The following were used at the canning factory: Tomatoes, 60,000 bushels; beans, 20 tons.

The vegetable industry in this section will be much larger this year as H. J. Heinz Co., of Pittsburgh, are opening a Canadian branch at Leamington, and will have under contract 450 acres for the production of vegetable food products.

Ruthven shipments for 1908 were as follows:

Tomatoes, 8,000 11-quart baskets; melons, 185 11-quart baskets; melons, 360 crates or bushel baskets; cabbage, 280 bushel baskets; cabbage, 415 crates; cucumbers, 30 11-quart baskets; corn, 450 dozen. These were all shipped by express and prices will rule about the same as at Leamington.

Kingsville shipments (all by express) for 1908 were as follows:

Tomatoes	1,120 6⅔-quart baskets.	Melons	35 Crates.
"	2,980 11 "	Cabbage	105 " or bushel baskets.
Cucumbers	25 11 "		
Melons	785 Baskets.		

The canning factory here used 41,000 bushels of tomatoes.

The shipments from the above three places make a total as follows:

Tomatoes	6⅔-quart baskets	1,120 at	25c		$280 00
"	11 "	42,980 at	35c		15,043 00
Peppers	11 "	1,000 at	25c		250 00
Cucumbers	11 "	1,955 at	40c		782 00
Beans	11 "	800 at	25c		200 00
Melons	11 "	1,720 at	40c		688 00
"	Crates or bushels	8,895 at	1 00		8,895 00
Cabbage	"	4,900 at	75c		3,675 00
Corn	Dozen	4,700 at	11c		517 00
					$30,330 00

To which should be added 101,000 bushels of tomatoes supplied the two canning factories, also 20 tons of beans.

101,000 bushels tomatoes at 27½ cents per bushel, $27,775.00.

There was also shipped from Leamington 56 cars of onions, an average of 440 sacks of 75 pounds each per car, making a total of 24,640 sacks for which the growers received an average price of 65 cents per sack, $16,016.00.

Making a grand total for this district as follows:

Vegetables shipped by express or freight	$30,330 00
Vegetables supplied canning factory	27,775 00
Onions shipped	16,016 00
	$74,121 00

I might add that the average yield per acre of tomatoes supplied the canning factories was under 200 bushel per acre.

HORTICULTURAL EXPERIMENT STATION, JORDAN HARBOUR.

By H. S. Peart, B.S.A., Director.

In preparing this, my first annual report of the work at the Horticultural Experiment Station, I shall briefly mention some of the particulars leading up to the work of the present year.

On acquiring the property in 1906 a foreman was placed in charge and much preparatory work in cleaning up the land and the removing of unnecessary fences done, but no attempt was made at experimental work.

In the spring of 1907 most of the land was sown to oats, the balance being in sod and summerfallow. Soon after my appointment in June, the work of underdraining was started, following plans prepared by Mr. W. H. Day, of the Ontario Agricultural College and before winter a complete system of drainage with a total length of nearly eleven miles was laid. The land was fall plowed, worked and ribbed before winter and a considerable portion was treated with a dressing of manure preparatory to spring planting.

Cold Storage and Barn at Horticultural Station, Jordan Harbour.

At a meeting of the newly appointed Advisory Board held in Toronto in February, 1908, a draft of the proposed experimental work was submitted, revised and approved. The necessary stock and seed were ordered and plots laid out.

On the opening up of spring work, we found as a result of under draining, that instead of the land being several days to a week later than adjoining farms as in the past, that we were able to begin work a few days earlier than our neighbors, which gave us a good start in April.

The station grounds were subdivided by cross roads at convenient intervals for the purpose of affording the public and our laborers easy means of access to all parts of the work. In most cases these roads divided the different classes of soil almost completely so that the work of planting was greatly simplified.

In order that future plantings be kept as nearly as possible uniform with the present, all the blocks are arranged so that they can be extended in at least one direction.

It is the purpose of the station to test all classes of crops of interest to horticulturists in Ontario, paying special attention to the tender fruit districts and to co-operate with other experiment stations to generally further the results of all. With this object in view, a few varieties of known merits were planted as checks and new and less widely known sorts set for comparative testing.

FRUITS.

Apples.

While apple growing is not a leading industry in this immediate locality, the necessity of doing considerable work with that fruit is manifest on all sides. A portion of the clay loam land was set aside for testing new varieties, different kinds of stocks for top working, dwarf *vs.* standard and high *vs.* low heads. The following varieties were used for top-working Baxter, Ben Davis, Duchess, Haas, Hibernal, McMahon, Pewaukee, Red Siberian, Tolman Sweet. For high *vs.* low heads and dwarf *vs.* standard the following one year old standard and Doucin trees were used: Astrachan, Alexander, Blenheim, Baldwin, Cranberry, Duchess, Gravenstein, Greening, Hubbardston, King and Spy.

The following is a list of the varieties, old and new, set for testing purposes: Arctic, Astrachan, American Pippin, Alexander, American Golden Russet, Bank's Red Gravenstein, Belle de Boskop, Baldwin, Boiken, Blenheim, Ben Davis, Baxter, Black Twig, Barry, Ben Hur, Bjorkman, Bethel, Bismark, Cranberry, Chenango, Cornish Aromatic, Canada Red, Champion, Duchess of Oldenburg, Delicious, Early June, Fameuse, Gano, Gypsy Girl, Grimes' Golden, Greening, Gravenstein, Green's Baldwin, Garden Royal, Hibernal, Haas, Hurlburt, Hubbardston, Jefferies, King, Keswick, Krup neena, King David, Keswick Codling, Lowell, Mother, Milwaukee, McMahon, Mann, Mammoth, McIntosh Red, Muskoka Beauty, Magog Red Streak, New Delicious, North West Greening, Newton Pippin, Opalescent, Peerless, Primate, Pewaukee, Peasgood Nonsuch, Queen of the North, Russell, Rolfe, Rome Beauty, Rufus, Rhode Island Greening, Rosenhagen, Scarlet, Seek, Spy, St. Lawrence, Salome, Shiawassee, Sutton's Beauty, Stark, Winter Arabka, Wealthy, Winterstein, Wellington, Wismer's Dessert, Wagner, Winter Banana, Windsor Chief, Wolfe River, York Imperial.

Apricots.

While few people care to plant very many apricots, there are some few sections where they may be grown for profit. The following varieties were planted here for testing: Alexis, Gibb, J. L. Budd, Harris, Stella, Sheuse.

Currants.

The following varieties of currants were set to test their relative merits in this locality: Red and white—Chautauqua, Cherry, Diploma, Francis, German, Fay, Filler, London Market, Long Bunched Holland, North Star, Perfection, White Grape, Wilder. Black—Boskop Giant, Champion, Clipper, Eagle, Kerry, Lee, Magners, Success, Saunders, Victoria.

Cherries.

Among the cherries the following varieties were set in the test blocks. Sweet—Allen, Black Tartarian, Caroon, Chapman, Early Lamourie, Governor Wood, Ida, Knight's Early Black, Llewelling, Luelling, Napoleon, Ohio Beauty, Pickering, Pelham, Windsor. Sour—California Advance, Double Natte, Dyehouse, English Morello, Early Richmond, Empress Eugenie, Fouche Morello, Late Duke, Louis Phillipi, Leib, Lambert, Montmorency, Murdock Bigg, Ontario Preserving, Reine Hortense, Terry, Weir.

A block composed of the following varieties, Black Tartarian, Dyehouse, Early Richmond, English Morello, Governor Wood, Montmorency, Napoleon and Windsor, was set to test different methods of tillage and all were treated alike this year, the land being planted with melons.

Crab Apples.

The following list of crab apples was set this year: Florence, Hyslop, General Grant, Minnesota, Martha, Montreal Beauty, Muskoka Champion, Orange, Power's Large, Red Siberian, Transcendant, Van Wyck, and Yellow Siberian.

Grapes.

A small vineyard of the following varieties was set: Amina, Agawam, Brighton, Barry, Banner, Concord, Campbell's Early, Catawba, Champion, Charleton Eclipse, Francis B. Hayes, Green's Early, Green Mountain, Herbert, Hicks, Hermon Jaeger, Isabella, James, King, Lady, Moyer, McPike, Moore's Early, Massasoit, Niagara, Pierce, Regal, Sunrise, Vergennes, Worden, and White Sweetwater. Some of these have been tested and proved the most suitable for the Winona District, and others are newer and have not been tested in Ontario as yet.

A block of the following varieties: Concord, Campbell's Early, Niagara, Vergennes, and Worden was set to make rows illustrative of different methods of training and pruning and to compare the relative merits of each system.

Gooseberries.

Owing to the brisk revival of appreciation of this important fruit, we made special arrangements to get the leading varieties which have given satisfaction in Great Britain and United States, with the result that we have in our trial grounds the following varieties: Bright Venus, Berry's Early Kent, Carmen, Columbus, Crown Bob, Cheshire Lass, Drill, Downing, Early Sulphur, Early White, Glory of Ratcliff, Glenton Green, Green Walnut, Green Casoigne, Hedgehog, High Sheriff, Heart of Oak, Industry, Keepsake, Leader, Langley Green, May Duke, Mountain Seedling, Oregon Champion, Pitmaston Green Gage, Portage, Raspberry, Red Jacket, Smith's Improved, Victoria, Whitesmith, Winham's Industry, White Champagne, and Yellow Scotch.

Peaches.

Special emphasis was placed upon the testing of peaches. We have secured trees from several parts of Europe, United States, and Canada and have altogether 101 varieties under test as follows: Arkansas Traveller, Australian Saucer, Alton, Arp Beauty, Admiral Dewey, Arthur Chevreau,

Brigdon, Barnard's Early, Beer Smock, Belle of Georgia, Bowslaugh's Late, Bronson, Banner, Bilyer's Late, Bonanza, Belle Henri Peinud, Baltet, Billmeyer, Baron Dufour, Biquett Free, Bailey, Berenice, Crawford's Early, Crawford's Late, Captain Ede, Chair's Choice, Crothers, Cardindale, Conklin, Coonnetts, Elberta, E. Mamie Ross, Edgemont Beauty, Edouard Andre, Early York, Early Elberta, Globe, Golden Drop, Greensboro, Goring's Red, Grosse Mignonne Hative, Galande, Graves, Hooker, Hative Paullard, Holderbouir, Holderbaum, Heiley, Engol Mammoth, Kalamazoo, Krummel October, Keyport White, Lemon Free, Leamington, Longhurst, La France, Lockwood, Lewis Seedling, Large Early York, Lamont, Lee Angle, Lamon, McKay Late, Muir, Michigan Beauty, Marshall, May Lee Cling, New Prolific, Old Mixon, Opulent, Opoix, Oceana, Prolific, Pres. Lyon, Poole Favorite, Picquett's Late, Prof. Villiare, Pearces' Mammoth, Reeves' Favorite, Russel, Rouge de Maide Brigg, Ray, Smock, Smithson, Smith's Superb, Stump of the World, Salway, Strawberry, Surpasse Melocoton, Triumph, Townsend, Tenton de Venus, Wellington, Wolsey, Worth, William's Favorite, Washington, Walkers, Wheeler's Late, Yellow St. John, and Yellow Rareripe.

To still further this test, most of the varieties are duplicated on both sand and clay soil. Blocks of the following varieties: Admiral Dewey, Elberta, Engol Mammoth, New Prolific, Smock, and Yellow St. John have been set on both sand and clay to illustrate the different systems of heading and pruning and possibly different methods of soil treatment.

Pears.

A large importation of French and English pears was brought in to test beside our leading commercial sorts, so that our variety test is at present composed of the following varieties: Antonine, Delfoose, Anjou, Amile Baltet, Alexander III., Bartlett Seckel, Beurre Clairgeau, Beurre Gifford, Beurre Hardy, Beurre Rance, Beurre Bosc, Belle Renee, Bon Chretien Bonnamour, Beurre Capiaumont, Bartlett, Beurre de Naghin, Baltet Pere, Beurre d'Amanlis, Beurre Bachelier, Beurre Gifford, Bartlett, Beurre d' Anjou, Clapp's Favorite, Crosby's Hardy, Comte de Lamy, Clapp, Dempsey, Doyenne Boussock, Dana's Hovey, Doyenne d'Alencoz, Durondeau de la Forestrie, Doyenne Martin Clavier, Duchess, Delavilleaine, Doyenne de Juilett, Des Monnes, Doctor Joubert, Directeur Hardy, Duchess d'Angouleme, Emile d'Heyst, Easter Beurre, Eva Baltet, Frederick Clapp, Flemish Beauty, Fondante d'Antoinne, Fondante Thirriot, Fondante des Boise, Forello, Goodale, Gan's Seedling, Hoosic, Howell, Japan Golden Russett, Jean de Arc, Josephine, Jargonelle, Keiffer, Koonce, King Karl, Louise Bonne, Lincoln Coreless, La de Jule Guinedon, Lyerlie, Lady Clapp, Marie Louise, Mme. Earnest Baltet, Mme. Baltet, Nouvelle Fulvie, Oliver des Serres, Pres. Druard, Pres. Barabe, Prof. Grosdemange, President Devolaine, Ritson, Roosevelt, Renfrew, Rutter, Sheldon, Souvenir, Superfine, Seckel, Thompson, Tyson, Virginia, Baltet, Vermount Beauty, Wilder, Worden, Seckel, and Winter Nelis.

A block of Bartlett, Beurre d'Anjou, Clapp's Favorite, Duchess d'Angouleme, Easter Beurre, and Flemish Beauty on both dwarf and standard stocks were set side by side to ascertain their relative merits. This should be of special interest to prospective pear planters.

Plums.

The following varieties of plums were set to illustrate their commercial value, and to be used for different methods of pruning and soil tillage,—Reine Claude, Gueii, Duane's Purple, Pond Seedling, Washington, General Hand, Lombard, and Yellow Egg.

The following varieties were set in the variety test: Apple, Archduke, Ancaster, America, Blue Prolific, Bleaker's Gage, Bartlett, Burbank, Bradshaw, Beauty of Naples, Canada Orleans, Chabot, Czar, Columbia, Climax, Clyman, Coe's Golden Drop, Cullin's Golden Gage, Duane's Purple, Diamond, Early Prolific, Early Rivers, Early Transparent, English Blue Damson, Emerald, Earliest of All, Field, Fellenburg, Formosa, French Damson, Gideon, Gueii, Giant Prune, General Hand, German Prune, German Damson, Gavotia, Grand Duke, Glass Seedling, Huling's Superb, Imperial Peach, Imperial Gage, Ickworth Imperatice, John A. Kirke's Plum, Klondyke, Kelsey, King of the Damson, Kingston, Lombard, Latchford, Lowry's Gage, Large Golden Prolific, Lucy Gray, Monarch, Moore's Arctic, Moyer, Mary, Mallard, Monroe, McLaughlin, Niagara, October Purple, Peter's Yellow Gage, Perry Oriental, Pond Seedling, Purple Egg, Prunus Simoni, Pearl, Quackenboss, Rockford, Reine Claude, Rutland Plumcot, Red Egg, Red June, Raynes, Sutton, Saunders, Smith's Orleans, Shipper's Pride, Shropshire Damson, Staunton, Santa Rosa, Satsuma, Shiro, Togo, Thanksgiving Prune, Vesuvius, Victoria, Warner's Late, Willard, Waugh, Washington, Yellow Egg, York State Prune.

Quinces.

The following sorts have been set for variety testing. Angiers, Bourgeat, Champion, Meech's Prolific, Orange, Pine Apple, and Rea's Mammoth and will be used for tillage and culture tests from now on.

Raspberries and Blackberries.

A small plantation of these was set out, but I regret to note that owing to the late date at which they were set, many of them did not live. A new plantation will be set out in 1909.

Orchard Culture.

Most of the young trees set this season have made a satisfactory growth but owing to the very severe drought, the late planted ones have not kept up with those set first.

A bearing apple orchard on the station grounds has been divided in five section to illustrate the effects of different methods of tillage.

Block I. Fall plowed, spring plowed, tilled until July, then sown to cover crop.

Block II. Both fall and spring plowed and tillage continued as long as fruiting will permit.

Block III. Spring plowed and tilled as No. II.

Block IV. Spring plowed and treated as No. I.

Block V. Sod mowed twice during growing season, the cuttings allowed to remain on the ground.

This method of culture was started in the spring of 1907 and with the serious drouth of the present season the effect of the sod was very marked by a general sickly appearance of the trees. The fruit was much smaller, though perhaps better colored, but decidedly more attacked by the codling worm. The sections which were tilled have shown very little difference as yet. All

the trees were thrifty and produced an excellent crop of high class fruit. We hope to continue this test for several years as an illustration of the effects of tillage.

Important Seedling. *Apple No. 1.* A seedling apple, was furnished by Mr. A. H. Culp, of Louth Township. Fruit medium, oblate, conic; color, yellow, splashed and mottled with bright crimson, handsome; stem, medium and slender, set in deep cavity. Calyx closed in shallow, smooth basin; thin skin; flesh, yellowish white; fine, juicy, mildly flavored subacid, slightly aromatic, good flavor, quality very good; season, November. May be useful to follow Gravenstein.

Offices, Laboratories and Directors' Residence at Horticultural Station, Jordan Harbour.

The orchard used for culture tests was also used for spraying tests for codling worm. Arsenate of lead, Paris green and the Norfolk Fruit Growers' formula: 1st spraying when buds begin to swell with 20 lbs. blue vitriol, 60 lbs. lime, and 200 gallons of water. 2nd, spraying just before buds break open; and third, spraying just as soon as blossoms fall with 12 lbs blue vitriol, 12 ozs. Paris green, 12 ozs. white arsenic, 2½ lbs. sal soda, 50 lbs. lime, 200 gallons water. Always use 10 lbs. water to the gallon.

These were all used, and the results seem to indicate that any of them will control the first brood of worms if properly and thoroughly applied. The arsenate of lead appears to cling to the foliage rather better than the others, and does not require the addition of lime to make it adhere to the leaves. Paris green when used with Bordeaux mixture gave fairly satisfactory results. Norfolk Fruit Growers' compound, while requiring somewhat more care in preparation gave excellent results. Three sprayings were used in all cases and the result was fruit comparatively free from worm.

Some patent formulas were used in a neighboring orchard for San Jose Scale, but we are not in a position to state definitely their relative merits from one year's test.

Fertilizers.

Through the courtesy of The Dominion Agricultural Offices of the Potash Syndicate, we were supplied with sufficient material to treat several vegetable crops with home mixed fertilizer. The following table will show the total yields and average weights obtained from one year's test. This will be tried again in 1909.

No. of fertilizer.	Onions.	Cabbage.	Average weight per head.	Tomatoes.	Musk melons.	Average weight of each fruit.	Cory corn.	Golden Bantam corn.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
No. 1—No fertilizer....	716	831	7	5,631	367	1	161½	135
No. 2 — Complete — 5 lbs. potassium sulphate, 10 lbs. superphosphate, 5 lbs. sodium nitrate.....	778	865	8	709	280	1	155	134
No. 3—5 lbs. sodium nitrate, 5 lbs. potassium sulphate.....	720	833	7½	574	199	1⅓	166½	149½
No. 4—5 lbs. potassium sulphate, 10 lbs. superphosphate	702	913	8½	685	310	1¼	143½	111½
No. 5—5 lbs. sodium nitrate, 10 lbs. superphosphate	850½	1,067	9	637	150	1	87	127

Several ready mixed fertilizers were used, but as the result was somewhat contradictory we wish to continue the tests for a series of years before comparing different brands.

The following mixture was used on a block of bearing apple trees: 6 lbs. sulphate potassium, 10 lbs. superphosphate, 4 lbs. sulphate ammonia to each tree. The results this year, however, were practically negative, as there was too little moisture to render the salts available. We shall watch these trees with interest next season.

VEGETABLE EXPERIMENTS.

Last spring we laid out a large block of land on which to carry out the experiments with varieties of vegetables. While these results are only for a single season, we are publishing them to give the growers an idea of how the varieties compared here in 1908.

Beets.

Out of 55 varieties of beets, the following one-half dozen were most satisfactory: Extra Early Flat Egyptian, Imperial, Eclipse Turnip, Detroit Dark Red, New Cardinal and Globe.

Cabbage.

Out of 89 varieties of cabbage, we might mention Acme Flat Dutch, First and Best, Winter Header, All Head, Square Deal and Early Flat Dutch as being the best one-half dozen, giving the largest yield of marketable heads. We did no work in early cabbage this year.

Cucumbers.

Owing to the very dry season, cucumbers were not a very great success. New Century Perfection, Improved Long Green, Evergreen, Giant Pera, and Hill's Forcing White Spine may be singled out as some of the most satisfactory for slicing purposes and Fordhook Pickling and English Gerkin Pickling two of the heaviest pickling varieties. 54 varieties were tested.

Watermelons.

Among the 42 varieties of watermelons that were planted, Black Spanish, Pride of Georgia, Early Canada, Seminole, Early, The Boss and Angel's Kiss were most satisfactory.

Muskmelons.

This year we grew 97 varieties of muskmelons, and the following are some of the varieties giving a good yield and being of good quality: Emerald Gem, Unsworth Perfect, Burrel Gem, Eden Gem, and Banana Citron.

Pumpkins and Squashes.

We planted 22 varieties of pumpkins and 42 varieties of squashes, but our results were somewhat interfered with by severe attacks of blight. This work will have to be duplicated next year.

Beans.

Among the 104 varieties of beans, we would recommend Earliest Hopkins, Red Valentine, Long Pod Forcer, Davis Kidney, Bountiful Bush, Early Red Valentine, Longfellow and New California Wax, as early varieties. Prolific German Wax, Dwarf Horticultural, Stringless Green Pod, Mighty Nice, XXX Best Green, Imperial Golden Wax, Giant Stringless Green Pod, ripen somewhat later, giving a succession of pickings. Hodson's Wax was decidedly the heaviest cropper we had, but New Pearl Wax, Black Wax, Refugee Improved and Large White Marrowfat are worthy of further trial and test for late crop.

Peas.

Out of the 109 varieties of peas that were tested, we would recommend: Extra Early, Rural New Yorker, McLean's Little Gem, First of All, Prolific Early, Market, and Clipper as early. Medium: French Canner, Improved Stratagem, Telegraph, Profusion, Heroine, Hordford's Market Garden, Mammoth Melting Sugar, Quality and Dwarf Gray Sugar. Late: Queen, Matchless, Early Dwarf, Brittany Sugar, Bliss Everbearing, Long Island Mammoth, Black-Eyed Marrowfat, Marblehead Early Marrowfat, Prodigious, and Royal Dwarf White Marrowfat.

Sweet Corn.

This year we grew 74 varieties of sweet corn of which Perry's Hybrid, Concord's Bearsfoot, Pearce's Early Evergreen, Early Champion, New Ideal Early, Howling Mob, Stabler's Early, Aristocrat, New White Evergreen, and Potter's Excelsior were the heaviest yielders. We might particularly mention Pearce's Evergreen, New White Evergreen, Stowell's Evergreen, Country Gentlemen and Golden Bantam as varieties of special quality.

Pop Corn.

We also had 7 varieties of pop corn, but so far we have found nothing to equal White Rice, either in vigor, quality, or yield.

Onions.

Out of 53 varieties of onions we might mention the following Italians as giving good results here this season: Largest Red Madeira and Mammoth Red Italian. Also we might mention Connecticut Large Red, Early Blood Red, Model Yellow Globe Danvers and Early Red Globe as being among the best cropping varieties, while Large Red Wethersfield, Southport Yellow Globe and Red Wonder gave very satisfactory results.

Cauliflowers.

34 varieties of cauliflower were grown here, Earliest Snowball, Extra Early Dwarf Erfurt, Queen of the Danes Erfurt, New Century, Earliest Dwarf Erfurt and Veitche's Autumn Giant giving us the largest yield and firmest heads.

Peppers.

We would suggest the following varieties of peppers as being useful for the market gardeners and the home gardener, Italian, Elephant's Trunk, Sweet Mountain, Golden Queen, Sweet Spanish, Procop's Giant.

Tomatoes.

This year we tested 77 varieties of tomatoes, Freedom, Extra Early Advance, and New Century giving exceptionally large yields. Extra Early Advance was somewhat too soft for shipping purposes, but may be useful for early local trade. Satisfaction, Dominion, Greater Baltimore, Success, Livingston's Royal Red and Great B. B., also did remarkably well, and I should like to call the attention of the public to a strain of Chalk's Jewel tomato which we grew here this year from seed supplied by Mr. W. C. McCalla. These were exceptionally fine tomatoes, and a heavy cropper. This goes to show what can be done by careful selection of seed.

Potatoes.

94 varieties of potatoes were grown here this year for comparative testing from seed secured from the O. A. C. The following varieties gave results which would indicate their value for this locality and soil, Davies Warrior, Roses New Invincible, Pearl of Savoy, Seedling (Miss Rose), Dewey, Montana Bluff, Extra Early Sensation, Rural Blush, White Elephant, Crown Jewel, Snowflake, Beauty of Hebron, Dempsey's Seedling, Early Rose, Early Manister, Queen of the Hebrons, Empire State and American Wonder.

Peanuts.

We also grew a few peanuts, and it may be of interest to know how they compared in total yield: Hardy Northern, Spanish, Pistache and New Mammoth Bush. Only four varieties tested.

Chards.

Among the chards, Swiss Improved and Beck's Improved Sea Kale gave us the best yield; were both good quality. 6 varieties were grown.

Egg Plants.

Of the 14 varieties of egg plants which we tested here, Long Purple, New Orleans, Black Pekin, and New York Improved were the most satisfactory this season.

Lima Beans.

We grew 19 varieties of Lima beans here this season, but we think the growing of Lima beans in this locality is not to be recommended. For those who care to try them, we would recommend Henderson's Bush Lima, Dwarf Bush Lima, Fordhook's Bush Lima, and Wood Prolific Bush as being the most satisfactory.

Plant Breeding.

Some work in this line was commenced early in the season, and we have at present a large number of strawberry hybrids ready to set out early in the spring. Also a considerable number of seeds of other fruits, which will give us a very nice collection to begin with, and as this will likely prove one of the most important features of our work, a considerable acreage has been laid out for the purpose of growing cross-breed and other seedlings, which work will be resumed in 1909 with a considerably increased force of workers.

Improvements.

This year we established a small canning plant, and did some preliminary work in testing varieties of fruits and vegetables for canning purposes, and hope to have everything in good shape for our work in 1909.

The following buildings have been erected this summer which will greatly facilitate the work we are carrying on: The barn, which gives accommodation for our horses, tools, implements and fodder with a large store-room for fruit packages and spray materials, in the basement of which we have a large cellar for storing fruits and vegetables, also a small cold storage plant which will afford us the opportunity of holding over certain crops beyond the ordinary shipping time.

The Administration building with the necessary offices and work rooms, with a small green house attached, the Director's residence and cottage for teamsters are nearing completion. With these buildings, we have secured sufficient space for our present needs with the exception of a foreman's residence which we trust may be added at an early date.

Conclusion.

In closing, I wish to express my appreciation of the efficient services rendered by those who have been associated with me during the past year in the work here, and to the public generally, for the hearty co-operation which has marked their approval of the work which has been outlined at the Horticultural Experiment Station.

STRAWBERRY REPORT.

By E. B. Stevenson, Guelph.

The strawberry season for 1908 was one of success, and when we compare it with that of 1907 we may congratulate ourselves upon the returns. A good crop is of importance not only for its value financially, but also marks an advance in the improvement in the berry, in methods of culture, and selection of improved varieties. The question of the improvement in varieties is a very real one at the present time. There are a great many growers now engaged upon the problem of the perfect strawberry all over the United States and Canada. One of the great hindrances to a good crop was absent here the past season, viz.; late frosts. We were free from them, although one or two nights were very close to frosts. But we had a very wet time during the season of blossoming, which is sometimes almost as great a drawback as frost. Cold rains have proved themselves almost as damaging to a full crop as frosts, the wet interferes with pollinization by wetting the pollen, making it too damp to be blown about by the wind, or to adhere to the bodies of insects, and thus be carried by them from blossom to blossom.

One of the most important things for a good crop is a bright warm time during the period of bloom, as only a third or fourth of the blossoms are open at the same time. If we have bright sunny days while the blossoms are out, we are sure of well fertilized berries of good shape, and not the nubbins that we get if we have cold wet weather during the season of bloom.

I made some preparation for frost in the shape of straw piles and damp rubbish with which to make smudge fires at night, but only lit them one night when it appeared the temperature was going down near frost, but did not. Although we had a wet time, still there was a good deal of warm sunny weather during bloom, and so obtained a good crop of well fertilized berries with few nubbins. I have on occasion saved the crop from frost by means of smudge fires when other growers who had not made such provisions lost their early berries. The vapor of smoke prevents the destructive action of frost just as does the vapor of a cloud. We know that in cloudy weather there is not so much danger of frost as on a clear night.

I was again well satisfied that the method of the narrow row is the best system for the commercial grower, and that the wide matted row is not the most profitable method. I would again lay emphasis upon the necessity of narrow rows. From my own experience, and from somewhat extended observation, I am sure that if commercial growers would follow the narrow method they would reap more money from their strawberry plantation.

Preparation of Soil.

One or two years should be given to root crops, either potatoes, turnips, or corn, manured and worked, then after the root or corn crop has been taken off, plow in full and work well in the following spring. After the ground is thoroughly prepared, choose good, strong, healthy plants that have never fruited, taking up the whole row for plants, discarding all tips and poor old plants, keeping the roots damp, not allowing wind or sun to dry the roots. Plant carefully, keeping the crown just even with level of the ground, making the rows three and a half feet apart and two or three feet in the row, according to the kind. Do your planting as soon as the ground can be worked well after all danger of hard frost is over. As soon as planting is over then

Fruit Growers' Homes : A Comfortable Frame Residence near Grimsby Park.

begin the work of cultivation, and especially after every rain, to keep a dust mulch and prevent drying out. I notice that some growers and nurserymen advise the removing of all runners until middle of summer. This they say strengthens the parent plant, enabling it to send out stronger runners later on. I do not advise, and have never pursued this plan. I make sure of good, strong, young healthy plants to start with, and if well planted these will soon begin to throw out one or more strong runners that will in turn send out other strong runners. The early, well rooted plant will soon make a row wide enough for fruiting. Keep all other runners cut off, let those new-made plants spend all their time till fall in making fruit crowns and storing up strength to mature the crop of next season.

The past growing season has proved the correctness of my contention to get the young plant rooted as soon as possible. I am sure those who have pursued the other method of cutting off all runners until the middle of summer will have a very poor stand of plants to fruit in 1909. As the long drought of 1908 commenced the middle of August and continued until the cold weather came, the ground became so dry and hard that no runners could root except those that had done so before the dry season set in. In a great many plantations, the stand of plants will be very small, as all late runners have been unable to take root and so cannot be depended upon to bear fruit next spring. This will be quite a serious loss to those who practiced keeping all runners off until the middle of July. Some of the varieties with me have made a good row as I encouraged them to root at once as soon as they first made runners, others that are not free runners have only made a thin stand of plants, so that I feel sure that next spring plants will be scarce and dear.

Prices of berries were good, running from 17c. per box that I got for the first pickings of 3 W's, to 8c. during the glut for a few days only. Large graded berries, smooth and faced in the box, sold regularly at 10c. and 12c. by the crate. I sold the bulk to one dealer who took all I could supply. The season began fully two weeks earlier than that of 1907. Blossoms began to open about May 15th. Among the first in bloom here were the Gill, 3 W's on a southern slope; Elba, Michels, Van Deman, Ruby, Early Beauty, Oom Paul, Young's Early Sunrise, Howard's No. 3, Early Market.

Fall Bearing Varieties.

I would desire to repeat what I said last year as to the so-called fall bearing kinds. After another year's trial, I cannot speak any more favorably about them. The dry summer seemed to be especially hard upon them. They only produced a few small, soft, poor flavored berries of very little value. I would say again from my experience that the fall growing of strawberries for profit is a failure and would not recommend any one to try it.

The season of 1908 had one or two surprises. There were a few varieties that moved up to the front in spite of any drawbacks. One of the varieties that surprised me was an extra early one by the name of Gill. Of the extra earlies, Fairfield, Excelsior, Oak's Early, Success, did not come up to their average and might be called failures this year. Van Deman was as good as usual, but the Gill was indeed a success. This was my first time of fruiting it. It was not petted in any way, and got no better treatment than any of the other 150 varieties I fruited. It was a surprise, as I was not expecting it. It was one that was sent me a year ago among some others by Mr. Crawford, of Ohio. I had not heard anything about it up to the time

I saw it fruit on my plot. I was going over my bed one day towards the upper end to look at some 3W's. They looked as if they were in bloom. On my way there I passed the Gill plants. I saw what looked like a ripe strawberry on the Gill. I stooped down and saw not only one but several ripe berries. Nearly every plant had one ripe berry. This was June 9th, before there were any ripe ones on any other variety—even the Michels were only getting white; and on the 11th of June I had a good picking of Gill's.

Since then, I have been enquiring about it, and I find it has done very well in other places, viz.: Ohio Experimental Station has fruited it twice, and says of it: "Conical, sometimes broadly conical, or slightly flattened, usually smooth and uniform; color, light red or scarlet, seeds yellow, prominent, flesh pink, only moderately firm; quality, quite mild, pleasant, but not highly flavored; plants rather low, compact, vigorous, showing but a trace of leaf blight. This variety attracted attention throughout its season by its bright, showy berries and great prolificacy. The last berries ran quite small, but only after producing a generous crop of attractive, marketable fruit."

I was very much pleased with it, and in a season such as the past, when we have no late frosts, it would be a very profitable berry, as we could have picked it nearly a week before the others.

Another variety that especially pleased me the past season was the Joe. I have fruited this variety some years now, but never saw it do as well as this year. It has always done well, and I have spoken highly of it, but it was very fine this season. It was one of the largest and handsomest of all the big mid-season varieties, and was so productive that it would satisfy any one in that respect. The Joe has not had the prominence given it that it has been deserving of. It is one of the pedigreed seedlings that was sent me eight or nine years ago by Jos. H. Black, of New Jersey. Nettie was another, a very late one, and is taking first place as a very large and very late sort. The Joe does not appear to have come to the front as it ought to have done, simply because it is not known. Growers for some years have been looking for a large late kind, and while Joe is not as late as Nettie or Latest or Sandy, yet in my opinion, it it better than any one of them. It is about the same season as Sample. It is large, regular, uniform in size, brilliant color, bright yellow seeds, firm, flesh red, fine flavor, plant healthy, vigorous, good grower and productive. Is not that enough? It is a very beautiful looking berry, as if varnished, and with its yellow seeds is very showy. It gets this quality from its parent, the old Middlefield.

Among some of the other good new ones, I might mention the Golden Gate, Saratoga, Goldsborough, King Edward, Brilliant, Good Luck, McNeil, World's Wonder, Oswego. Among the older kinds that were fine Three W's; President, Minute Man, Mead, Pocomoke, Beidler, Kitty Rice, Uncle Sam, Buster, Hummer, Jacoma, Hundred Dollar, Abundance Auto, Arnout, Ekey, Chesapeake, Steven's Late Champion.

The old standards made a good showing and still hold a front place such as Sample, Glen Mary, Splendid, Tennessee Prolific, Haverland, Parson's Beauty, Ruby, Williams, Brandywine, Latest, Warfield, Wm. Belt, Senator Dunlap, Bederwood, Margaret, Marshall, Ridgeway, Van Deman, Woolverton, Cardinal, New York. The season was over by the 5th of July, two weeks earlier than the season of 1907.

List of Varieties.

Abundance (Perfect): Sent me by S. Woodruff & Sons, New York. Plant a good healthy grower, making plants freely, quite productive, very good size, bright scarlet, yellow seeds, conical, firm, good quality, not too late, a good one.

Arnout (Perfect): Sent me by J. L. Arnout in 1906. One of the best new kinds, did very well with me the last season, a fancy berry. The plant is strong, healthy, and a good grower, and quite productive. The berry is large to very large, conical, bright scarlet, yellow seeds, flesh white and pink, medium in firmness, medium to late season.

Abingdon (Perfect): From L. Blanchard, of Massachusetts. Plant healthy, strong grower, medium in productiveness, berry is large, roundly conical, crimson and red seeds, good quality, late season, first berries irregular, a fancy berry.

Auto (Perfect): From Maryland. The plant is large, strong, healthy, and quite productive. The berry is large to very large, dark scarlet, yellow seeds, roundish with red flesh, firm for so large a berry, good quality, well worth a trial, a good one.

Armstrong (Perfect): This is almost if not quite the same as Corsican, New York, Maximus and Uncle Jim; the plant is healthy and strong and quite productive, grown largely as a fancy berry . The berry is large to quite large and fair flavor.

August Luther (Perfect): A good early plant, quite healthy, but small; good runner, medium in productiveness, in some soils does very well, medium in size.

Alice Hathaway (Perfect): Sent me by the originators, Hubach and Hathaway, Arkansas. The plant is quite healthy, a good runner, and quite productive. The berry is medium in size, bright scarlet, good quality.

Annie Hubach (Perfect): Sent me by Hubach and Hathaway. The plant is healthy, good runner, making plants freely, light green color and quite productive. The berry is medium to large in size, a bright scarlet color with yellow seeds, pink flesh, medium quality, mid-season, looks well in the basket, sells well.

Aroma (Perfect): One of the late kinds, a standard, largely grown in some localities. The plant is dark green, healthy and fair runner. The berry is large, round, firm, about same season as the Gandy, does better in some soils than the Gandy.

Brilliant (Perfect): Somewhat like Gandy, plant a good strong grower, making plants freely, and productive. Berry is very regular in shape, season late, will give further trial.

Bower (Perfect): A new one from Missouri. Plant is large, making few runners, berry is large, long in shape, firm and quite good quality, will give further trial. Appears to be a good one from one fruiting.

Bradley (Perfect): Appears to be a good late sort. Plant healthy, good grower, and productive, would like to give another trial before deciding on its merits.

Blaine (Perfect): Sent me by the originator, J. W. Blaine, of Iowa. The plant makes a fine growth, healthy and strong, good runner; a cross between Bederwood and Lovett, foliage, light green color, and broad leaves. The berry is large, firm, good bright color and good flavor, season late.

Buster (Imperfect): This was sent me by the originator, C. C. Stone, of Illinois. The plant is very healthy, strong and good runner, dark green foliage. The berry is large to very large, scarlet, medium in firmness, quite productive, season late, fair quality, a good one for near market.

Beidler (Imperfect): This is one of M. T. Thompson's, of Virginia. The plant is a good, healthy, strong, vigorous grower, and productive. The berry is large with a large neck, sometimes wedge shaped, bright red, quite firm, good quality, solid red flesh, mid-season, a good one, did well this season.

Bederwood (Perfect): One of the best early kinds so well known and widely grown no need to describe.

Bismarck (Perfect): One of the old well-known sorts, did well again this year. Plant very healthy, very productive, one of the best.

Bubach (Perfect): One of the old standards, is weakening somewhat in plant vigor; has held its place in front rank for a long time, but is being crowded out now by new varieties.

"Greening" Apple in Bloom, Durham County.

Brandywine (Perfect): One of the best mid-season to late kinds. Plant is very strong and a free runner, largely grown in some places. It is productive, berry is large, quite regular in shape, dark bright red and of best quality.

Chipman (Perfect): Originated in Sussex Co., Del. Sent out by W. S. Todd. The plant is strong, upright grower, large and healthy, with broad, bright, glossy, green foliage, showing no trace of rust. The berry is large regular in shape, early to mid-season, color a dark red, glossy, flesh red, and good flavor. It is firm, and I believe will ship well; worth a trial.

Colossus (Imperfect): Plant dark green, strong and healthy, fair runner, and quite productive. Berry is large and bright, dark scarlet, resembles the old Bubach very much indeed, both in plant and fruit.

Chesapeake (Perfect): Comes from Maryland, and introduced by W. F. Allen. The plant is large with thick leathery leaves, quite healthy, only medium in productiveness. The berry is large, round with a nose, bright, glossy, scarlet, resembles Bismarck; solid, flesh white and pink, worthy trying by those looking for large, late, firm berry.

Commonwealth (Perfect): A good late sort, originated by W. H. Munroe, of Massachusetts. Plant healthy, good growers and quite productive. The berry is large, dark, glossy, red, firm, good quality, will ship well, quite late.

Cardinal (Imperfect): Sent me by Mr. Streator, of Ohio. The plant is a healthy free runner, but must be well fertilized to produce well. The berry is large, bright, glossy and very firm and good flavor.

Clyde (Perfect): One of the best known, originated by Dr. Stayman, of Kansas. Plant is weakening, does not produce foliage enough; the berry is very large and good quality, light scarlet color.

Corsican: Same as Armstrong.

Diamond (Imperfect): Sent me by J. A. Baner, of Arkansas. The plant is a strong, vigorous, healthy grower, and quite productive; will give further trial.

Dixie Belle (Imperfect): Plant vigorous and free from rust. Berry large, regular in shape, bright red; comes from North Carolina; will give further trial.

Dighton Rock (Perfect): Sent me by A. B. Howard, of Massachussetts. Plant healthy. Vigorous grower, did fairly well; will try it another year before deciding its value.

Ekey (Perfect): This did well, and the fruit was extra fine. The plant is a good strong grower, healthy and productive. The berry is large, long, bright, dark, glossy, red with red seeds, solid and firm; so different from other kinds in appearance that it attracts attention, quality is good, season early—medium and short. The whole crop ripens almost at once, two or three pickings and it is over.

Early Hathaway or Texas (Perfect): Sent me by the originator, in 1902; afterwards introduced by another party as the Texas. It is quite well known now by one or other title. Originated by same as the Excelsior; is a little later than Excelsior, larger and a heavier yielder; foliage is dark and healthy, a fair runner, berry roundly conical, red flesh, good quality, medium to large, a good medium early.

Early Market (Perfect): Plant quite healthy, makes runners freely and productive, runs through a long season, a good early, the berry is medium size and roundish and fair quality.

Early Beauty (Perfect): Introduced by Mr. Crawford, who sent me plants. Plant is a good runner and healthy, and quite productive, berry roundish, bright red, flesh red, did well the past season.

Ernie (Perfect): The plant is a strong, healthy grower and quite productive; a good early sort. The berry is large for so early a berry; it is a good red with yellow seeds, round, a good medium early, worth a trial.

Elma (Imperfect): Sent me by the originator, J. H. Black, of New Jersey. It is a cross of Nettie and Robbie, fertilized by Joe. The plant is very healthy, no trace of rust, strong grower and quite productive. The berry is large to very large, roundish in shape, a bright red color, pink flesh, medium firm, very late. One of latest.

Evening Star (Perfect): A seedling of Gandy. Plant is a good grower and healthy; berry is large and quite firm, some claim that it is a better late one than the Gandy, it did well the past season with me, I will give it another trial. I have only fruited it once.

Emperor and Empress (Perfect): These two sorts are so much alike, can note very little difference between them. Originated by the late John Little, of Granton, Ont. The plant is strong and healthy, berry is large and fine looking and good quality.

Fountain (Perfect): Plant is healthy and very vigorous grower, and quite productive. The berry is large, conical, firm, a fine dark scarlet with yellow seeds, a good flavor, a good shipping berry, did very well again this season.

Florella (Perfect): A seedling of Bubach, plant healthy, a good grower, quite productive, the berry is large, bright glossy red, blunt heart shaped, flesh red and solid, somewhat irregular, early mid-season.

Golden Gate (Perfect): Originated by S. H. Warren, of Massachussetts. A vigorous grower, makes large plants with luxuriant foliage and quite productive. The berry is large, bright dark scarlet, roundish with a neck, yellow seeds, good quality. It has strong staminate blossoms with a lot of pollen. I should say from one fruiting this will prove a good one. I was very pleased with it. I would recommend it.

Gill (Perfect): A good extra early, sent me by Mr. Crawford, of Ohio. The plant is thrifty and makes runners freely, is healthy, light color and quite productive. The berry is rounded, conical, large, scarlet, yellow and red seeds, good flavor, extra early; well worth a trial, did very well first year of fruiting.

Good Luck: Sent out by W. F. Allen, Maryland. Made a good showing the past season. The plant is one of the strongest I have on my place. Vigorous and healthy, originated by E. Pedrick, of New Jersey. The fruit is as large as Gandy, as productive and almost about the same season. Conical, dark glossy red, ripens all over at once, no green tips; a good one.

Goldsborough (Perfect): Originated by A. T. Goldsborough, of Washington, D.C. The plant is healthy, tall and upright, a good grower and quite productive. The berry is round, regular and smooth, bright scarlet with yellow seeds, spicy flavor, flesh red all through, a good one, worth a trial. Did well with me.

Great Scott (Imperfect): Introduced by S. H. Walter, Massachussetts. The plant is a good one, healthy and good grower. No rust. The berry is large, a bright scarlet, good quality and quite productive.

Gov. Rollins (Imperfect): Originated by Benj. Smith, Massachussetts, and named in honor of Geo. Rollins, of New Hampshire. The plant is medium in size but healthy. Berry is large and firm, dark red and good quality and productive, holds its size to last picking.

Gen. Joe Wheeler (Perfect): Introduced by W. F. Allen, Maryland. This is a southern berry. supposed to be a seedling of Lady Thompson, and resembles that variety very much; did only fairly well; will give further trial.

Glen Mary (Perfect): Introduced ten or twelve years ago by W. F Allen. It is well known and widely grown, one of the standards. Plant is strong and healthy, large dark green foliage, the berry is large, irregular, dark red, prominent yellow seeds, flesh red, good quality, is a good firm shipper, it is popular for fancy local market, few any better.

Gandy (Perfect): A standard late, very well known, made a good showing on my place past year.

Greenville (Imperfect): Resembles the Bubach; berry is not as large; the plant is healthy, dark green a good runner and quite productive; berry is large, bright red, medium in firmness, a good one.

Haverland (Imperfect): One of the standards, and most productive; the plant is a strong grower and good runner, a great favorite with many; its only weakness is its weak fruit stalks, being unable to hold up the mass of berries it produces.

Hummer (Perfect): Sent out by W. F. Allen, 1907. It is well named, for it is a hummer. The plant is large, healthy and good grower and quite productive, the berry is large, bright scarlet, pink flesh, yellow seeds, firm good quality, a good one, all growers should try it.

Hundred Dollar (Perfect): Sent me by introducer, W. Hathaway, of Ohio. The plant is large, strong and healthy, a good grower, fairly productive. The berry is of the largest size, scarlet, with red seeds, flesh white or pink, good mild flavor, resembles Woolverton, also Ryckman, a fancy berry, a good one.

Heflin's Early (Perfect): A good early kind. The plant is a fair grower. Berry is a good size, firm and of good quality.

Howard's No. 3 (Perfect): Originator, A. B. Howard, of Massachusetts. A seedling of Clyde, and shows its parentage in its productiveness and color of plant; a rampant grower and very productive. Berry is medium to large, conical, firm, bright, scarlet or yellow seeds, a good early market variety.

Howard's No. 7 (Imperfect): Seedling of Haverland and Marshall, sent me by A. B. Howard. Plant is healthy, good grower and productive. The berry is conical, good flavor, of good size.

Howard's No. 103 (Imperfect): A seedling of a Crescent and Clyde cross sent me by originator. The plant is healthy, a good grower and productive. The berry is large, roundly conical, dark red and firm. Seeds somewhat early.

Howard (Perfect): Seedlings of Button's E, fertilized by Gandy, sent me by originator, J. H. Black, of New Jersey. The plant is large, strong and healthy, very dark green foliage. Berry is large, dark red and firm, season late, fairly productive, a fine looking berry.

Howard's No. 2 (Imperfect): Originated by late G. W. Howard, of Michigan. The plant is small, a good runner, some rust, but quite productive. The berry is good size, roundish, solid flesh, pink, good quality. Did very well the past season.

Howard's No. 96 (Perfect): Originated by late G. W. Howard. The plant is healthy, good runner and quite productive; berry is medium to large, dark scarlet color, flesh red, solid, firm and good quality, late.

Ham (Perfect): Sent me by originator, J. H. Black. A seedling of Mary and Parker Earle; it resembles Mary very much. A good healthy grower: very dark and green foliage, medium in productiveness; berry is large, dark red, flesh red, good flavor, firm and smooth.

Irena (Perfect): Sent me by originator, W. S. Butler, of Wisconsin. A seedling of Jesse and Warfield. The plant is a good healthy grower, making plants freely. With me it could not have been well fertilized, as I got very few berries from it, will give further trial, a failure so far.

Ideal (Perfect): A seedling of Bubach and Hoffman, by Mr. Kerr, of Maryland. Plant is a good healthy grower and fairly productive. The berry is true conical, every one as if turned in a lathe; bright scarlet, yellow seeds, fair quality, berries all same size and shape, firm, fine looking, but weak in productiveness.

Jacoma (Perfect): A good one. The plant is healthy, a strong grower, makes plants freely and is quite productive. The berry is large, bright red, medium in firmness, of good quality, worth a trial, and did well with me.

Joe (Perfect): Sent me by the originator, J. H. Black, of New Jersey, eight years ago. Has always done well; better this year than ever before. The plant is healthy, a good grower and very productive. The berry is large and regular in shape, a bright glossy scarlet, obtuse, conical, uniform in size, fine quality, season medium to late. A very good one.

Johnson's Early (Perfect): Medium early plant, small dark green foliage, never has done very well here on my soil; berry sour, not productive enough, said to do well in some places. I shall drop it.

King Edward U.S. (Perfect): Sent me by the originator, D. J. Miller, of Ohio; has done well. The plant is very large, healthy and strong, a good runner, rooting quickly and easily and quite productive. The berry is large, roundish, a bright scarlet with red seeds, firm, flesh white, of fine quality, a good one. Not yet introduced, will be offered for sale spring 1910.

King Edward, Ont.: Sent me by Mr. Chrysler, of Galt. Plant is healthy, fair grower, fairly productive. I have fruited it once; will give it further trial. It is unfortunate that we have two new ones of the same name. It will cause a good deal of confusion, and make the names too long to distinguish the one from the other.

Kitty Rice (Imperfect): Comes from Ohio. Has always done well. The plant is a good grower, strong and healthy, makes runners freely and quite productive. The berry is large, roundish, a fine glossy red, firm and good quality, looks well in the basket, a good one.

Latest (Imperfect): Sent out by S. H. Warren, of Massachussetts, from whom I got my plants. Plant is healthy and large, does not make many runners, stools out and is quite productive; a good one for the hill system. The berry is large, crimson, conical, firm and good quality, season the latest. A very promising later variety; berry not quite as large as Nettie, but better looking, more attractive.

Louis Hubach (Imperfect): From Arkansas. Sent me by the originator. A seedling of Warfield and Lady Thompson. Plant a good runner, healthy and productive. The berry is a bright red, with yellow seeds, conical, flesh red and solid, fair quality, medium in firmness, a good market sort.

Lyon (Imperfect): Plant good runner and productive. Berry is long and pointed, a dark glossy red with red seeds; flesh red, fair size; resembles the old Longfield. Medium to late, good quality.

Lester Lovett (Perfect): A second Gandy; so much like it in plant and fruit and season. No difference can be seen between them. No doubt a seedling of Gandy.

Miss Boston (Imperfect): Plant healthy, a good grower, dark green foliage. Berry large, bright red, fair quality; fruited once, will give a further trial.

McNeil (Perfect): Plant strong, healthy grower, dark green foliage, productive. Berry large, oblong, roundish, flesh red, medium in firmness, fine quality, a good one and worth a trial.

Mrs. Mark Hana (Perfect): Plant healthy, a good strong flavor, some rust. Berry large and fine, only medium in productiveness.

Mrs. Miller (Imperfect): The plant is a strong healthy grower, not very productive; the berry is large, bright red, oblong, somewhat flattened, season, medium, late.

Millie Hubach (Imperfect): Sent me by the originators. The plant is a good plant maker and quite productive. The berry is a bright scarlet, with yellow seeds, conical, with slight neck, flesh pink and white, good quality, a good market sort, did well this season.

Mead (Perfect): Originated by H. O. Mead, of Massachussetts. It has done well, is a good one. The plant is a good grower, healthy, runs freely, dark green foliage. The berry is large, bright red, coloring all over at same time, firm, good quality, worth a trial by all.

Minute Man (Imperfect): Here is a good one, very promising. The plant is a good strong grower, somewhat like Senator Dunlap; free from rust

and quite productive. The berry is very regular and smooth, large, crimson, with yellow seeds, flesh reddish pink all through, good quality, medium firm, worth a trial.

Margaret (Perfect): Plant is healthy, and if it gets good treatment will produce the first berries. Will not stand neglect, one for the amateur grower.

Marie (Perfect): A fine market berry, a seedling of Crescent, very productive, of good large weight, berry acid but spicy, medium firm.

New York (Perfect): See Armstrong.

Nettie (Imperfect): One of last late, sent me by originator, J. H. Black, of New Jersey. Plant a good strong grower, free plant maker and quite productive. The berry is one of the largest but irregular, only medium in firmness. It is perhaps the latest. Has done well with me.

Oak's Early (Perfect): The plant is small but a good vigorous grower, and quite productive; berry is medium in size, dark red, with red seeds, flesh red, early to mid-season.

Oswego (Perfect): Sent me by L. J. Farmer, of New Jersey, who introduced the variety 27 years ago. The plant is quite vigorous, healthy and good grower and productive; the berry is roundish, of good form, large, mid-season to latest; fruited once. It did well; worth a trial.

Parson's Beauty (Perfect): Comes from Maryland. Plant is healthy, good grower, strong, dark green foliage, quite productive; the berry resembles the old Wilson, a dark rich scarlet, yellow seeds, firm and good quality, a good market sort.

President (Imperfect): A good one for fancy market. Plant is a good grower, but develops some rust, fairly productive. The berry is large and fine looking. Medium in firmness. Has done well with me.

Pan American (Perfect): A sport of Bismarck, grown as a fall bearer. No value for market. I have given it a trial for four years, bears a few berries through the summer, and into October; not of much value.

Prof. Fisher (Perfect): A seedling of Bubach and Sharpless. Plant is strong, large, healthy and produces a few very large and fine berries, but not enough.

Red Bird (Perfect): Sent me by W. F. Allen, of Maryland. It comes from the south; an early sort, makes plants freely; healthy, and quite productive; I should say quite productive for an early berry. I have fruited it once; a good color, medium in size. It is promising as an early kind.

Ridgeway (Perfect): Here is a good old kind. Has always done well, producing some of the finest berries of any plant; is large, healthy, stools out; does not make many plants, but is quite productive. The berry is large, roundish, a dark bright red, with golden seeds, firm and good quality. Worth trying.

Ryckman (Perfect): A fancy berry. Plant is large, free grower. Berry is large with a neck conical; very good flavor, medium in productiveness; resembles the Woolverton. Would fill in fancy market.

Ruby (Perfect): An old standard, one of the good ones; good plant maker, dark foliage and productive. The berry is large, conical, good quality; has always done well; worth a trial by all.

Saratoga (Perfect): A seedling of Glen Mary and Sample, originated by Wm. Palmer, of New York, and sent me a year ago. The plant is large, resembles Glen Mary, makes plants freely, strong and healthy. The berry is large to very large, dark red color, good shape and productive, medium to late, a good one. I was pleased with it from once fruiting it.

St. Louis (Perfect): Originated by J. A. Baner, who sent me plants of it. The plant is a healthy good grower. It ripens its crop in short time as early as Excelsior. Will give it a further trial; I have fruited it once.

Sample (Imperfect): One of the best standards and best market kinds, very widely grown now. Has always done well, with plant healthy and vigorous and very productive.

Splendid (Perfect): This is one of the most profitable market sorts, has always done well; the plant is a healthy vigorous grower and quite productive. The berry is large, round, bright color, scarlet, firm, a good shipper. All should try it; one of the best; well named.

Success (Perfect): Plant a good grower, productive. Berry is large, roundish, conical, dark scarlet, firm, good flavor, a good early.

Senator Dunlap (Perfect): This is a good one; has always done well; a good healthy variety. Plant a good, strong, vigorous grower and very productive; berry conical, dark scarlet, firm, medium to late.

Stevens Late Champion (Perfect): Plant healthy, a good free runner and productive; berry is large, roundish, scarlet, with golden seeds, resembles Glen Mary, firm, good quality; a good late sort.

Tennessee Prolific (Perfect): One of the best market varieties; an old standard; has always done well; so well known needs no description, mid-season.

Three W's (Perfect): One of the most productive; did very well the past season. I have fruited it three times, and it seems to do better each time. The plant is a strong, healthy, vigorous grower, makes plants freely and very productive. The berry is large, conical and blunt at end, good shape, a bright, dark, glossy scarlet, with yellow seeds, fine flavor, firm pink flesh, medium to late season. All should grow this fine variety.

Texas (Perfect): Same as Early Hathaway.

Uncle Jim (Perfect): Like Armstrong; see description; a good fancy berry.

Uncle Sam (Imperfect): Plant is large,healthy, good grower and productive; the berry is one of the largest; roundish, bright glossy scarlet, with red seeds, good quality, medium firm, mid-season to late.

Virginia (Imperfect): Originated by Thos. J. Custis, of Virginia. A seedling of Hoffman and Sharpless. A good grower, runs freely, dark green foliage, productive, conical, blunt at end, medium in size, dark red with red seeds; flesh red; firm, mid-season, fair quality.

Van Deman (Perfect): One of the best early sorts here. Runs through a long season, does not do well with some growers. Plant is small, good grower; dark green foliage. The berry is conical, good size, bright, glossy, dark scarlet, with yellow seeds; very handsome, firm, and best quality.

Victor (Perfect): Plant a good strong grower, dark foliage, and productive. The berry is large and fine looking, dark crimson, with yellow seeds; firm and good quality, originated by D. J. Miller, of Ohio.

Wonder (Perfect): Or Sampsell's Wonder. Plant a strong grower and productive. Berry is large to very large, dark bright red and good quality, medium to late season, a good one.

Wm. Belt (Perfect): One of the best old kinds; did very well again the past season, but had some rust on the plants; the first or king berry is often very irregular, but the remaining berries are very regular and fine. The berry is a bright scarlet, firm and good quality, medium season.

Williams (Perfect): Widely grown for shipping. It can be picked before it is ripe, as it begins to color before it is ripe. Only medium in quality. Some seasons it rusts a good deal, but is a very productive variety, of large, good looking berries.

Warfield (Imperfect): One of the most productive when it gets plenty of water; very vigorous grower. The berry is conical, dark crimson; a good canning variety on account of dark color; plant is very sensitive to dry weather.

World's Wonder (Perfect): The plant is a strong, healthy grower and very productive; claimed to be as productive as the Haverland; it certainly did well the past season with me. The berry is large and very fine, a bright dark red and quite firm, for so large a berry; a good one, and worth a trial by all growers.

Woolverton (Perfect): Originated by the late John Little, of Granton, Ont. One of the largest and finest berries. The plant is a strong and healthy one, blossoms all open through a long season; a good pollenizer for pistillates.

Yant (Perfect): The plant is healthy, light colored foliage, strong grower, productive, the berry is large, regular, with a neck, mid-season to late, a good one.

New Varieties for Trial.

Last spring I had a number of new seedlings sent me by the originators and introducers of new varieties for trial. I have them planted in a trial plot with the older kinds for next year's fruiting. Some of them have made a very good showing considering the drouth we have had during the growing season. They are as follows: Bountiful, Battenburg (Goldsborough), Chas. Newman, Dickey, Jim Dumas, Feudall, Myer's No. 1, Howard's No. 1, Early Harvest, Island King, Minnie's Early, Mammoth Beauty, Pocahontas, Penn Dutchman, Southern Beauty, Shipping King, 1st Quality, W. H. Taft, July 1st. And the following sent me by A. T. Goldsborough, of Washington, D.C.: St. Louis, Taft, Outlands, Battenburg, Howard's No. 2 and 17 and Highland.

List for Growers and Seasons of Fruiting.

Extra Early and Early: Gill, Van Deman, Michel, Success, Heflin's Early, Early Hathaway, Howard's No. 3, Staples, Bederwood, Excelsior, Oak's Early, Red Bird.

Early Mid-season: Ekey, Splendid, Golden Gate, Goldsborough, Tennessee Prolific, Warfield, Bismarck, Senator Dunlap, Haverland, Bubach, Parson's Beauty, Marshall.

Mid-season: Three W's, World's Wonder, Chipman, King Edward (U.S.), McNeil, Good Luck, Beidler, Hundred Dollar, Hummer, Glen Mary, Jacoma, Mead, Minute Man, Brandywine, Sample, President, Kitty Rice, Uncle Sam, Wonder, Arnout, Wm. Belt, Greenville, Virginia, Marie, Colossus.

Late to Extra Late: Aroma, Joe, Saratoga, Oswego, Gandy, Abingdon, Chesapeake, Latest, Stevens Late Champion, Commonwealth, Cardinal, Elma, Nettie, Howard's No. 96.

SPECIAL EXPERIMENTS.

REPORT ON CRANBERRY EXPERIMENTS, 1908.

By A. McMeans, O.A.C., Guelph.

The cranberry is more closely restricted by natural conditions than any other fruit industry of economic importance. The peculiar requirements of the plant limit its culture to regions possessing a cool climate, a rich alluvial soil, and where an abundance of sand is easily available, together with an almost unlimited water supply.

The Province of Ontario has depended on the United States for the bulk of its cranberry supply. Of late years, the Province of Nova Scotia is coming to the front as a producer of cranberries, the crop in that Province this year being estimated at 10,000 barrels.

The imports to Canada from the United States are as follows:

Year.	Amount in bushels.	Value.	Value per bushel.
1903	17,168	$37,412 00	$2 18
1904	21,662	53,365 00	2 46
1905	24,560	51,554 00	2 10
1906	15,091	39,160 00	2 59
1907	26,514	75,014 00	2 83
	104,995	$256,505 00	$2 44

The protective duty on cranberries is 25 per cent., thus making the average value of a bushel of cranberries $2.44 plus 61c., total, $3.05 per bushel, exclusive of freight charges. The present price of cranberries in Toronto markets are as follows: Cape Cod, $15 to $16 per barrel; Nova Scotias, $10 to $11 per barrel.

Some cranberries are grown naturally in Ontario; Parry Sound, Manitoulin Island, Simcoe, Prescott, and Norfolk counties, being the only places I know of where they have been marketed.

There is a marsh of seven or eight acres on the farm of Mr. Ackerman, Delhi, Ontario, where cranberries have been growing for a number of years. Of late years the owner has been harvesting and selling them for profitable prices, but he did not know anything regarding cultivation or propagation of the vines, with the result that the vines grew in patches, and generally matted so heavily as not to produce a full crop.

A small plot was cleared on the above marsh, and was planted on June 9th, as a test of some seven varieties. The following varieties were secured from Nova Scotia: Large Bell, Neily Bell, and Large Cherry; Early Black, Howes, Centreville, and McFarlin were secured from Cape Cod district. The vines have done very well considering the dry weather of the past season. Mr. Ackerman is very much interested, and has prepared during the past summer, one-half acre of the marsh, and would be pleased to plant it out as a larger test feeling sure that cranberry growing can be made a profitable business in Ontario where carried on under suitable and proper conditions.

Another small plot consisting of the same varieties was planted at Dunnville on June 10th, at the request of Mr. M. J. Cleary of that place, but owing to the conditions not being as suitable, they have not done so well.

When in a commission house in Ottawa this fall, I saw eighty-five bushels of cranberries that were grown in the vicinity of Plantagenet Springs, there being some bogs there capable of development.

Communications have also been received at the College from Midland, Orillia and Londesborough, regarding the cultivation of cranberries, suitable soil, etc.

I may also state that the estimated price of preparing and planting an acre of bog in the Cape Cod district varies from $250 to $300. The yields of fruit are quite variable. One hundred bushels per acre is considered a good average yield, and in the best seasons one hundred barrels per acre have been gathered. According to the United States census of 1900, Massachusetts had 5,128 acres devoted to cranberries, with a yield of 598,906 bushels, an average of 117 bushels per acre.

From the above it will be seen that with suitable conditions and a careful study of the subject, cranberry growing may be made to pay in Ontario.

FERTILIZER EXPERIMENTS WITH ONIONS.

By A. McKenney, B.S.A., Essex.

Owing to the fact that the season of 1907 was extremely unfavorable for the growth and maturing of the onion crop, this crop was almost a total failure in the Leamington onion section. A large part of the crop was scallions, and did not mature.

From one experiment conducted in 1907, with a complete fertilizer, marked results were obtained. The onions on this plot matured a month earlier than any of the others, and gave a large yield of perfect bulbs. This led us to undertake a series of experiments to find out if fertilizers affect the yield, maturity of the onions, and which fertilizer, or combination of fertilizers gave the best results.

Ten growers were selected on different portions of the marsh, and in each case five plots were laid out. In each case the experiments were conducted carefully and accurately, with very contradictory results. This may have been due to the season, which was a very dry one, the different methods of cultivation, the previous cropping and treatment of the soil. If it were possible to repeat our experiments on the same plots for another year, very favorable results might be obtained.

However, from a study of the results of the year's experiments, we have come to the conclusion that in order to obtain reliable and accurate data as to the value of fertilizers, when applied to muck soils, that it will be necessary to conduct the experiments upon soil of which we have definite information regarding its previous cropping and treatment.

If these experiments could be spread over a series of five years, with climatic conditions under observation, and mechanical conditions under control, we could, I think, be in a position to state definitely the value of fertilizers when applied to muck soils.

In order to do this, I think the co-operation plan should be abandoned, and at least one acre of land procured, and the experiments conducted upon this. This could be procured at a very reasonable figure, and with seeding, cultivation, and other conditions under our control, we should be in a position in five years at least, to collect much more valuable data than we could hope to in a co-operative way, with so many things occuring to make the results unreliable.

APPENDIX.

FRUIT PRIZE LIST AT ONTARIO HORTICULTURAL EXHIBITION, 1908.

APPLES.

Class 1.—Export of Foreign Market Varieties.

(*a*) *Barrels ready for Shipment.*

Baldwin: 1st, Gilbertson, Jos., Simcoe; 2nd, Norfolk F. G. A., Simcoe; 3rd, Johnson, Jas. E., Simcoe.
Ben Davis: 1st, Oshawa F. G. A.; 2nd, Chatham F. G. A; 3rd, Dempsey, Frank, Albury.
Golden Russet: 1st, Oughtred, W. C., Clarkson; 2nd, Chatham F. G. A.; 3rd, Guthrie, J. B., Dixie.
Greening (R. I.): 1st, Johnson, Jas. E.; 2nd, Dempsey, W. H., Trenton; 3rd, Oshawa F. G. A.
King: 1st, Norfolk F. G. A., Simcoe; 2nd, Gilbertson, Jos.; 3rd, Johnson, Jas. E.
Spy: Johnson, Jas. E.; Gilbertson, Jos.; Norfolk F. G. A.
Stark: Oughtred, W. C.; Oshawa F. G. A.

(*b*) *Standard Boxes ready for Shipment (Unwrapped).*

Baldwin: 1st, Thompson, R., St. Catharines; 2nd, Watson, W. G., Dixie; 3rd, Stewart, F. G., Homer.
Fameuse: 1st, Watson, W. G.; 2nd, Dempsey, W. H.; 3rd, Brown Bros., Humber Bay.
Golden Russet: 1st, Watson, W. G.; 2nd, Gilbertson, Jos.; 3rd, Brown Bros.
Greening (R. I.): 1st, Stewart, F. G.; 2nd, Norfolk F. G. A.; 3rd. Watson, W. G.
King: 1st, Watson, W. G.; 2nd, Thompson, Robt.; 3rd, Gilbertson, Jos.
McIntosh: 1st, Parker, W. C., Humber Bay; 2nd, Oshawa F. G. A.; 3rd, Stephens, C. L., Orillia.
Spy: 1st, Gilbertson, Jos.; 2nd, Johnson, Jas. E.; 3rd, Watson, W. G.

(*c*) *Standard Boxes ready for Shipment (Fruit Wrapped).*

Fameuse: 1st, Watson, W. G.; 2nd, Thompson, Robt.; 3rd, Norfolk F. G. A.
Gravenstein: 1st, Thompson, R.; 2nd, Norfolk F. G. A.; 3rd, Gilbertson, Jos.
King: 1st, Gilbertson, Jos.; 2nd, Oshawa F. G. A.
McIntosh: 1st, Parker, W. G.; 2nd, Harkness, A. D., Irena; 3rd, Oshawa F. G. A.
Spy: 1st, Norfolk F. G. A.; 2nd, Johnson, Jas. E.; 3rd, Gilbertson, Jos.
Wealthy: 1st, Oshawa F. G. A.; 2nd, Guthrie, J. B.; 3rd, Whyte, David, Woburn.

Class 2.—Domestic or Home Market Varieties.

(*a*) *Barrels ready for Shipment.*

Blenheim: 1st, Brown Bros.; 2nd, Parker, W. C.; 3rd, Oshawa F. G. A.
Gravenstein: 1st, Oshawa F. G. A.
Ontario: 1st, Guthrie, J. B.
Tolman: 1st, Norfolk F. G. A.; 2nd, Oshawa F. G. A.; 3rd, Guthrie, J. B.
Roxbury Russet: 1st, Oshawa F. G. A.
Any other variety not named in Class 1: 1st, Norfolk F. G. A.; 2nd, Oshawa, F. G. A.; 3rd, Norfolk F. G. A.

(*b*) *Standard Boxes ready for Shipment (Fruit Unwrapped).*

Blenheim: 1st, Watson, W. G.; 2nd, Brown Bros.; 3rd, Oshawa F. G. A.
Gravenstein: 1st, Thompson, R.; 2nd, Guthrie, J. B.; 3rd, Gilbertson, Jos.
Ontario: 1st, Guthrie, J. B.; 2nd, Brown Bros.
Ribston: 1st, Norfolk F. G. A.; 2nd, Guthrie, J. B.
St. Lawrence: 1st, Watson, W. G.; 2nd, Oshawa F. G. A.; 3rd, Guthrie, J. B.
Any other desirable variety not named in Class 1: 1st, Norfolk F. G. A.; 2nd, Norfolk F. G. A.; 3rd, Oshawa F. G. A.

Class 3. Dessert Varieties, Plates of Five.

Fameuse: 1st, Watson, W. G.; 2nd, Thompson, Robt.; 3rd, Guthrie, J. B.
Golden Russet: 1st, Brown Bros.; 2nd, Bennett, C. A., Burlington; 3rd, Guthrie, J. B.
King: 1st, Challand, C. W., Marburg; 2nd, Watson, W. G.; 3rd, Brown Bros.
McIntosh: 1st, Stephens, C. L.; 2nd, Michael, J. G., Brooklin; 3rd, Parker, W. C.
Wealthy: 1st, Brown Bros.; 2nd, Guthrie, J. B.; 3rd, Parker, W. C.
Spy: 1st, Challand, C. W.; 2nd, Gilbertson, Jos.; 3rd, Watson, W. G.
Spitzenburg: 1st, Challand, C. W.; 2nd, Thompson, Robt.; 3rd, Watson, W. G.
Any other Variety: 1st, Stevenson, W.H., Oshawa; 2nd, Stephens, C. L.; 3rd, Watson, W. G.

Class 4.—Cooking Varieties, Plates of Five.

Alexander: 1st, Brown Bros.; 2nd, Caston, G.C., Craighurst; 3rd, Guthrie, J. B.
Baldwin: 1st, Challand, C. W.; 2nd, Gilbertson, Jos.; 3rd, Thompson, R.
Blenheim: 1st, Brown Bros.; 2nd, Brown, N. A., Eglinton; 3rd, Guthrie, J. B.
Cayuga: 1st, Johnson, Jas. E.; 2nd, Brown Bros.; 3rd, Parker, W. C.
Greening, R. I.: 1st, Thompson, R. W., Ellesmere; 2nd, Dempsey, W. H.; 3rd, Brown Bros.
King: 1st, Challand, C. W.; 2nd, Gilbertson, Jos.; 3rd, Johnson, Jas. E.
Ribston: 1st, Brown, N. A.; 2nd, Brown Bros.; 3rd, Thomson, R. W.
Spy: 1st, Challand, C. W.; 2nd, Johnson, Jas. E.; 3rd, Gilbertson, Jos.
Any other Variety: 1st, Challand, C. W.; 2nd, Harris, Craig; 3rd, Stainton, W. H.

Class 5.—Cones of Fruit.

Ben Davis: 1st, Oshawa, F. G. A.; 2nd, Caston, G. C.; 3rd, Chatham F. G. A.
Baldwin: 1st, Watson, W. G.; 2nd, Guthrie, J. B.; 3rd, Oshawa F. G. A.
Blenheim: 1st, Brown Bros.; 2nd, Watson, W. G.; 3rd, Oshawa F. G. A.
Gravenstein: 1st, Brown Bros.; 2nd, Guthrie, J. B.; 3rd, Oshawa F. G. A.
Fallawater: 1st, Oshawa F. G. A.; 2nd, Brown Bros.; 3rd, Guthrie, J. B.
Fameuse: 1st, Watson, W. G.; 2nd, Dempsey, W. H.; 3rd, Guthrie, J. B.
King: 1st, Norfolk F. G. A.; 2nd, Watson, W. G.; 3rd, Oshawa F. G. A.
McIntosh: 1st, Oshawa F. G. A.; 2nd, Harkness, A. D.; 3rd, Watson, W. G.
Ontario: 1st, Watson, W. G.; 2nd, Guthrie, J. B.; 3rd, Oshawa F. G. A.
Spy: 1st, Norfolk F. G. A.; 2nd, Guthrie, J. B.; 3rd, Watson, W. G.
Wolf River: 1st, Whyte, David: 2nd, Stephens, C. L.; 3rd, Caston, G. C.

PEARS.

Class 6.—Plates of Five.

Anjou: 1st, Guthrie, J. B.; 2nd, French, Wm. H.; 3rd, Thompson, R.
Bosc: 1st, Smith, A. M.; 2nd, Thompson, R.; 3rd, Read, M. A., Port Dalhousie.
Clairgeau: 1st, Read, M. A.; 2nd, Stewart, F. G.; 3rd, Robertson, G. A.; St. Catharines.
Diel: 1st, Smith, A. M.
Duchess: 1st, Stewart, F. G.; 2nd, Guthrie, J. B.; 3rd, Thompson, R.
Howell: 1st, Smith, A. M.; 2nd, Thompson, R.; 3rd, Delworth, Thos.
Keiffer: 1st, Smith, A. M.; 2nd, Tenbroeck, A. E.; 3rd, Bunting, T. G.
Lawrence: 1st, Stewart, F. G.; 2nd, Peart, A. W.; 3rd, Thompson, R.
Winter Nelis: 1st, Read, M. A.; 2nd, Thompson, R.; 3rd, Stewart, F. G.
Any other Variety: 1st, Smith, A. M.; 2nd, Read, M. A.; 3rd, Smith, A. M.

Class 7.—Export Varieties.

Boxes ready for Shipment (Fruit Wrapped).

Anjou: 1st, Guthrie, J. B.; 2nd, Thompson, R.; 3rd, Stewart, F. G.
Bosc: 1st, Stewart, F. G.; 2nd, Robertson, G. A.; 3rd, Smith, A. M.
Clairgeau: 1st, Robertson, G. A.; 2nd, Stewart, F. G.; 3rd, Thompson, R.
Duchess: 1st, Robertson, G. A.; 2nd, Thompson, R.; 3rd, Stewart, F. G.
Winter Nelis: 1st, Stewart, F. G.; 2nd, Robertson, G. A.; 3rd, Thompson, R.
Kieffer: 1st, Tenbroeck, A. E.; 2nd, Bunting, T. G.; 3rd, Stewart, F. G.
Lawrence: 1st, Thompson, R.; 2nd, Robertson, G. A.; 3rd, Stewart, F. G.

GRAPES.

Class 8.—Plates.

1st, Stewart, F. G.; 2nd, Tenbroeck, A. E.; 3rd, Robertson, G. A.

Concord: 1st, Stewart, F. G.; 2nd, Bunting, T. G.; 3rd, Thompson, R.

Lindley: 1st, Stewart, F. G.; 2nd, Robertson, G. A.; 3rd, Thompson, R.

Niagara: 1st, Bunting, T. G.; 2nd, Stewart, F. G.; 3rd, Tenbroeck, A. E.

Vergennes: 1st, Stewart, F. G.; 2nd, Thompson, R.; 3rd, Robertson, G. A.

Wilder: 1st, Stewart, F. G.; 2nd, Thompson, R.; 3rd, Tenbroeck, A. E.

Any other desirable Variety: 1st, Stewart, F. G.; 2nd, Robertson, G. A.; 3rd, Tenbroeck, A. E.

Best 9 lb. basket Black Grapes: 1st, Bunting, T. G.; 2nd, Robertson, G. A.; 3rd, Stewart, F. G.

Red Grapes: 1st, Stewart, F. G.; 2nd, Thompson, R.; 3rd, Bunting, T. G.

White Grapes: 1st, Bunting, T. G.; 2nd, Stewart, F. G.; 3rd, Robertson, G. A.

Best Fancy Package.

Black Grapes: 1st, Thompson, R.; 2nd, Robertson, G. A.; 3rd, Stewart, F. G.

Red Grapes: 1st, Robertson, G. A.; 2nd, Stewart, F. G.; 3rd, Thompson, R.

White Grapes: 1st, Robertson, G. A.; 2nd, Thompson, R.; 3rd, Stewart, F. G.

Display of fruit in commercial packages exhibited by an Agricultural or Horticultural Society, or Fruit Growers' Association, table space limited to 60 sq. ft. for each exhibit: 1st, Norfolk F. G. A., Simcoe; 2nd, St. Catharines Cold Storage Association, St. Catharines; 3rd, Grantham F. G. A., St. Catharines.

Display of fruit not in commercial packages, exhibited by an Agricultural or Horticultural Society, or Fruit Growers' Association, table space limited to 60 sq. ft. for each exhibit: 1st, St. Catharines Cold Storage Association; 2nd, Grantham F. G. A.; 3rd, Norfolk F. G. A.

Class 9.—Apples.

Display of apples not in commercial packages, exhibited by an Agricultural or Horticultural Society, or Fruit Growers' Association, table space limited to 60 sq. ft. for each exhibit: 1st, Norfolk F. G. A.; 2nd, Oshawa F. G. A.; 3rd, East Simcoe Agricultural Society, Orillia.

PRESERVED FRUIT.

Class 10.—Quart Sealer of Canned Fruit of each of the Following Varieties.

Blackberries: 1st, Tenbroeck, A. E., St. Catharines; 2nd, Guthrie, Mrs. J. B., Dixie.

Cherries, Black and Red: 1st, Depotie, Mrs. P. A., St. Catharines; 2nd, Stewart, Mrs. F. G., Homer; 3rd, Thompson, Mrs. R., St. Catharines.

Cherries, White or Yellow: 1st, Depotie, Mrs. P. A.; 2nd, Stewart, Mrs. F. G.; 3rd, Thompson, Mrs. R.

Gooseberries: 1st, Thompson, Mrs. R.; 2nd, Depotie, Mrs. P. A.; 3rd, Stewart, Mrs. F. G.

Grapes, Black or Red: 1st, Tenbroeck, A. E.; 2nd, Morningstar, S., Goderich; 3rd, Delworth, Mrs. T., Weston.

Peaches (White fleshed): 1st, Stewart, Mrs. F. G.; 2nd, Gregory, Miss E. G., Port Dalhousie; 3rd, Morningstar, S., Goderich.

Peaches (Yellow Fleshed): 1st, Thompson, Mrs. R.; 2nd, Gregory, Miss E. G.; 3rd, Delworth, Mrs. Thos.

Pears: 1st, Delworth, Mrs. T.; 2nd, Thompson, Mrs. R.; 3rd, Depotie, Mrs. P. A.

Plums, Blue or Red: 1st, Delworth, Mrs. T.; 2nd, Depotie, Mrs. P. A.; 3rd, Morningstar, S.

Plums, Green or White: 1st, Stewart, Mrs. F. G.; 2nd, Tenbroeck, A. E.; 3rd, Thompson, Mrs. R.

Raspberries, Red: 1st, Stewart, Mrs. F. G.; 2nd, Thompson, Mrs. R.; 3rd, Emery, Mrs. W. A., Aldershot.

Raspberries, Black: 1st, French, Mrs. W. H., Oshawa; 2nd, Tenbroeck, A. E.

Strawberries: 1st, Depotie, Mrs. P. A.; 2nd, Tenbroeck, A. E.; 3rd, Martin, Miss M. E., 100 Pembroke St., Toronto.

Class 11.—Pint Jar of Jam of each of the Following Varieties.

Currant, Black: 1st, Hilborn, Mrs. J. L., Leamington; 2nd, Depotie, Mrs. P.A.; 3rd, Stewart, Mrs. F. G.

Gooseberry: 1st, Thompson, Mrs. R.; 2nd, Stewart, Mrs. F. G.; 3rd, French, Mrs. W. H.

Grape: 1st, Depotie, Mrs. A. P.; 2nd, Emery, Mrs. W. A.; 3rd, Thompson, Mrs. R.

Peach: 1st, Stewart, Mrs. F. G.; 2nd, Thompson, Mrs. R.; 3rd, Depotie, Mrs. P. A.

Pear: 1st, Thompson, Mrs. R.; 2nd, Stewart, Mrs. F. G.; 3rd, Delworth, Mrs. T.

Plum: 1st, Morningstar, S.; 2nd, Depotie, Mrs. P. A.; 3rd, Sparling, Mrs. J. W., Bowmanville.

Raspberry: 1st, Depotie, Mrs. P. A.; 2nd, Stewart, Mrs. F. G.; 3rd, Thompson, Mrs. R.

Strawberry: 1st, Depotie, Mrs. P. A.; 2nd, Gregory, Miss E. G.; 3rd, Stewart, Mrs. F. G.

Class 12—Half-pint Jar of Jelly of each of the Following Varieties:

Jars or Glasses containing from 7 to 12 oz.

Apple: 1st, Whyte, David; 2nd, Stewart, Mrs. F. G.; 3rd, Hilborn, Mrs. J. L.

Crab Apple: 1st, Whyte, David; 2nd, Depotie, Mrs. P. A.; 3rd, Thompson, Mrs. R.

Currant, Red: 1st, Martin, Miss M. E.; 2nd, Depotie, Mrs. P. A.; 3rd, Delworth, Mrs. T.

Grape: 1st, Depotie, Mrs. P. A.; 2nd, Thompson, Mrs. R.; 3rd, Stewart, Mrs. F. G.

Quince: 1st, Depotie, Mrs. P. A.; 2nd, Stewart, Mrs. F. G.; 3rd, Thompson, Mrs. R.

Raspberry, Red: 1st, Depotie, Mrs. P. A.; 2nd, Sparling, Mrs. J. W.; 3rd, Thompson, Mrs. R.

Class 13.—Grape Juice.

Grape Juice, unfermented, one quart bottle: 1st, Sparling, Mrs. J. W.; 2nd, Stewart, Mrs. F. G.; 3rd, Thompson, Mrs. R.

Thirty-Ninth Annual Report

OF THE

Entomological Society

OF ONTARIO

1908

Published by the Ontario Department of Agriculture, Toronto.

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TORONTO.

To the Honourable JOHN MORISON GIBSON, K.C., LL.D., etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present herewith for the consideration of your Honour the Report of the Entomological Society of Ontario for 1908.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1908.

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Erratum.—On page 54, J. W. Eastham should read A. Eastham.

Thirty-Ninth Annual Report

OF THE

Entomological Society of Ontario,

1908.

To the Honourable James S. Duff, *Minister of Agriculture.*

Sir,—I have the honour to present herewith the Thirty-ninth Annual Report of the Entomological Society of Ontario, which contains the proceedings of the forty-fifth annual meeting of the Society which was held at the Agricultural College, Guelph, on the 5th and 6th of November, 1908. A full account is given of the discussions upon fruit-tree insects that took place, the papers that were read and the reports of the various officers and branches of the Society.

"The Canadian Entomologist," the monthly magazine of the Society, has been regularly issued during the past year and has now completed its fortieth volume. Its high scientific standard has been steadily maintained.

I have the honour to be, Sir,

Your obedient servant,

Charles J. S. Bethune,

Editor.

Ontario Agricultural College,
Guelph.

Entomological Society of Ontario.

OFFICERS FOR 1908-1909.

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Fisher, George E ..... Freeman.
Fletcher, Dr. James ..... Ottawa.
Fraser, W. J ..... Toronto.
Frier, G. M., O.A.C ..... Guelph.
Gibson, Arthur ..... Ottawa.
Grant, C. E ..... Orillia.
Groh, H ..... Ottawa.
Hahn, Paul ..... Toronto.
Haight, D. H ..... Sudbury.
Hallam, M ..... Toronto.
Hallam, R ..... "
Hamilton, R. S ..... Galt.
Harrington, W. H ..... Ottawa.
Holland, W. H ..... Toronto.
Howitt, J. E., O.A.C ..... Guelph.
Ivy, M ..... Toronto.
Jarvis, T. D., O.A.C ..... Guelph.
Johnston, James ..... Hamilton.
Jones, D., O.A.C ..... Guelph.
Kilman, A. H ..... Ridgeway.
King, R. W ..... Toronto.
Laing, J ..... Toronto.
Law, John ..... London.
Lawrence, C. A., O.A.C ..... Guelph.
Matthews, J. S ..... Toronto.
Maughan, J., Jr ..... Toronto.
McCready, Prof. S. B., O.A.C.. Guelph.
McMillan, G. O ..... Glenallan.
McRitchie, A. R ..... Kincardine.
Moore, T. J ..... Guelph.
Morden, J. A ..... Hyde Park Corners.
Morris, F. J. A ..... Port Hope.
Mosey, Miss ..... Toronto.
Nash, C. W ..... "
Pearson, Gerald ..... London.
Readwin, R ..... Guelph.
Richard, A. E ..... Ottawa.
Saunders, H. S ..... Toronto.
Saunders, W. E ..... London.
Silcox, Sidney ..... Toronto.
Slater, A. E ..... Port Hope.
Smith, Arthur ..... Toronto.
Stafford, E. W., O.A.C ..... Guelph.
Tanton, John ..... Kingston.
Thompson, W. Robin, O.A.C .. Guelph.
Tothill, J. D., O.A.C ..... Guelph.
Treherne, R. C., O.A.C ..... "
Walker, Dr. E. M ..... Toronto.
Watson, Dr. A. H. R ..... Port Hope.
Webb, J. H ..... Toronto.
Wheaton, R. R., O.A.C ..... Guelph.
White, James ..... Snelgrove.
Williams, J. B ..... Toronto.
Wood, S. T ..... "
Young, C. H ..... Ottawa.
Zavitz, E. J., O.A.C ..... Guelph.

Province of Quebec.

Barwick, E. C ..... Montreal.
Begin, Rev. Abbe, P. A ..... Sherbrooke.
Bickell, Miss ..... Quebec.
Boulton, A. R. M ..... "
Boulton, Capt. J. G ..... "
Boulton, Mrs ..... "
Bowen, Miss ..... "
Brainerd, Dwight ..... Montreal.
Brainerd, H ..... "
Burgess, Dr. T. J. W ..... Verdun.
Campbell, J. G ..... Magog.
Chagnon, Gustave ..... Montreal.
Clark, Rev. Wylie, C ..... Quebec.
Denny, E ..... Montreal.
Dunlop, G. C ..... "
Elliott, W. R ..... Sherbrooke.
Faulconer, Mrs ..... Levis.
Faulconer, Miss Clare ..... "
Fosberry, C. S ..... Montreal.
Freeman, Miss I. H ..... Quebec.
Fyles, H ..... Levis.
Fyles, Miss W ..... "
Fyles, Mrs ..... "
Fyles, Rev. Dr. T. W ..... "
Geggie, James ..... Beauport.
Geggie, Miss Lois ..... "
Gibb, Lachlan ..... Montreal.
Griffin, A ..... "
Hamel, Miss Julia ..... Levis.
Hedge, Miss Louisa ..... "
Huard, Rev. Victor ..... Quebec.
Johnston, Miss M. G ..... Bedford.
Kollmar, E. J ..... Montreal.
Lindsay, Col. Crawford ..... Quebec.
Lochhead, Prof ..... Macdonald College.
Lyman, H. H ..... Montreal.
MacLeod, Miss E ..... Quebec.
Moore, G. A ..... Montreal.
Norris, A. E ..... "

CANADIAN MEMBERS—*Continued.*

Poston, Mrs. T. A .....Levis.
Reford, L .....Montreal.
Robertson, Miss.....Quebec.
Seton, Mrs. W. W.....Levis.
Simmons, J. H ..... "
Simmons, Mrs. J. H ..... "
Southee, G. R .....Outremont.
Swaine, J. M .....Macdonald College.
Tourchot, A. L .....St. Hyacinthe.
Turnbull, Lt.-Col. F.....Quebec.
Turner, Hon. Richard.... "
Turner, Mrs. R..... "
Wade, Miss.....New Liverpool.
Weir, Douglas .....Montreal.
West, Dr. J.....Magog.
Winfield, Mrs.....Quebec.
Winn, A. F .....Montreal.
Wood, Rev. Edmund..... "

ALBERTA.

Baird, Thos.....High River.
Dod, F. H. Wolley .....Millarville.

BRITISH COLUMBIA.

Abercrombie, Miss Ivy .....Vancouver.
Anderson, E. M .....Victoria.
Anderson, J. R..... "
Armstrong, E. W.....Salmon Arm.
Bryant, T .....Ladysmith.
Bush, A. H .....Vancouver.
Cockle, J. W .....Kaslo.
Danby, W. H .....Rossland.
Dashwood-Jones, W. H .....New Westminster.
Day, G. O .....Duncan's Stn.
Draper, R .....Hillcrest.
Elliott, B. R.....Victoria.
English, T. M .....Cowichan Stn.
Foster, F .....Vancouver.
Grassham, R. T.....Keithly Cr'k.
Hanham, A. W .....Duncan's Stn.
Harvey, R. V .....Victoria.
Keen, Rev. J. H.....Metlakatla.
Livingston, C .....Duncan's Stn.
Luscombe, P.....Cowichan Bay.
Marrion, H.....Vancouver.
Mason, J., G.T.P .....Copper River.
Reed, E. Baynes.....Victoria.
Sherman, R. S.....Vancouver.
Skinner, E. M.....Duncan's St'n.
Taylor, Rev. G. W .....Departure Bay, Nanaimo.
Towler, J.....Vancouver.
Van Steenweyk, Miss ..... "
Venables, E. P .....Vernon.
Wilmot, E. S..... "
Wilson, T .....Vancouver.

MANITOBA.

Criddle, Norman .....Aweme.
Dennis, A. J .....Miniota.
Heath, E. F .....Cartwright.
Hunter, Rev. A. J.....Teulon.
Wallis, J. B .....Winnipeg.

NOVA SCOTIA.

Hervey, C. L. G.....Round Hill.
Mackay, Dr. A. H.....Halifax.
Payne, H. G.....Granville Ferry.
Russell, John.....Digby.

SASKATCHEWAN.

Croker, A. J.....Redvers.
Willing, T. N.....Regina.

HONORARY MEMBERS.

Cockerell, Prof. T. D. A ....Boulder, Col.
Cresson, Ezra T.....Philadelphia, Pa.
Edwards, Wm. H .....Coalburgh, W. Va.
Howard, Dr. L. O .....Washington, D.C.
Scudder, Dr. S. H.....Cambridge, Mass.
Smith, Prof. J. B .....New Brunswick, N.J.
Uhler, P. R .....Baltimore, Md.
Webster, F. M.....Washington, D.C.
Wickham, Prof. H. F .....Iowa City, Iowa.

LIFE MEMBER.

Saunders, Dr. William .....Ottawa.
Director of the Experimental Farms of the Dominion.

Entomological Society of Ontario.

ANNUAL MEETING.

The forty-fifth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 5th and 6th, 1908. Owing to the lamented absence of the President, Dr. James Fletcher, in consequence of serious illness, which terminated fatally on the following Sunday, the chair was taken by the Vice-President, Mr. Tennyson D. Jarvis, Lecturer in Entomology and Zoology at the O. A. College. Among those present were Rev. Dr. Fyles, Quebec; Mr. Henry H. Lyman, Montreal; Prof. W. Lochhead, Macdonald College, Ste. Anne de Bellevue; Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. F. J. A. Morris, Trinity College School, Port Hope; Messrs. C. W. Nash, J. B. Williams and Dr. Brodie, Toronto; Mr. Calvert, Orangeville; Mr. Collingwood, Kintore; President Creelman, Professors Zavitz, Hutt, Bethune, Messrs. Howitt, Eastham, Crow, Caesar, Klinck, McMeans and others, Guelph. There were also present a large number of students from the College, and on the Thursday evening of young women students also from the Macdonald Institute. The Society was favored with the presence of Dr. E. P. Felt, of Albany, State Entomologist of New York. Letters expressing regret at their absence were received from Prof. C. C. James, Deputy Minister of Agriculture, Directors C. E. Grant, Orillia; G. E. Fisher, Burlington; and C. H. Young, Ottawa; Dr. E. M. Walker, Toronto; Mr. John D. Evans, Trenton; Mr. A. F. Winn, Montreal; Mr. J. H. Bowman, London, and others.

During the first morning a business meeting of the Council was held at the Wellington Hotel, Guelph, at which their report was drawn up, and various matters discussed. It was decided to permit the formation of Nature Study Clubs in affiliation with the Society at any school in the Province on condition that there should be at least six members and that each Club should pay one dollar a year as a subscription to the funds of the Society; in return each Club should receive one copy of the issues of the "Canadian Entomologist" and a copy of the Annual Report for each individual member. The Society would also endeavour, on request, to send a representative to deliver a lecture on some natural history subject once a year if practicable. The following resolution of sympathy with Dr. Fletcher in his illness was adopted and a copy was sent to Mrs. Fletcher in order that it might be communicated to him.

"The members of the Entomological Society of Ontario have heard with deep regret of the serious illness of their esteemed President, Dr. James Fletcher, and of his enforced absence from this annual meeting.

"They desire to convey to Dr. Fletcher their earnest hope that his illness will be of no long duration and that he may soon be restored to health and strength. They beg to assure him of their warm sympathy with him in his sufferings and the interruption to his useful work."

The afternoon meeting was held in the spacious Massey Hall at the College and was largely attended. Mr. Jarvis took the chair at 2 o'clock and called upon the Directors of the Society to read their reports on the noteworthy insects of the year in their respective divisions. Mr. Fisher sent a letter explaining his inability to prepare a report for Division No. 5 owing to the pressure of business, and there was no report from No. 6 in consequence of the lamented death of the Director, Mr. J. A. Balkwill, which took place at London on October 10th.

REPORTS ON INSECTS OF THE YEAR.

Division No. 2.—Midland District. By C. E. Grant, Orillia.

The season of 1908 was a beautiful one, the finest summer I think I ever saw, but still there was no great outbreak of injurious insects and in fact no insects were particularly abundant as noted by me. On account of the small amount of rain in this section the plant lice were rather plentiful; I saw a field of turnips in September which were practically covered with them, but still the turnips were above the average size and the owner of the farm stated that he had taken no measures to kill them off.

Another insect, the yellow-necked apple-tree caterpillar, (*Datana ministra*) was remarkably abundant, some apple trees were nearly stripped of their leaves in the gardens around the town and the moths came in droves to my lamp.

The Buffalo beetle nuisance seems to be increasing, nearly all housewives are complaining of it and it seems hard to devise a perfect remedy for it.

Heliothis armiger is another insect which has been complained of as affecting the corn; the moths were flying in the day time over a clover field I visited in September and October along with *Plusia brassicæ*; I took both species in numbers; there had been corn grown in the next field.

This season I purchased a 7 amp. multiple lamp and had it installed on my verandah, the results were wonderful as to the number of insects attracted; the bombardment of *Lachnosterna fusca*, June beetles, in the spring was more than anyone but an Entomologist could stand and every now and then the deeper hum of *Belostoma americana*, the giant water-bug, would be heard, as this great bug thumped down on the verandah; during the month of June there was a constant and ever-changing stream of insect life. Unfortunately our power had to be shut down from the middle of July to the end of August, thus spoiling my sport. I got, however, several good things such as *Caripeta discivaria, Syneda Alleni, Apatela quadrata,* two new Plusias, *Oreta rosea,* and five or six *Eacles imperialis.* I took twelve species of Hawkmoth, the rarest here being *Smerinthus myops cerisyii* and *Sphinx luscitiosa;* one very handsome *Heterocampa* was also taken, if not *astarte,* it is very much like it. A new *Crocota* and several good things not, however, new to me such as *Mamestra nimbosa* and *latex,* and others too numerous to mention. If I had been present at the meeting I should have liked to have given a longer account of the numerous species attracted but as the directors are supposed to confine their report to injurious insects I will at some other time give a fuller list of what can be taken at Orillia, if it is thought desirable. I might mention one other capture in the daytime, namely, *Anisota virginiensis* (or *stigma*) taken on the edge of a wood flying about ten feet from the ground in the bright sunshine. *Junonia cœnia* was rather plentiful; I took four specimens in two weeks, *Colias eurytheme* was also taken several times.

Division No. 3—Toronto District. By J. B. Williams.

I am not able to report very much this season as I was away in England most of the summer.

The Tussock Moth did a good deal of damage to the shade trees in Toronto. I noticed, in September, that a large part of many trees had been nearly stripped of their foliage. The late Park Commissioner, Mr. Chambers, always said that in many streets it was almost useless collecting

cocoons because in adjoining private grounds the trees were infested with them, and the owners took no trouble to check their increase.

Our new Commissioner, Mr. Wilson, is getting a by-law passed to enable him to collect the cocoons on private grounds, as well as on the streets, and he has a grant of $5,000 for the work this winter; so we may expect to see some decided improvement in a year or two, if the work is thoroughly carried out.

Last year there was an almost total absence of Walking Stick Insects (*Diapheromera femorata*), in Niagara Glen, but this year they again appeared in countless hosts; some trees were quite stripped of their foliage by them, and they kept falling in numbers on the heads and shoulders of any passers-by in parts of the Glen where they were most numerous. Probably the cold weather in May and June last year prevented the eggs from hatching, and so they all lay over until the second year, as they are sometimes known to do, and then produced an especially numerous and voracious crop of Walking-sticks.

Division No. 4—East York District. By C. W. Nash, Toronto.

In April last I attended two meetings of Horticulturists at Oakville. At these meetings the insect pests which infested the orchards of the vicinity were thoroughly discussed. Among those mentioned as being particularly destructive was the Tree Cricket. This insect is now very abundant in raspberry plantations and was said to do more harm in that locality than any other pest they had. Raspberry growers in other districts should be on their guard against this Cricket for where it becomes established it is somewhat difficult to control and it is capable of doing much mischief.

Although the early spring was cold and apparently unfavorable to insect life yet, when on April 12th I was cleaning up my garden, I found that under the shelter of the dead leaves which laid thickly over the flower beds, many forms were snugly and safely tucked away, waiting for warmth and sunshine to start them upon their summer activities. At the base of some of my shrubs small adult Lady beetles were very abundant; these I was not surprised to find, for like many others of their order, they hibernate in the adult stage, but when clearing up some hardy carnation plants, I was not only surprised but somewhat disgusted at finding upon them a large number of nearly full grown wingless green Aphids. That many species of Aphids hatch early and grow rapidly, I am well aware but this was the first time I had ever seen lively well-grown specimens flourishing when surrounded with ice crystals, upon plants which were still saturated with water from melting snow.

On May 5th from beneath a heap of dead leaves I raked out a handsome Red Admiral butterfly. It was living but very listless and weak.

Although for several years I have kept a sharp lookout, east of Toronto, for the Red Asparagus beetle I did not find it. This year, however, it appeared and by the end of the season outnumbered in some places the common Blue species. Both forms were abundant on the plants at the same time. The Red is much the more active of the two, flying off instantly when an attempt is made to capture it.

The Hunting Beetles (*Calosoma*) appeared to be much more abundant this year than usual, *C. calidum* especially being particularly common about the end of June.

Cosmopepla carnifex, which for the past three years had been steadily increasing in number, was entirely absent; I did not see one anywhere during the whole season. The Rose Beetle, too, has disappeared. This I can

account for as the sparrows hunt for them most persistently and feed them to their young when in the nest. It may be that they also feed upon Cosmopepla but I have seen no evidence of it.

The Monarch butterfly did not make its appearance this year in this district until late. On July 8th I saw the first, a single one, very much worn and dull colored. On the 11th I counted about a dozen between Toronto and Highland Creek, a distance of sixteen miles; these were old and much worn. On the 20th of August new, fresh specimens were common and soon were mated.

Usually the migration of this species is at its height during the first week in September, after which but few stragglers are seen. This year I saw no migration in large flocks at all and stragglers were fairly common as late as the first of October, and the last was seen on the fifth.

House-flies have been comparatively scarce this summer and so were Mosquitoes until the evening of July 8th when they became fairly abundant, but at no time during the season have they swarmed in their usual hosts. Most of those examined were parasitized by mites, but this does not prevent their doing business in their good old fashioned way.

The Stalk borer (*Gortyna cataphracta*) was more abundant and destructive than ever before. This year I found the first young larva in the blossom stem of an Iris on the 15th of June. The larva was rather less than a quarter of an inch long and had evidently entered by boring a hole from the outside at about nine inches from the ground. As in 1907 I gave the full life history of this pest as far as I know it, I need not repeat it. No parasites have yet been bred by me from the larvæ of this moth, though I have carried a great many of them through to the imago stage.

While *Gortyna cataphracta* is a much dreaded pest in a flower garden, yet the damage it does rarely extends to the entire destruction of a plant; the affected stems are killed but the root is uninjured. All members of the genus are not, however, so considerate, for some of them work into the root-crown or the roots and thereby cause the death of the plant affected.

This summer I noticed that all my plants of *Aquilegia chrysantha* looked sickly and they scarcely threw out a healthy blossom. On August 20th the plants appeared to be dead. Upon pulling away the stalks which came off easily, the upper part of the fleshy roots was found to be hollowed out. A search in the soil yielded two chrysalids; they were lying about four inches from the roots and about two inches beneath the surface of the earth. These I took in and from them, on the 5th and 8th of September, moths emerged which are, I believe, *Gortyna purpurifascia*. One of them, shortly after emerging, deposited a number of eggs singly upon the surface of the soil in the jar where the moths were bred out.

If this moth becomes common, Aquilegia growers will require to look out for its larvæ or they will lose their plants. Strange to say while all my *chrsanthas* were destroyed, no other variety of Aquilegia was attacked.

Although I have grown Aquilegias for many years in Ontario, I have never before had one attacked by this insect nor have I ever seen any others so affected in this district.

I am sorry to say that at last I have positive proof that the San José scale has become established on the north shore of Lake Ontario. As yet, however, there are only two or three orchards infested, but past experience has shown that unless proper precautions are taken the pest will rapidly spread.

This year the Tussock Moth larvæ were about as abundant as usual. On the 13th of July I saw many spinning cocoons, at the same time there

were numbers of them not more than a quarter of an inch long. Could the cold backward season have delayed the hatching of the eggs in some cases?

Although I have since 1887 paid a good deal of attention to this insect and each year have bred large numbers of them I had found but few parasitized. This season, however, in some parts of the City of Toronto it was the exception to find a pupa free from parasites, the chief of these being *Pimpla inquisitor*. As I have brought a number of specimens of the various parasites bred from the Tussock Moth larvæ which we can discuss at leisure, I need make no further reference to them now.

THE WHITE-MARKED TUSSOCK MOTH.

By Paul Hahn, Toronto.

Being asked by our President, Dr. Fletcher, to deliver a report regarding the extermination in Toronto of the white-marked Tussock Moth (*Hemerocampa leucostigma*), which has done so much damage to our shade trees, allow me to state the following. (Fig. 1.)

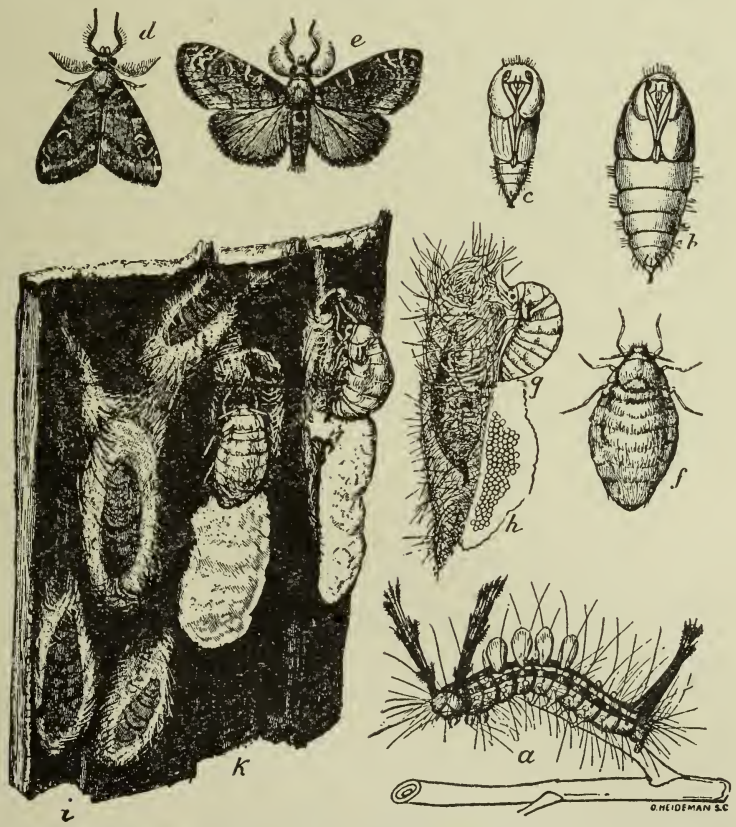


Fig. 1. Tussock Moth: *a* caterpillar; *b* and *c* chrysalids; *d* and *e* male moths; *f* and *g* wingless female moths; *h* eggs; *i* male cocoons; *k* female moths and egg masses on cocoons.

Two years ago noticing that this insect had done considerable harm to our beautiful trees I called on the Mayor and the Park Commissioner of our city.

I advised them strongly to collect the egg-masses and urged them to get a special permit from the Government to pass a by-law compelling citizens to rid their trees of these egg-masses.

Very soon after this visit I took ill and was unable to follow up the matter, having to go out of town for quite a long time. Last year I thought again about taking up the matter, but being still in poor health I had to abandon the idea.

I made out a report, called on the Board of Control, and bringing the matter up most forcibly at their meeting I persuaded them to give the Park Commissioner a grant of $5,000 to enable him to clean the city trees of these egg-masses, at the same time urging the passing of the by-law compelling the citizens to clean their trees.

On receipt of the grant of $5,000 the Park Commissioner at once sent out several gangs of men and they did splendid work in the infested places.

About October 1st the by-law was passed and it was published in all the papers, giving the citizens ten days' notice to have their trees cleaned. Should the property holders not comply with this request the city has full power to enter upon the premises, do the work and charge it up to the citizens. This charge to be levied and collected with the local improvement rates for the current year or other municipal rates.

Should it be necessary the Park Commissioner will engage the school-children again to collect the caterpillars and give them so much per quart, and if needed some spraying will also be done.

With the above method I feel sure the pest will be wiped out.

Dr. BETHUNE expressed his gratification at the success which Mr. Hahn had achieved in at length persuading the Board of Control in Toronto to adopt proper methods of dealing with the Tussock Moth trouble. It was a disgrace to the city that this insect should have been permitted for so many years to ravage the horse chestnut and other shade trees; the failure to deal properly with the pest was due to the late Park Superintendent who would not take the advice of Entomologists but adopted methods of his own, which were perfectly useless.

Mr. NASH: I have this to say that I think the whole trouble in Toronto may be very fairly charged to the late Park Superintendent. It was in 1887 that I first noticed the Tussock Moth in Toronto, and I called his attention to the fact, and he then gave me to understand that he knew all about it, that he required no advice nor assistance, and that he would do as he pleased in the matter. I think about the same time I spoke to Dr. Brodie and he said that he and other members had endeavoured to do something and that they had failed. However, from that time on the Tussock Moth increased. Application was then made for funds and every year he has been supplied with three or four thousand dollars. He could have used that money to very good advantage, but as a rule it was simply thrown away. They waited until the larvæ were about to spin their cocoons and he then expected to kill the insects by putting poisons on the foliage long after the caterpillars had ceased to eat. However, we have now a thoroughly educated man in charge of our parks, one capable of judging and observing for himself and willing also to take the advice of those who are experienced. It is not possible for us now to exterminate the Tussock Moth; it has spread all through the woods and is all over the country. I found it on Manitoulin Island and on St. Joseph's Island where it had done an immense amount of mischief. As everyone knows the egg-masses must be destroyed and this can very easily be done during the winter months.

CONFERENCE ON THE CHIEF INSECT PESTS OF THE SEASON.

The Leaf Blister Mite.

The Chairman, Mr. T. D. Jarvis, announced that the rest of the afternoon would be devoted to a discussion of some of the chief insect pests of the season, taking up especially those injurious to fruit culture. The first to which he would draw the attention of the meeting was the Leaf Blister Mite (*Eriophyes pyri*) which attacks the foliage of the pear and apple, and has during late years slowly and steadily spread throughout Ontario. It is an almost microscopical mite and by its attacks causes little blisters to appear which become dark brown on the under side of the leaves.

Mr. Caesar showed some mounted specimens of the Blister Mite and stated that they are to be found on the under side of pear and apple leaves on which they produce dark swellings which look like a fungus disease. In travelling through the province this year he had found this Blister Mite in the Niagara district, at St. Catharines, Grimsby and other places; also in Essex county, some in Norfolk, a great deal in Prince Edward county, a considerable amount in Peel county. In his own home orchard in Peel county were some pear trees that had hardly a single leaf that was not covered with the work of the Mite. A year ago here at the College he found it in the orchard on the pears, but this year he could not find any. The only explanation that he knew of for its disappearance in the orchard was that the trees had been sprayed with lime-sulphur. It is found that this Blister Mite winters over in the nearly full grown stage. It is such a tiny little animal that it can hardly be seen with the naked eye. Before winter comes on it gets under the scales of the buds where the lime-sulphur wash may reach and destroy it. There is also another remedy that has given good results for the destruction of this pest, viz.: kerosene emulsion. Mr. Caesar did not know how injurious the pest might be, but from the diseased trees which he had seen, it must do a great deal of damage by lessening the power of the tree to supply food for its necessary growth.

Mr. Jarvis: It is interesting to hear that the lime-sulphur wash may destroy this pest. A species of this genus of mite with similar habits attacks perhaps forty or fifty of our forest and shade trees, and if the lime-sulphur will kill them, it will be a good remedy for the Soft Maple mite as well as many others which winter in the leaf buds.

Dr. Felt: The Blister Mite, in some parts of New York state has been very injurious. I noticed one place in particular where some trees were so badly infested by Blister Mites that one could see the brown foliage a quarter of a mile away, and when the foliage is in that condition there is no doubt that the trees are seriously injured. Our experiments go far to show that lime-sulphur or an application of miscible oils or kerosene emulsion in early spring is very effective in controlling the mites.

Respecting the value of the lime-sulphur wash on Maple trees it would depend on whether it would go under the bud scales and thus destroy the mites; he was doubtful whether it would do so.

Mr. Jarvis: I have had no experience with the lime-sulphur on these trees; I only suggested its use, but as Dr. Felt implies the scales of the Maple buds are very compact and perhaps the wash would not get into them so well as it would those that are looser.

Mr. Caesar wished to know whether the wash had ever been applied in the fall instead of the spring with the same good results.

Dr. Felt: I see no reason why the application would not be just as successful. In the case of the San José scale we do not hesitate to recommend the use of the lime-sulphur in the fall; I think the same would be true in the case of mites, but I would much prefer to advise putting it on in the spring. If the operations are delayed a little the buds will be slightly opened and you will secure greater results in that way. The material retains more or less its caustic value for a considerable period and the wash will, therefore, prove destructive to any mites which it reaches.

The Lesser Apple Worm (*Enarmonia prunivora*).

Mr. Jarvis: There is considerable interest being taken in the so-called work of the Lesser Apple Worm this season and I shall ask Mr. Caesar to introduce the subject.

Mr. Caesar exhibited a number of apples that had recently been sent to him from Prince Edward county and from St. Catharines. The senders believed that the injuries were due to some new worm. Mr. Caesar said that all he knew about this pest was what Professor Quaintance had described in his bulletin on the subject but that he was very anxious to get any information that any of the entomologists present could give him. He felt that the injuries on some five or six apples which he picked out corresponded very closely with Prof. Quaintance's descriptions and illustrations. On showing these to Dr. Felt the latter agreed with him that they were probably due to the Lesser Apple Worm. The other injuries Dr. Felt and others thought were not caused by this insect. Mr. Caesar said that if the first class of injury pointed out was due to the Lesser Apple Worm, it would appear that this insect was to be found throughout a large proportion of the best orchards of the province but that it was satisfactory to find that nowhere was it abundant. It was not an entirely new pest because Dr. Fletcher had reported its presence at Toronto, Prince Edward county and Ottawa several years ago. It is also very widely spread throughout British Columbia but Mr. Palmer, one of the Agricultural College students and a son of the Mr. Palmer who has furnished Dr. Fletcher with reports of its progress in the West, states that it is not increasing rapidly in British Columbia.

The life-history of the insect is very similar to that of the Codling Worm but, unlike the latter, instead of boring a hole into the core of the apple it lives near the surface, often causing ugly blotched mines either on the side or at the calyx end. These blotches are often as large as a ten cent piece, or even larger, and disfigure the apple greatly. It is believed that the spraying that controls the Codling Worm will also control the Lesser Apple Worm.

Prof. Lochhead: I have not observed its work at all in the Montreal district. The only reference to it I have had came from Kingston, so I have have had no experience in dealing with it. I do not think it has been reported from Quebec province.

Mr. Jarvis: It is so much like the Codling Worm that we may easily pass it by and not recognize it.

Dr. Felt: I wish to say that I have had no experience with the Lesser Apple Worm. We know, however, that the Codling Worm goes deeper into the apple, so it appears as though the apples exhibited may in some cases have been attacked by this less common pest. The only way, I think, that we can be absolutely certain about it is to find some of the larvæ at work. Although the larva of this insect is very like that of the Codling Moth, yet on careful comparison you can see a difference, particularly, if I remember correctly, at the posterior extremity.

THE APPLE MAGGOT (*Rhagoletis pomonella*).

Mr. JARVIS: The Apple Maggot is the larva of a little two-winged fly, and it is reported from a few places in Eastern Ontario. I should like to know if it has spread to any other districts.

Prof. LOCHHEAD: We found the Apple Maggot somewhat abundant in certain districts about Montreal. A few miles up the Ottawa River the Apple Maggot has been abundant for some years in a large commercial orchard and the owner has done everything in his power to control it. Just across the river from Como there is a farm where the Apple Maggot is known to be and we have two careful observers there, upon whose observatios I think we can depend. At St. Anne's, five miles from there, I have found the Apple Maggot in some of the old orchards on French farms. I have not observed it on the College trees. Then at Hull, further west, Mr. Reid, Secretary of the Quebec Horticultural Society, reports its presence; and at Covey Hill, near the boundary line between Quebec and New York. I have not seen it there myself. Mr. Swaine was in that district and he confirms Mr. Reid's observations. Then in the City of Montreal one of this College's graduates, who is in charge of the work this year, reports the Apple Maggot as doing serious damage. It is in the barrels in which the apples are packed for shipping. Sometimes he finds it hard to detect. The Apple Maggot, of course, works underneath the skin of the fruit and seldom comes close to the surface. It is difficult to tell when an apple contains one of these maggots. (Fig. 2.)

The only method that we can recommend for its destruction is clean culture and gathering and destroying all the apples that fall. It seems that the Apple Maggot does not leave the apple until full grown. As soon as the apple falls the maggot matures, crawls out and hides at or near the surface of the ground, and there pupates.

Now, it is thought that if hogs or sheep or any common stock are allowed in the orchard to pick up and destroy this fallen fruit the pest would be unable to develop and to pupate. I think that this is probably one of the best methods; but then again we have the point: no matter how careful we are, suppose our neighbors do not take steps for their control, would not the apple flies come over to us from our neighbors? It has been asserted that the flies are not given to the habit of flying from orchard to orchard but confine themselves to the same trees. I do not know how far that can be confirmed.

Going through Prince Edward county six or seven years ago I estimated that from one-third to one-half of the apples were damaged by the Apple Maggot. It does not seem to spread very far out of that particular district. It just seems to locate in certain parts and is not widely spread.

Mr. GIBSON: We have had reports from Ontario and Prince Edward counties regarding it this summer.

Mr. CAESAR thought the fly did not migrate as a rule. He had found in Prince Edward county a Snow apple tree which had been badly affected by the maggot for three years, while the fruit on the other trees near by of the same variety was untouched. Tolman Sweets were attacked, but Spys and some others in the same orchard were not; Crab apples were also severely injured. It seems on the whole as if the insect preferred the early varieties. The fruit-buyers have now become sufficiently familiar with the pest to refuse to purchase fruit affected by the maggot; such fruit is only fit for the cider mill. Mr. Caesar did not mean to imply that winter apples were not attacked because in other orchards than the one referred to he found

Spy apples very badly affected. While in Prince Edward county he had met one man who had succeeded in almost completely destroying the insects by careful attention to fallen fruit. Hogs had been of great service in accomplishing this result.

Mr. JARVIS: While there is no doubt that the Apple Maggot attacks winter apples, yet my experience has been that it prefers Yellow Harvests to any other variety. I also find it in fall apples.

MALFORMATIONS OF FRUIT DUE TO INSECTS.

Mr. JARVIS: We should, I believe, now discuss another question that has interested us a good deal this year, viz: the cause of malformations of apples and pears. I hope anyone who has had any experience and has studied them will speak out and help in the discussion.

Mr. CAESAR: Here is an apple that was sent in by Mr. Sweny, son of Colonel Sweny, of Toronto, from British Columbia, to find out what was wrong with it. You will notice that there are several strangely elevated areas on its surface suggestive of the boils that rise on a person's body, if I may be allowed to use the comparison. There are also several rather deep depressions. The sender said that whole orchards last year and this year were affected in this way. He said that this year his neighbors had carefully drenched their trees with Bordeaux in the hope of getting free of the trouble. He had used lime-sulphur on his orchard. The result had been that his orchard, with the exception of some of his Duchess trees was very little affected, while his neighbors have had poor results from their spraying. I have very little idea as to what has produced this malformation that you see. Mr. Sweny says: "On Spys, Duchess, Wealthy and Ben Davis, the injury appears chiefly as a hollow, usually turning brown, with a dry brown spot running to the core. On peaches the appearance is the same, but the flesh is not affected." The specimen I have shown you is, he thinks, another form of the same trouble. If he is right in his belief that lime-sulphur has saved many of his apples this year it would, I think, stand to reason that the insect (for there is not much doubt that it is an insect) hibernates in some form on the tree and so is destroyed by contact with the wash. Bordeaux of course would not be expected to give good results against an insect.

There have been a number of pears and a few apples sent to us this year from Brooksdale and Bowmanville, Ontario. These were badly distorted by depressions and elevations. It looks very much as though the trouble is due to the punctures of some insect. When over in the State of New York this autumn I found similarly misshapen apples and asked the entomologist at Geneva what he thought was the cause. He said he had always attributed it to the Plum Curculio. A few days afterwards I showed the same fruit to Prof. Slingerland, who thought that it was not the Curculio but some species of Hemipterous Leaf Bug that had caused the injury.

Dr. Fletcher also thought the injury was due to some Hemipterous insect, possibly a Jassid (Leaf Hopper). I hope some one here has had some experience that will throw further light on this important matter.

No one present had devoted sufficient time to the subject to feel able to give any further suggestions. It was pretty unanimously agreed, however, that the injury was due to some species of insect.

After this specimens of the undoubted work of the Plum Curculio on apples were shown.

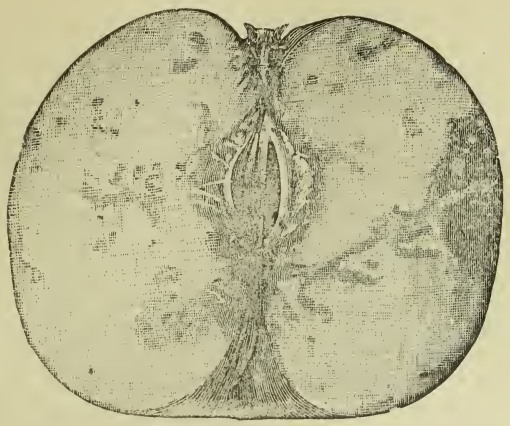


FIG. 2.. Apple affected by Apple Maggot.

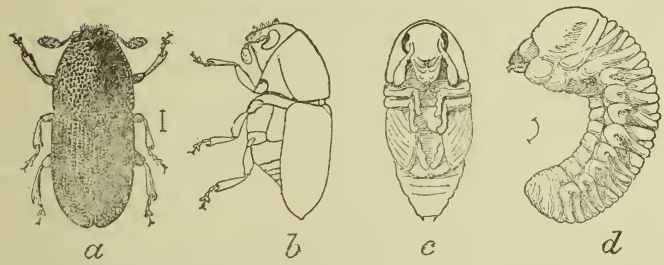


FIG. 3.—*Scolytus rugulosus*: *a*, adult beetle; *b*, same in profile; *c*, pupa; *d*, larva—all magnified about 10 times. (U. S. Dep't. of Agriculture).

FIG. 4.—Work of *Scolytus rugulosus* in twig of apple—natural size. (U. S. Dep't. of Agriculture).

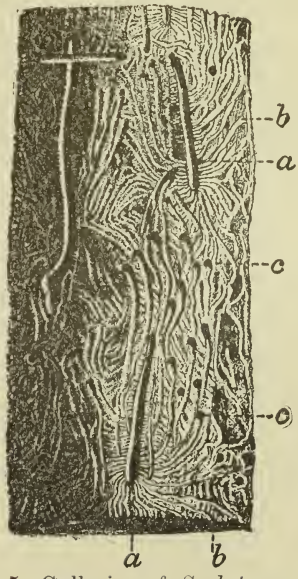


FIG. 5—Galleries of *Scolytus rugulosus* on twig under bark; *a*, *a*, main galleries; *b*, *b*, side or larval galleries; *c*, *c*, pupal cells—natural size—(after Ratzeburg, from U. S. Dep't. of Agriculture).

The Shot-hole Borer (*Scolytus rugulosus*).

Mr. Jarvis: The Shot-hole Borer or Engraver-beetle has been doing considerable injury, or at least we think it has been doing so, during the past two or three years. At one time it was thought that the borer only worked on decaying wood or on unhealthy trees, but some of our fruit-growers are beginning to think that they cause the death of the tree. We would like to hear from any of the members who have had any experience with this beetle.

Mr. Caesar: The Shot-hole Borer was brought up and discussed last year at the annual meeting of the Entomological Society. We had hoped that its ravages would be checked by this year, but it has been so destructive this spring and fall that it is necessary, in justice to the Society, I think, and in justice to those who are interested in the work of the Society, that it should be brought to the attention of the members.

When I was down near St. Catharines on the 10th of June examining a fungus disease that was attacking the peach trees, Mr. McCalla—one of our best and most scientific fruit-growers,—asked me to come and look at his cherry trees. He had fifteen fine sour cherry trees apparently flourishing so far as the foliage showed at that time, but every branch up to half an inch in diameter was practically covered with exudations of gum. There were thousands of exudations on the trunks and all over the trees. Of course a tree cannot stand that sort of thing very long. On removing the gum with a knife one could see a little round hole quite clearly. A black beetle about a quarter of an inch in length was causing the trouble. Last year I found in about ten different districts perfectly healthy trees, both sour and sweet cherry, attacked by this same Shot-hole Borer, (*Scolytus rugulosus*). Figs. 3, 4, and 5.

Not more than two weeks ago a man near Grimsby, to whom I had recommended a method of treatment last year, wrote me that he had again this fall millions of these beetles. "I believe," he said, "it is the most difficult pest there is in the Province to combat. I have already this fall removed sixty of my cherry trees out of three hundred. I have taken out twenty loads of branches in addition and I am afraid I am going to lose every cherry tree I have got."

Just the other day I had a letter from Mr. Beattie, of St. Catharines, stating that his peach trees were being severely attacked. I have often seen a peach tree here and there throughout the district attacked but the sweet and sour cherry trees are by far the most commonly assailed, occasionally plum trees are rather badly attacked.

Dr. Felt: You have found that they attack the healthy cherry trees as well as diseased ones?

Mr. Caesar: Yes, the fifteen cherry trees belonging to Mr. McCalla gave every appearance of being perfectly healthy when attacked. Many of the trees I found attacked last autumn were also healthy ones.

Dr. Felt: Is it not probable that there is a great deal of dying wood in that district?

Mr. Caesar: There is a great deal of it. I am afraid that unless old orchards that have been killed by San José scale or trees that have died from other causes are cut down and burned, these may afford such excellent breeding grounds for the beetles that the fruit-growers may lose very seriously from the attacks of great numbers of them on healthy trees. The beetles certainly are increasing at an alarming rate.

My observations this year and last year lead me to believe that there are two periods in the year when they are specially destructive: First, in May, continuing on for some time into June; second, in August, continuing on through September. I might say that in no case hitherto have I been able to find either eggs or larvæ under a gum mass on a healthy tree; so that it would seem perfectly possible in many instances to save healthy trees even after they are attacked. If there were eggs or larvæ under the gum masses this would be impossible.

The treatment recommended last autumn in a circular letter to the press of the district was to cut down and *burn* before the warm days of the spring all dead and dying trees, and also any trees so badly weakened that there was small hope of their recovery. In addition, dead or badly attacked branches were to be pruned off and burned. This was to be followed by the thorough spraying of all the remaining trees with lime-sulphur in the spring. This was done in several orchards and no further trouble was found, or in those orchards where spring applications of an oil wash had been made. This is not sufficient, however, to prove that lime-sulphur or an oil wash, such as Carlson's Mixture, was the real cause of the absence of the beetles, though it looks as though such was the case. For the August attacks it seems probable that lime-sulphur or a lime and soap wash with a little carbolic acid in it would be very useful as a means of warding off the beetles.

Prof. LOCHHEAD: I remember that some years ago when dealing with the San José scale this Shot-hole Borer was very abundant in some districts where the scale had already killed the trees. I have always believed that the Borer attacked trees that were a little off-color or something wrong with their roots, and so not completely healthy. I do not see exactly why the borers should limit themselves to diseased trees; still it seems to be their natural habit to go to such trees.

Mr. JARVIS: I know of three peach trees in sod in the Grimsby district which are badly attacked by this beetle; close by there are other trees where the soil is cultivated, which show no evidence of this pest.

Dr. FELT: I have watched these insects for some years and know that generally speaking they do attack weakened or diseased trees. I believe, however, that they do, as mentioned this afternoon, sometimes attack perfectly healthy trees. The real source of the trouble in such cases is not necessarily due to their breeding in the immediate neighborhood. Dr. Hopkins has recorded flights of the beetles evidently coming from a considerable distance and I believe that they fly in more or less large swarms. My impression is that the beetles that have attacked the healthy trees referred to have probably come in swarms of greater of less extent. I think the only practical solution of the difficulty is to get the fruit-growers interested and remove all the dead material. Then let them, as suggested, put on their lime-sulphur. If it does not ward off the beetles it will at least pay for itself by warding off fungus diseases.

In answer to the question whether he agreed with the statement that there were apparently two main times in the season that attacks were to be feared, Dr. Felt said he believed the statement was correct so far as he knew.

APHIDS.

Mr. JARVIS: The cabbage Aphids have been increasing year after year now for several years. We get a great many letters asking for remedies. We find it very difficult to get any really satisfactory remedy that seems practicable.

Mr. Caesar said he was afraid that no remedy could possibly ward off attacks because he thought that winged females flew from plot to plot and rendered all remedies more or less futile.

Mr. Bethune: I think that it is the long continued dry weather that has allowed the Aphids to become so very numerous and destructive this year. It is very difficult to suggest a remedy to a farmer who is growing turnips by the acre, because he will not apply a troublesome spray, and what I recommend them all to do is to be on the lookout when they are hoeing the crop and trample underfoot any affected foliage. Some farmers said that their crops were entirely destroyed, while others said that the turnips were all right though the foliage was very badly affected.

Another insect which has been serious in a great many places is the Turnip Maggot, similar to the Cabbage Maggot. These insects cause the turnips to be all distorted and with woody or rotten spots. They are then useless for any purpose as the cattle will not eat them and they are of no use in any other way. I do not know any remedy that is really practicable for dealing with this insect.

The Bag Worm.

Mr. Jarvis: I wish to call your attention to another insect that was found by Raymond Zavitz, of Guelph, this year, the Bag Worm. It was found on a cherry tree. I think it has been found here for the first time. I would like to hear what Dr. Felt says about this pest. We have it here this year and it is probably the first time that it has been reported in the Province. I saw a note about its being found in New York State.

Dr. Felt: The Bag Worm is in New York State, rather commonly about New York City, and I should say off and on ranging rather abundantly for thirty miles around. This last summer I was rather surprised to receive the Bag Worm from Red Cedar, forty miles south of Albany. I think it is an unusual record for New York State and just why you should find the insect here I do not understand, because this must be equivalent to about fifty miles further north than the latitude of Albany, and perhaps the weather is a little more extreme in winter.

Dr. Bethune: I had a specimen of the moth given to me two years ago, which was taken in this part of Ontario and I thought it was extremely remarkable. I never heard of the Bag Worms in Ontario before. Here in Guelph we are just on the verge of the upper Austral and the Canadian Boreal zones and we get a little of the fauna and flora of both zones, so that we find a few insects reach us here that hardly extend further north or south, as the case may be, and it seems we are free from most of the southern species which are troublesome along the shores of Lake Erie. This insect certainly is remarkable for having come to such a point as this.

As far as these zones are concerned I suppose we are rather more than fifty miles further north than Albany. It is never safe to say where the line between these zones should be drawn.

We find many things growing quite luxuriantly about Dundas and in the vicinity of Hamilton, which will not grow here at all. We are, I think, about 1,100 feet above the level of the sea and are more than twice as high above Lake Ontario as the Hamilton Mountain, so that there is a difference in altitude as well.

After some further informal discussion on a variety of injurious insects. the meeeting adjourned.

EVENING SESSION—THURSDAY, NOVEMBER 5TH, 1908.

A public meeting was held in the Massey Hall building of the Ontario Agricultural College, and was largely attended by members of the Society, students of the College and Macdonald Institute and visitors from the city. The chair was taken by Dr. Bethune, Professor of Entomology. The proceedings were very much enlivened by musical selections excellently rendered by the College Orchestra.

The chairman, in his opening remarks, referred in feeling terms to the great regret that was felt by all at the absence of their President, Dr. James Fletcher, who was seriously ill in a hospital at Montreal. Being the forty-fifth annual meeting of the Society, of which he, the chairman, was one of the founders, he gave a short account of the history of the Society and of the good work which it has accomplished during all these years. He then introduced, as the chief speaker of the evening, Dr. E. P. Felt, of Albany, the State Entomologist of New York, who was widely known from the numerous books and papers on economic and systematic entomology that he had published; though still a young man he had attained a high reputation due to the excellence and thoroughness of his work. Dr. Felt then gave the following lecture on "The Interpretation of Nature," which was illustrated with a large number of beautiful and interesting lantern slides.

THE INTERPRETATION OF NATURE.

By E. P. Felt, Albany, N.Y.

Our civilization is based on the accumulated wisdom of the ages. The ancient lore of the Chinese, the mystery of the Hindoo, and the culture of the Greek, all have had an important influence upon the development of the human race. The learned man acknowledges his debt to these and other sources of wisdom. None take issue with Pope when he writes: "The proper study of mankind is man." We would go farther and say: The proper study of mankind is man, the earth and the fulness thereof. Even as ignorance of the wisdom of the ancients restricts the usefulness and activity of the individual, so does a failure to understand the laws governing the existence of other forms of life, circumscribe the power of dominant man. In other words, the welfare of man is most closely bound up with that of a number of animals and plants. Detailed knowledge of these latter is essential to continued progress. One can not be separated from the other.

Nature is kind to the student of economic entomology, since she gives him five or six opportunities to identify an insect, namely, the egg, larva, pupa, adult and work. This kindness is not always so apparent, especially when it is remembered that this abundance and variety of form means a corresponding increase in the number of characters to be memorized, particularly as an entomological constituency frequently expects identification in all stages. The story is easy to decipher if the page has been previously studied, otherwise its translation may be as difficult as that of the Egyptian hieroglyphics. Not infrequently neither the egg, larva, pupa, adult, work or debris is at hand, and the entomologist may be called upon to separate fact from poor or absolutely misleading descriptions. In the latter event, it not infrequently happens that an intimate knowledge of local conditions is of vast service in reaching a satisfactory conclusion.

The work of the economic entomologist only begins with the identification of the insect. This step is simply a means to an end. Now, he is called upon to exercise his proper function as an interpreter and to render an opinion as to the nature of the insect. His prognostication depends upon several factors, the most important of which is a knowledge of the insect and its previous history in the locality under consideration. This is of much service in the case of well known insects but of comparatively little value when an unusual outbreak occurs. Then he must fall back upon his knowledge of the general habits of the group, supplemented in not a few instances by an understanding of the local conditions. Furthermore, he must take into consideration the influence of climate and the likelihood of parasites being abundant enough to check an outbreak in its incipiency. Recommendation naturally follows prognostication and is determined in large measure by the previous findings. It frequently happens that, owing to the nature of the crop infested or the character of the outbreak, direct control measures are impossible. An intimate knowledge of the possibilities may result in a different rotation of crops being advised or modifications in culture. The wisdom of applying direct insecticides, such as the internal poisons or those destroying by contact can be determined only by a variety of conditions. We must take into account the time of year, the condition of the crop, particularly if it be fruit, and the recommendations may not only vary from year to year but be widely diverse in different seasons of the same year.

The Bark Borers are extremely interesting forms and we propose to discuss a number of species very briefly because of the most admirable records they give concerning the identity of the form responsible for the mischief, the time when the injury was inflicted, the sequence of the species working in the bark and a variety of interesting biological data, all of which may be gleaned by a study of their workings.

The small, pale, yellowish, gummy exudations on the limbs of peach trees are very suggestive of the Fruit-tree Bark-beetle (*Eccoptogaster rugulosus*, Ratz.). It is only necessary to make an examination and find the circular exit holes or to disclose the characteristic galleries lying beneath the bark, in order to confirm our suspicions. The early work of this insect is very beautiful, showing the longitudinal gallery made by a single female and the numerous, more slender larval tunnels, the latter increasing in size with their length and ending in a pupal cell. This species is occasionally so abundant in New York State as to literally destroy the inner bark and thickly score the sapwood. This illustration shows such a condition and also represents the work of a wood-pecker. This bird not only removes the outer bark in its search for the grubs and pupæ, but frequently splinters the wood in its eagerness to secure such delicacies. The Hickory Bark-borer (*Scolytus quadrispinosus*, Say) is related to the preceding and has a very similar method of operation. The female enters at one point, continues her gallery with the grain of the wood, depositing eggs on either side. The larval galleries diverge therefrom as in the preceding species. It is comparatively easy to estimate the prolificacy of an individual by counting the larval burrows originating from the tunnel of a female. This species is occasionally very injurious to hickories in New York State. The Red Cedar Bark-beetle (*Phloesinus dentatus*, Say), though rarely abundant enough to cause material injury, is extremely interesting because of the beautiful and very characteristic galleries it makes in its food plant. There is almost invariably a three-lobed chamber at the point of entry, while the long, slender larval tunnels, just grazing the white wood, present a strong contrast to the dark brown bark delimiting their margins. Most interesting of

all, we occasionally find a piece of fossilized wood engraved by one of these borers. We have before us an illustration representing a piece of arbor vitæ from the interglacial beds in the vicinity of Toronto, and the carvings, though faint, tell interesting stories of early life on this continent. The form of these galleries is so characteristic that Dr. Hopkins, our American authority on this group, referred the maker (*Phloesinus squalidens*, Scudd.) to a genus and on account of the restricted food habits of its allies, gave a provisional determination of its food plant. The Ash Bark-beetle (*Hylesinus aculeatus*, Say) presents another type, since the adult galleries diverge from a common point, indicating, as we are told, that two females are probably responsible for their construction. The borings are beautiful in their regularity.

Some of these insects are very injurious to our forest trees, and a study of their habits has therefore a practical, as well as a scientific value. It is interesting to note what can be learned from a large pine tree which has evidently been dead some years. The bark may have largely disappeared, as in the case illustrated, but a close examination of the lower portion of the trunk shows that the sapwood has been badly scored by some borer, and a little familiarity with the habits of these insects would enable us to name the offender. Before attempting this, let us look at the condition of two pines as they were in September. One is apparently in excellent condition while the top of the other has perished. The needles of both, though not shown in the illustration, were decidedly unhealthy and by the following spring the trees were bare and the bark had begun to peel. An examination of the lower portion of the trunk shows a number of pitch tubes, indicating clearly that certain bark beetles had been at work before life was extinct. A pitch tube is nothing more than particles of pitch carried by the insects from their burrows and laid around the mouth of the exit. The insect responsible for this work is known as the coarse writing bark beetle (*Tomicus calligraphus*, Germ.), a species which makes a very characteristic series of galleries and confines its operations almost exclusively to the thicker bark of the lower portion of large trees. Occasionally a dead tree may be found standing and give little external evidence as to the cause of injury. A closer examination may result in finding circular exit holes here and there upon the bark. These invariably mean that insects have been at work beneath. The removal of a large piece of bark may reveal a confused mass of galleries frequently nearly filled by borings and decaying particles of bark. Apparently there is little of significance, but on brushing away the debris, we sometimes find a few galleries preserved by infiltrated pitch, incontrovertible evidence that the pine was attacked while alive. The tree, in making an effort to recuperate from the injury, exudes pitch. This latter infiltrates the walls of the galleries and thus a record of injury may be preserved for years. The bark borer is followed in turn by certain species which live upon the dead inner bark, and in some instances also upon dying wood. One of the most characteristic of these is *Rhagium lineatum*, Oliv., a species which produces, between the bark and the wood, very characteristic pupal cells, the walls of the latter being composed largely of white fibres torn from the sapwood. *Pytho americanus*, Kirby, is an ally of the same and, like its associate, constructs between the bark and the wood a distinctive pupal cell, the walls of the latter being composed entirely of almost rotten bark borings. The two last named species may also be found in association with Monohammus, the larvæ of which are perhaps better known as sawyers. The exit holes of Monohammus are large, irregular, not sharply defined. The galleries made by the larvæ are easily recognized, since they are broad, irregular, traverse

both bark and wood, occasionally entering the latter to a considerable depth, and are invariably accompanied by coarse, sawdust like borings.

The coarse writing bark beetle mentioned above is usually hardly more than an assistant to the pine bark beetle (*Tomicus pini*, Say). This latter is a smaller form and confines its operations to the thinner bark of the middle of the tree and on the larger branches. Its galleries, like that of its associate working below, are very characteristic and, in some instances, extremely beautiful. Not infrequently this insect breeds in such large numbers that the bark is fairly dotted with its exit holes, while the tissues beneath are riddled by numerous galleries of both adults and larvæ, not to mention the borings of young Monohammus larvæ, frequently found in these situations. Later, Rhagium and Pytho may occur, though as a rule, not so abundantly as under the thicker bark at the base of the tree.

The Balsam Bark-borer (*Tomicus balsameus*, Lec.) is another extremely interesting species. It is occasionally quite injurious to its food plant. The early work begins with an irregular central chamber with two or more transverse adult galleries, the larval burrows being usually with the grain of the wood. This insect breeds throughout the length of the tree and occasionally a group of adults, starting from one central chamber, may entirely girdle a young twig, though this method of work is somewhat exceptional. Three transverse galleries originating from a central chamber is somewhat typical of this insect's work. The plan of operation is frequently obscured in a badly infested tree by interlacing of the galleries and the development of fungus in the decaying tissues. Under these conditions, the only evidence we know of to show that the tree was attacked while alive is the occurrence, in small chambers here and there, of masses of dried balsam. These accumulations usually result from balsam flowing into cavities from injured living tissue.

It will be seen from the preceding that much can be learned from comparatively obscure signs when one understands their significance. The galleries of various bark borers are so characteristic as to permit of the ready identification of most species, and in not a few instances the determination of the plant affected. Furthermore, the condition of the tree at the time of attack can be determined with a considerable degree of confidence and the sequence of the species ascertained. The same is true of insect work in many other groups though it is not always so susceptible of proof. Many times the signs have little or no significance because we fail to comprehend their import.

Records of insect work are sometimes made under other than natural conditions. Certain species invade the house, and, unfortunately, many of us are too familiar with signs of their presence. Occasionally, as in the instance under consideration, the insect is the sufferer. This particular case is of special interest, since it is practically an artificial fossil, a large June beetle (*Lachnosterna*) having been literally crushed into the paper during the process of calendaring. Note the preservation of the antennæ and legs, suggestive of what might be done along this line with other species. Incidentally, we wish to call attention to the melancholy fact that a few individuals, insect as well as human, attain notoriety only when they make an exit from this world in an unusual manner.

Turning now to some forms which are of great interest to residents of cities and villages, allow me to give you a little idea of their importance in an adjacent State. The work of the White Marked Tussock Moth (*Hemerocampa leucostigma*, Sm. & Abb.) is so well known that we unconsciously associate defoliated horsechestnut trees with the presence of this

insect. It has been very destructive in recent years in many cities, and villages of New York, particularly at Buffalo. Furthermore, judging from accounts which have come to our attention, certain Canadian cities have not been altogether free from the ravages of this beautiful caterpillar. The wingless female is probably well known to most who are at all interested in preserving our shade trees, while the characteristic white egg masses need no description at the present time. The control of this insect is easily affected, either by collecting egg masses or thorough spraying with an arsenical poison at the time the young caterpillars begin operations. The selection of one method to the exclusion of the other must be governed largely by local conditions.

The Elm-Leaf Beetle (*Galerucella luteola*, Mull.) is another species which has been very injurious to elms for over a decade in the Hudson valley. It has recently become quite destructive at Ithaca, N.Y., and will presumably inflict considerable injury upon elms in other cities in the western portion of the State. Saratoga Springs and its vicinity seems to be the northernmost limit in New York State where serious injury is likely to occur. It displays a marked preference for the English and Scotch elms and, under certain conditions, may become injurious to the American elm. The larvæ feed exclusively on the lower surface, leaving the tough upper epidermis unbroken. The leaves are skeletonized, only the mid and lateral ribs, supported by a thin, brown membrane, remaining. This habit of the larva makes it imperative to apply the arsenical poison to the under surface of the leaves.

The Snow-white Linden Moth (*Ennomos subsignarius*, Hubn.) attracted a great amount of attention, because the delicate, snow-white moths appeared in myriads about the electric lights of New York City, various other localities in the Hudson valley north to Saratoga and along the Mohawk valley westward to Utica. Reports of similar flights also came from northern New Jersey, from Springfield, Mass., and Ottawa, Canada. This species has not, in recent years at least, attracted notice on account of injuries to shade trees, and even during the past summer there was no marked damage by the caterpillars of this insect to street trees. There were, however, serious outbreaks by this species in both the Adirondacks and the Catskills, the injuries in the latter locality having been preceded by extensive defoliation the preceding year. The light brown, barrel-shaped eggs of this insect are deposited in clusters upon the bark, and a search for them should give some idea as to the probability of the injuries being repeated another season.

The Sugar-Maple Borer (*Plagionotus speciosus*, Say) is rarely seen, though its operations upon sugar maples are very evident in many localities throughout New York State. The initial injury is usually marked by an oblique elevation on the trunk or near the base of the lower branches. This overlies the gallery of the grub and is caused by the abundant formation of new tissues along the line of injury and the consequent pushing up of the old bark. The latter, in case of a bad injury, eventually cracks, exposes the wood, and after a series of years, owing to the deficient circulation, both above and below the oblique part of the wound, the bark dies back till we have a large bare space, usually accompanied by the death of the limbs on that side of the tree. The exposed tissues decay and eventually wind and storm bring about the destruction of magnificent trees. This insect may be regarded as one of the most serious enemies of maples in New York State, though its work is conducted in a very unobtrusive manner.

The Gipsy Moth (*Porthetria dispar*, Linn.) should be mentioned in this connection, though it has not yet been found in New York State. It has

become established in two Massachusetts localities within fifty miles of our line. The control of this insect is of great interest to all States liable to become infested. It would be a rash individual who would dare to say that any locality in the Northeastern United States or in a territory adjacent to the north might not be invaded by this insect within a decade. Defoliated woodlands are characteristic of a bad infestation by this species. The caterpillars not infrequently become so abundant as to form large clusters at the base of trees, sometimes fairly covering the trunks as they range themselves side by side. The caterpillar itself is an inch and a half to two inches long, hairy, dark grayish, with a double row of warts down the middle of the back, the ten anterior blue, the twelve posterior red. The insect is also easily recognized by the heavy bodied, dingy white female lightly and irregularly streaked with black and gray, in connection with the conspicuous yellowish or buff colored, oval egg masses about an inch in diameter and appearing much like a section of a sponge.

The Brown Tail Moth (*Euproctis chrysorrhœa*, Linn.) though a more recent introduction, has become much more widely disseminated than the preceding. It has not yet become established in New York State, though it occurs in Nova Scotia. The winter nests of this species are very familiar, while the snow white, brown-tailed moths and the orange brown caterpillars, with a conspicuous row of white spots on either side and two bright red spots near the posterior extremity, are easily recognized. This insect is not nearly so injurious in Massachusetts as the Gipsy Moth.

The control of these two introduced species is of great importance to all residing in territory likely to become infested, since the more thoroughly the inscet is kept in check, the less chance there is of its becoming established in new territory. Massachusetts authorities are using thoroughly up-to-date power spray apparatus for the application of arsenical poisons to shade and forest treees. Recent improvements have resulted in greatly increasing the capacity of the ordinary spraying outfit by replacing the usual six horse power gasolene engine, weighing some 1,800 pounds, by a ten horse power engine made especially for automobiles and weighing only 400 pounds. Furthermore, a heavier and more powerful pump has been employed, the whole weighing no more than the usual spray outfit. The machinery is mounted upon a stout wagon with a 400 gallon tank, and a heavy inch and a half hose some 400 to 800 feet long, with a smooth quarter-inch nozzle, is employed. A pressure of 200 to 250 pounds is maintained. The hose is handled much as though a fire was in progress. Ten men, at intervals of six or eight feet, carry the end of the hose, the nozzle being in charge of a superior man, with instructions to keep it moving all the time. The pressure is sufficient to throw the insecticide 40 or 50 feet and the resistance of the air breaks it into a fine spray. The foliage is well covered if the nozzle is handled intelligently. This giant outfit is particularly adapted to work in woodlands. It usually requires four horses and is capable of spraying 14 to 16 acres a day, much depending upon conditions. The cost of treatment in this manner is reduced to about $10.20 per acre where the woodland is fairly clear of underbrush. An interesting modification of this apparatus has been employed for spraying strips along the road side, and it could probably be used, under some conditions at least, upon shade trees. It simply consists of a giant extension nozzle mounted on a universal joint so that the tip may be lifted 40 or 50 feet from the ground. This last named apparatus, with a favorable wind, can cover a strip 400 feet wide.

The work with parasites of the Gipsy and Brown Tail Moths, conducted by the State of Massachusetts in co-operation with the Federal Gov-

ernment, is most encouraging. The work of 1907 has been considerably extended in providing larger quarters and a more adequate staff. Furthermore, efforts have been made to secure larger sendings from European countries, and a special agent was dispatched to Japan. This latter undertaking has proved most encouraging, in that a large Apanteles and a new egg parasite of the Gipsy Moth have been received from Japan. The Apanteles has been bred through one generation in American caterpillars. The sendings from Japan have, in addition, resulted in the introduction of four species of Tachinidæ which promise to be very efficient parasites of the Brown Tail Moth. Marked improvements have been made in methods of handling and rearing parasites and other natural enemies. This latter justifies the expectation that it would be practical to breed thousands of the more effective species prior to their being liberated under favorable conditions. This work with the parasites may rightly be considered as most important, owing to the fact that the Gipsy Moth is now so widely established as to render any widespread method of control, aside from that with natural enemies, exceedingly costly.

There are several fruit tree insects worthy of mention in this connection, though most of them are so well known that comparatively little that is new can be given. The Codling Moth (*Carpocapsa pomonella*, Linn.) lays heavy tribute upon our fruit growers, causing an annual loss on the apple and pear crop of New York State estimated at $3,000,000. The operations of the Apple Worm are too familiar to require description, and the same is true of the characteristic pupal cells found under the bark. The parent insect is less frequently seen and the transparent, whitish egg, sometimes deposited upon the fruit and frequently upon the leaf, practically escapes observation. Our fruit growers rely almost entirely on thorough spraying with an arsenical poison, making the application when the green sepals are still open. Arsenate of lead, in the experience of one pear grower at least, has proved much more effective than other poisons in controlling this insect upon that fruit.

The Cigar Case-bearer (*Coleophora Fletcherella*, Fern.) has caused much injury to fruit trees in some sections of Western New York. This species appears to be much more destructive in that region than in the Hudson valley. The brown, cigar-like cases are about one-quarter of an inch long and easily recognized by their characteristic form. The young caterpillar, as is well known, eats a little hole into the leaf and then devours the more tender parenchyma lying between the upper and lower epidermis. This habit renders its control somewhat difficult, though an early application of a poison at the time the leaves begin to appear has proved very effective.

The Blister Mite (*Eriophyes pyri*, Nal.) has been unusually destructive in certain orchards in Western New York and its presence has also been noticed in the Hudson valley. The work of this species is quite characteristic though it presents a somewhat superficial resemblance to that of the case bearer mentioned above. The blisters caused by the mite are invariably raised, somewhat thickened, and there is a small, irregular, circular hole near the center of the blister. The venation also disappears in the affected area. These characters serve to separate its work from that of the case bearer mentioned above, while the thickening of the tissues at once differentiates it from fungous attack. Spraying in early spring with either a lime-sulphur wash or a whale oil soap solution has proved effective in controlling this species. The advisability of making such an application must be determined largely by the abundance of the mite.

Several scale insects are more or less common in New York State orchards. An old and common enemy is the Oyster Scale (*Lepidosaphes ulmi*, Linn.), a species which is sometimes quite abundant upon young fruit trees and is especially likely to be numerous on ash. It is easily controlled by thorough applications of either a whale oil soap solution or a kerosene emulsion, the latter part of May or early in June at the time the yellowish young are most abundant. The Scurfy Scale (*Chionaspis furfura*, Fitch) is another old enemy, which in recent years has proved somewhat more destructive than the Oyster Scale mentioned above. It can be controlled in the same way. The San José Scale (*Aspidiotus perniciosus*, Comst.) has become well established in a number of sections in New York State and our more progressive growers are quite confident of their ability to keep the insect in check. Early spring applications of a lime-sulphur wash, or a miscible or so-called "soluble" oil are the two methods most extensively employed. We think it safe to say that by far the most of our fruit growers rely upon some preparation of a lime-sulphur wash and, as a rule, obtain very satisfactory results. The application is generally made in the spring, the more thorough growers making a practice of giving two sprayings, with the wind in opposite directions, whenever possible.

In conclusion, we wish to call attention to one of the most important of economic insects. The welfare of our forests, the preservation of our shade trees and the production of large quantities of farm produce, while valuable and in may ways essential to happiness, is of no avail if life be in danger by reason of neglect of ordinary sanitary precautions. The ubiquitous House-fly, tolerated for ages and assumedly an inevitable nuisance (not to use a stronger word) has come to be regarded as one of our most important economic insects. This change in attitude is due to the recent discovery that, under certain conditions at least, the House-fly may be an important factor in the distribution of typhoid fever and the germs responsible for certain other grave intestinal disorders. It is stated that there are 350,000 cases of typhoid fever annually in the United States, about 35,000 proving fatal. Recent investigations in the City of New York, conducted under the auspices of the Merchants' Association, show a remarkably close parallelism between the abundance of flies and the occurrence of typhoid fever and related infections. It is not necessary at this time to give full details respecting this insect. The House-fly is a child of filth with inherited tastes perverted beyond the possibility of reclamation. Furthermore, its breeding places are comparatively restricted. It is entirely within practicability to reduce its numbers to an almost negligible quantity He who is indifferent to this insect and its possibilities might well dance on the edge of a crumbling cliff overhanging a deep chasm inhabited by one of the most hideous forms of death. This is strong language. The situation justifies it. The suffering of a typhoid patient and the heavy pall of grief falling upon the afflicted family, cannot be adequately depicted by words. The true relation of the House-fly to the welfare of man must be known. This bearer of malignant germs should be excluded from our homes and a campaign begun which should eventually result in the practical eradication of this insect from the haunts of man.

ENTOMOLOGY IN THE GRADUATE SCHOOL OF AGRICULTURE, CORNELL UNIVERSITY, JULY 6-31, 1908.

By Wm. Lochhead, Macdonald College, P.Q.

It was somehow or other unconsciously taken for granted by all students of insect life that Entomology would form one of the parallel courses offered during the summer session of the Graduate School at Cornell University. To have a School of Agriculture at Cornell without Entomology was hardly possible, even thinkable, for did not four-fifths of all the Experiment Station workers and teachers in Entomology in agricultural colleges receive their inspiration and early training from Professor Comstock and his able staff of co-workers? So it came about naturally that Entomology was placed on the programme of courses, as soon as it was decided that the Graduate School would be held in 1908 at Cornell.

The task of arranging for speakers, topics and dates fell mainly on Prof. Slingerland, who also acted as chairman of each meeting. It was finally decided to have a lecture every morning (except Saturday and Sunday) from 9.30-10.30, and seminars on Tuesday and Thursday afternoons from 3 to 5. By this schedule, the horticulturists at the School were free to attend, and to benefit by the course. This arrangement was welcomed, and many of them attended every lecture.

The first week was assigned to the experts of the Bureau of Entomology at Washington. Dr. Howard gave two lectures on (1) "The Present Condition of Economic Entomology," and (2) "Recent Developments in the Practical Handling of Beneficial Parasitic Insects." Prof. A. L. Quaintance discussed the deciduous fruit investigations of the Bureau of Entomology, and led a large field party in a study of Mr. King's extensive orchards at Trumansburg. Prof. A. H. Hopkins gave one lecture on "The Work of the Bureau of Entomology Against Forest Insects," and conducted a field trip for the study of the common insects infesting trees in the vicinity of Cornell. Prof. F. M. Webster concluded the lectures of the first week by an account of the investigations of insects injurious to grain and forage crops by the Bureau of Entomology.

The second week was assigned to some of the most important Station Entomologists. Prof. P. J. Parrott of the N. Y. Agricultural Experiment Station, Geneva, gave two lectures on methods in planning and conducting co-operative experiments which were very suggestive and helpful. His seminar was devoted to a study of problems which were interesting him at the present time, viz., the pits on apple twigs and branches, made by the tree-cricket; the pits and markings on pear fruit by membracids; the leaf blister-mite in apple orchards; the willow girdler.

Prof. Slingerland described the work of an interesting plum leaf miner (*Nepticula*), and the work of Heterocordalis malinus, a bright red bug which distorts the leaves and fruit of the apple, preferably Greening and Ben Davis varieties.

Mr. Crosby described a new chalcid (*Syntomaspis druparum*) which he found infesting apple seeds.

Prof. E. D. Sanderson, Director of the Vermont Experiment Station, gave two lectures, one on the publications of the State Entomologist, and the other on methods of studying the Codling Moth, and conducted a seminar on the Codling Moth. The work of Prof. Sanderson was highly appreciated by all who took part.

Dr. E. P. Felt, New York State Entomologist at Albany, gave a lecture on the "Work and Systems in the Office of the State Entomologist," giving

particular attention to the methods he adopted in indexing and cataloguing insects, experiments, and correspondence.

The third week was assigned to Dr. Forbes and Dr. Folsom of Illinois. The former in his first lecture discussed the scope of economic entomology, and emphasized the importance of the ecological phase. The Economic Entomologist should study both plant and insect ecology on account of their mutual bearings, and should keep continually before him the humanistic aspect; that is, the value of his results is to be interpreted by their ultimate good to man. Dr. Forbes' second lecture dealt with concrete examples of economic studies, which he himself had made in Illinois, viz., the Northern and the Southern corn-root-worms, the common white grubs, and the aphids of the corn plant. In the period allotted for a seminar, Dr. Forbes described his method of keeping his office records. He keeps (1) an Accession Catalogue, (2) A Species Catalogue, and (3) An Experiment Record. Dr. Folsom gave three most interesting and instructive lectures on the "Insects Injurious to the Clover Plant," and conducted a trip for the study and collection of these insects in the fields. He dealt with the following: *Clover-leaf weevil, Pea aphis, Clover-stem borer, Clover-seed Midge, Clover-seed Chalcid, Clover-seed Caterpillar, Clover-root Borer* and *Clover-hay worm.* A monograph on clover insects will be published soon by Dr. Folsom, who has devoted nearly five years to this subject.

The fourth week was assigned to the Entomological Staff of Cornell University. Prof. Slingerland devoted two lectures to insect photography, to which he has given much attention, so that he is now considered our foremost insect photographer.

Dr. J. G. Needham gave a lecture on "What Shall be Done with the Marshes?" He pointed out that while many marshes should be drained and made valuable as agricultural lands, there are other marshes that should not be drained, as they serve useful purposes, and on account of their location would never be valuable as farm lands. He urged that such areas be made places of beauty and recreation, free from the festive mosquito. Dr. Needham conducted the class to his Marsh Laboratory near Renwick Park and explained the nature of the investigations he was conducting with aquatic forms.

Drs. MacGillivray and Riley gave interesting lectures on the "Methods and Aids in Entomological Instruction." They urged the importance of careful systematic work, not only along the older lines of anatomical and systematic Entomology, but also along the newer lines of morphological and embryological investigations, if many of the problems that are now confronting the economic entomologists are to be solved successfully.

Much credit is due Prof. Slingerland for the excellent course of lectures provided, which every member of the class thoroughly enjoyed.

From the old Cornell students in attendance, the absence of Prof. and Mrs. Comstock—who were taking a well-earned holiday in Egypt and Europe—called forth many expressions of regret, for to most of them the most pleasant memories of their Cornell life are associated with Prof. and Mrs. Comstock in the Entomological Laboratories.

At the close of the proceedings a hearty vote of thanks to Dr. Felt was proposed by Prof. Lochhead, seconded by the Rev. Dr. Fyles, of Quebec, and enthusiastically adopted by the meeting. After a musical selection by the orchestra, the audience joined in singing "God save the King," and the session was brought to a close.

SECOND DAY'S SESSION—FRIDAY, NOVEMBER 6TH, 1908.

The Vice-President, Mr. Tennyson D. Jarvis, took the chair at 9.30 o'clock a.m. in the Biological lecture-room of the Ontario Agricultural College. There was a good attendance throughout the day, composed of students as well as members of the Society. The first order of the day was the reading of the reports of the Council, the Branches of the Society at Montreal by Mr. H. H. Lyman, Quebec by Rev. Dr. Fyles, and Toronto by Mr. J. B. Williams. The reports of the Treasurer, Librarian and Curator were presented by the respective officers, and that of the Delegate to the Royal Society by Mr. Arthur Gibson of Ottawa. This was followed by the election of officers for the ensuing year, 1908-9 (see page 6). Dr. Fletcher was unanimously re-elected President, and Mr. T. D. Jarvis and Dr. E. M. Walker, of Toronto, first and second Vice-President respectively; the latter appointment was made in view of the fear that Dr. Fletcher might be incapacitated from accepting any office. This apprehension proved unhappily to be well-grounded; our reverend and beloved friend died two days later—an account of his life and fatal illness will be found in another part of this report. At a subsequent meeting of the Society held on November the 18th, Mr. Jarvis was elected President and Dr. Walker, Vice-President.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present the report for 1907-8.

The forty-fourth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on October 31st and November 1st. Many members from a distance, almost all of the local members and a considerable number of interested outsiders, including many of the students of the College, were present.

The first afternoon was devoted to a conference on Fruit-tree Insects. The chief insects discussed were the Fruit-tree Bark Beetle or Shot-hole Borer, which had been doing much damage to Cherry trees in the Niagara district during the season, Codling Worm, Oyster-shell, Terrapin and San José scales, and the Woolly Aphis. This discussion was followed by the "Reports on Insects of the Year" by the directors from their respective divisions of Ontario. In the evening the president, Dr. Fletcher, delivered his inaugural address entitled "The Entomological Outlook." This was followed by a very interesting and instructive illustrated lecture by Mr. A. H. Kirkland of Boston, Mass., on "The Gypsy and Brown-tail Moths in Massachusetts." The morning and evening of the second day were occupied with the reading of reports from the branches and officers of the Society and a series of scientific and practical papers on various subjects. In the evening session Dr. E. M. Walker of Toronto University gave an illustrated lecture on "Collecting and Rearing Dragon Flies at the Georgian Bay Biological Station." All of these papers and addresses have been published in the annual volume.

This volume, the 38th Annual Report to the Legislature of Ontario, was published early in March, and contained 136 pages, and four excellent half-tone plates of Galls from a variety of plants. Besides the papers

already mentioned it included the following articles: "Voices of the Night," by Dr. Fyles; "A Preliminary List of the Scale Insects of Otnario," by Mr. T. D. Jarvis; "The Lime-Sulphur Wash," by Mr. L. Caesar; "An Unusual Outbreak of Halisidota Caterpillars," by Mr. A. Gibson; "Additional Insect Galls of Ontario," by Mr. T. D. Jarvis; "Injurious Insects in Ontario in 1907," by Dr. Bethune; "A Remarkable Outbreak of the Variegated Cutworm," by Dr. Bethune and Mr. L. Caesar; "Two-winged Flies," by Dr. Fyles; "A Report of the Summer Meeting," by the Secretary; and "The Entomological Record," by Dr. Fletcher and Mr. A. Gibson.

"The Canadian Entomologist," the monthly magazine of the Society, has been regularly issued at the beginning of each month. The 39th annual volume was completed in December last and eleven numbers of the 40th volume have already been published.

The volume for 1907 consisted of 423 pages and was illustrated with eleven full-page plates and a number of figures from original drawings. The contributors were 73 in number and included writers in Ontario, Quebec, Manitoba, Alberta, British Columbia, the United States, Cuba, Jamaica, the Hawaiian Islands and England. The articles are for the most part of a scientific character and contain, among much highly valuable matter, descriptions of eleven new genera and 222 new species and varieties of insects belonging to various orders. There is also a series of articles by different authors on subjects included under the title of "Practical and Popular Entomology." The material contained in the volumes of our magazine is so indispensible to specialists in all departments of Entomology that there is a steadily increasing demand for volumes and numbers, and occasionally for complete sets.

The reports from the Branches of the Society at Montreal, Quebec, Toronto and British Columbia are very satisfactory, meetings having been regularly held and many papers read and discussed. The Bulletin published quarterly by the British Columbia Society contains lists of local insects and many notes and observations of a highly interesting character.

From October to the third week in March meetings of the Society have been held every alternate Wednesday evening in the Biological lecture-room of the Ontario Agricultural College at Guelph. The attendance throughout has been satisfactory and a gratifying amount of enthusiasm has been shown by the members throughout the year. The following is a list of the papers read at the meetings: "The Cynipid Galls," by Mr. W. R. Thompson; "The Fight against the Brown-tail Moth in Nova Scotia," by Mr. T. Brady; "Wing Classification of the Heteropterous Land Forms," by Mr. R. C. Treherne; "Parasitism," by Mr. G. M. Frier; "Adaptions of Aquatic Insects," by Mr. L. Caesar; "Fungi that attack Insects," by Mr. J. W. Eastham; "Insects as carriers of Disease," by Mr. T. D. Jarvis; "Reminiscences of Entomologists whom I have known," by Dr. Bethune.

It is with deep regret that the Council records the death in his 67th year of Mr. John A. Balkwill, Director for the London District, and for several years the efficient Treasurer of the Society, which took place at his residence in London on the 10th of October, after a few weeks' illness. While much interested in Entomology, he was particularly devoted to Botany and Horticulture, and was familiar with all the wild plants in the neighborhood of London. He was the first President of the local Horticultural Society and continued to be an active member of its directorate, taking a leading part in its annual floral exhibitions and in the general improvement of the parks, boulevards and gardens of the city. The members of the Council beg

to offer to his widow and family their respectful sympathy in the bereavement that they have sustained.

The Council has also to lament the death of one of the Honorary Members of the Society, Dr. William H. Ashmead, which took place on the 17th of October. For nearly thirty years he was a constant and valued contributor to the pages of the "Canadian Entomologist" and had attained a high reputation among all students of this department of science from the thoroughness of his work. He had devoted himself especially to the study of the Hymenoptera and became the chief authority on the order in North America. His death at the early age of 53 years is a distinct loss to science and leaves a gap that it will not be easy to fill.

Respectfully submitted,

TENNYSON D. JARVIS,
Vice-President.

ANNUAL REPORT OF THE MONTREAL BRANCH.

The 294th regular, and 35th annual meeting of the Montreal Branch was held in the rooms of the Natural History Society, Drummond Street, on Saturday evening, May 16th, 1908.

Members present: Messrs. Geo. A. Moore in the Chair; Henry H. Lyman, E. C. Barwick, G. Chagnon, A. E. Norris, A. F. Winn.

The Secretary read the following report of the Council.

During the season 1907-08 meetings have been held monthly except in July and August, making ten in all, the average attendance being 7½, and two meetings of the Council have been held. The papers read at the meetings were as follows:—

Annual Address of President, Geo. A. Moore.
Hemiptera taken at St. Madeleine, Quebec, May 24, Geo. A. Moore.
Notes on Coleoptera taken at St. Madeleine, G. Chagnon.
An Afternoon at Highgate Springs, Vt., A. F. Winn.
Canadian Cerambycidæ, 1907, G. Chagnon.
Sugaring Record—August, 1907, A. F. Winn.
Hemiperta taken at Lacolle, Quebec, July 19-31, G. A. Moore.
Report on Boston Meeting Ent. Soc. of America, and Work on Brown-tail and Gypsy Moths, Henry H. Lyman.
A Field of Golden-rod, A. F. Winn.
Notes on collecting Sthenopis thule, E. Denny.
Note on Sphinx Canadensis, E. C. Barwick.
Variations in shade of Samia cecropia, E. Kollmar.
On the Oriental Moth, Henry H. Lyman.
An Account of the Annual Meeting at Guelph, Henry H. Lyman.
Plusia precationis at Petunia blossoms, A. F. Winn.
Further Notes on Hepialus thule, Henry H. Lyman.
Larval habits of Pyrausta theseusalis, walk, G. Chagnon.
An odd Home for a Micro Larva, A. F. Winn.
Another Fortnight at Biddeford, Me., A. F. Winn.
Notes on Hemiptera taken at Biddeford, Me., Geo. A. Moore.
Collecting and breeding Notes for 1907. Henry H. Lyman.
A few remarks on the Season's Work, E. Denny.

My best Captures for 1907, G. Chagnon.
Notes on the Season 1907, A. F. Winn.
On the attraction of Male Moths to bred females, E. C. Barwick.
Notes on the English Season 1907, L. Gibb.
Habits of Insects as a Factor in Classification, Prof. H. Osborne, (selected) read by Mr. Lyman.
A Trip to Chicago and Decatur, Ill., Henry H. Lyman.
Type and Typical, Henry H. Lyman.
Our Meetings—a Statistical Review, Henry H. Lyman.
Evolution of a Locality Label, A. F. Winn.
North American Species of Monohammus, G. Chagnon.
A little Journey to the Home of Mr. E. P. Van Duzee, G. A. Moore.
Entomological Reminiscences, Henry H. Lyman.

While the average attendance at the meetings is smaller than might be hoped for, it is gratifying to your Council to be able to state, that not only has the work of contributing papers been shared among the members, but also that the total of 34 papers is the largest number for any year in the history of the Branch. During the year we have added four names to our roll, but we have lost from our active list—for the time being—Mr. G. R. Southee, whose business position has necessitated his removal to Calgary, Alta. However, we feel sure he will favor us from time to time with accounts of his work among the butterflies and moths of that vicinity. We had the pleasure of having Mr. C. H. Young of Ottawa at our October meeting.

One field day was held at St. Madeleine, Quebec, on May 24th, but weather conditions were very unfavorable.

The collection of photographs of members has been added to by the presentation of a portrait of the late Mr. Robert Jack.

In the library have been placed copies of the current numbers of the Canadian Entomologist, the annual report of the Parent Society for 1907, report of the South London Entomological Society, 1907, Dr. Fletcher's "Weed book," the N. Y. State Entomological publication and the Plates of Wright's Butterflies of the west coast.

The Curator's duties have not been made arduous by the addition of any new specimens, but the collection is in good condition, and any duplicates the members can spare will be very acceptable. The Treasurer presented a statement showing a balance on hand of $65.35.

The following officers were elected: President, Geo. A. Moore; Vice-President, Henry H. Lyman; Secretary-Treasurer, A. F. Winn; Curator and Librarian, L. Gibb; Council, E. C. Barwick, G. Chagnon and E. Kollmar.

Albert F. Winn, *Secretary-Treasurer.*

REPORT OF THE QUEBEC BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The season of 1908 has been a very remarkable one. We have had a long continuance of fine weather and a great lack of rain. The long drought dried the leaves on the trees and they began to fall before the frosts came.

There have been destructive forest fires all around us, and the air has been full of smoke—at times so dense as seriously to impede navigation.

In consequence, there have been but few insects on the wing, but Mrs. Turner took a lovely specimen of *Hyphoraia parthenos*, Harris, at her summer residence on the Island of Orleans. Mr. Boulton captured several interesting specimens on the same island, amongst them one of *Phycanassa viator*, Edw. This insect is rare in our locality.

We are greatly indebted to Miss Freeman for several valuable donations for our cabinet, of choice specimens from the South and West of America.

We have heard with deep concern of the serious illness of J. H. Simmons, Esq., a member of our council. Many earnest prayers are offered on his behalf.

The Rev. Dr. Fyles has retired from the position of chaplain at Quebec for the S.P.C.K., and intends to move from this neighbourhood shortly. He has therefore felt called upon to present his resignation of the office of president of the Branch. He has done so with regret. The loss of his valuable services will be greatly felt by the members of the Branch whose best wishes accompany him to his new home.

(Signed) R. A. M. Boulton,
President.

Crawford Lindsay,
Sec.-Treasurer.

Report of Council.

The Branch now numbers 29 members.

The secretary-treasurer's report will be submitted to you.

During the year papers were read on the following subjects:—

By the President, Rev. Dr. Fyles: "Two-winged Flies," "Variations in Insects," "Southern Hawk Moths," "Form and habits of the mole cricket."

By Mr. R. A. M. Boulton: "Moths collected by the electric light at Montmorenci Falls," "Buterflies of the New Forest, England."

The thanks of the Branch are due to the authorities of Morrin College for allowing the members the use of their rooms.

(Signed) Crawford Lindsay,
Sec.-Treasurer.

At the annual meeting held on the 24th October, 1908, the officers for the coming year were elected as follows:—

Honorary President: Hon. R. Turner, M.L.C.
President: Mr. R. A. M. Boulton.
Vice-President: Mrs. R. Turner.
Secretary-Treasurer: Lt.-Col. Crawford Lindsay.
Council: J. H. Simmons, Esq., James Geggie, Esq., Miss Bickell, Miss Freeman, Miss Hedge.

(Signed) Crawford Lindsay,
Sec.-Treasurer.

REPORT OF THE TORONTO BRANCH OF THE ENTOMOLOGICAL SOCIETY FOR 1907-8.

The twelfth annual meeting of the Society was held on Tuesday, May 26, 1908, in the Provincial Museum, St. James' Square.

The President, Dr. Brodie was in the chair, and the following members were present:—Mr. Coleman, Mr. Webb, Mr. Williams, Mr. Woods, Miss Blackmore, Dr. Abbott.

The following officers were elected for 1908-9:—

President: Dr. Brodie.
Vice-President: Dr. Walker.
Secretary-Treasurer: Mr. Laing.
Librarian: Mr. Williams.
Curator: Mr. Laing.
Council: Mr. Woods, Mr. Webb, Mr. Ivey, Dr. Abbott.

During the past year 12 meetings were held with an average attendance of 8. The Society also spent a day at Niagara Glen which was both profitable and enjoyable.

The membership of the Society has increased to 30. As a number were comparatively young in the study of Entomology, an effort was made during the past winter to study the orders systematically. A committee for identification was also formed so that members might have some assistance in identifying their specimens. The study of Botany, in so far as it relates to the life history of insects, has also been introduced.

The work of making as complete a record as possible of the fauna and flora of Niagara Glen has also been proceeded with and reports from several members have been made.

The subject of Insect Mimicry has received much attention, and discussion, as the list of papers appended will show.

The treasurer's report shows the finances to be in a satisfactory condition with a balance in hand of $4.51.

List of Papers Read.

Characteristics of the Order Orthoptera—Dr. Walker.
Defence of Theory of Mimicry—Dr. Walker.
Insect Mimicry and Evolution—Dr. Brodie.
The Order Lepidoptera—Mr. Williams.
Arrangement of Insects according to habit—Dr. Brodie.
Interior of Africa—Mr. Thurston.
Galls—Mr. Cosens.
Relation of Plants to Insects—Mr. Ivey.
Aquatic Hemiptera—Dr. Walker.

Respectfully submitted,

E. Blackmore,
Sec.-Treasurer.

FINANCIAL STATEMENT.

Of the Entomological Society of Ontario made to the Department of Agriculture for the Province of Ontario for the year ending August 31st, 1908.

Receipts.

Cash on hand from previous year as per last report	$640 73
Members' fees and subscriptions to "The Entomologist"	402 31
Sales of cork, pins, etc.	68 49
Sales of back numbers of "Entomologist"	121 70
Advertisements in "The Entomologist"	52 75
Government grant	1,000 00
Interest on bank deposits	11 28
Printing—Sale of extra pages, cuts, etc.	32 20
Expenses—Return of postage by Government, etc.	10 41
Total	$2,339 87

Expenditures.

Supplies of pins, cork, etc.	$51 67
Back volumes	2 00
Fees remitted	5 11
Printing	869 02
Expenses—Postage, express, etc.	47 42
Annual meeting	109 31
Library	11 31
Annual report	114 29
Salaries	300 00
Honorarium—Dr. Bethune for services in moving headquarters	50 00
Total	$1,560 13
Balance on hand August 31st, 1908	$779 74

Examined and found correct this 5th day of November, 1908.

J. W. Eastham, }
J. W. Crow, } Auditors.

STATEMENT OF ASSETS AND LIABILITIES.

Assets.

Cash in bank	$779 74
Books and magazines in library	2,500 00
Museum	1,600 00
Wood cuts, plates, electros, etc.	700 00
Office furniture	75 00
Back numbers of the Canadian Entomologist and annual reports	850 00
Microscopes	225 00
	$6,729 74

Liabilities.

Nil.

S. B. McCready,
Treasurer.

CURATOR'S REPORT.

During the past year, as in previous years, the curator's work has been chiefly the general care and supervision of the Society's collections and the recording and placing of new specimens received from members of the Society. Last year lists of the species especially desired for the Society's collections were prepared and sent out to some of the members. These lists were long and contained many common species and gave the idea to some of the members who received them that the Society's collections were far from being representative of the fauna of Canada. This, however, is not the case as nearly all the common species appearing in the lists are in the Society's collections but many of them lack date and locality labels, and some of them are old and imperfect specimens. Thus they were included in the lists in the hope that in time all the common species might be represented in the Society's cabinets by perfect specimens bearing date and locality labels.

Since the last report the following contributions have been received and our sincerest thanks are due to the generous contributors for the same: 6 specimens of Coleoptera, by A. Gibson, Ottawa; 2 specimens of Lepidoptera, by James Fletcher, Ottawa; over 200 specimens of Lepidoptera, by Mr. F. H. Wolley Dod, of Millarville, Alberta; 50 specimens of Lepidoptera, by Mr. Charles R. Ely, of Washington, D.C.; 87 specimens of Cuban Lepidoptera, by Mr. Charles T. Ramsden, Guantanamo, Cuba.

In conclusion, the curator begs to remind the members of the Society that specimens, especially of rare and new species, are always most acceptable, and help to make the Society's collections more representative and of more value to every member of the Society.

Respectfully submitted,

J. E. Howitt,
Curator.

REPORT OF THE LIBRARIAN.

During the year ending August 31st, 1908, forty-nine bound volumes have been added to the Library, making the total number on the register 1,971; also a very large number of periodicals, pamphlets and bulletins, many of which will be bound during the next few months. Among the new books may be mentioned the English reprint by Mr. P. Wytsman, of Brussels, of Hubner's Sammlung Exotischer Schmetterlinge (*Lepidoptera Exotica*), edited by Mr. W. F. Kirby, of the British Museum; this work, which has been issued in parts during the last fourteen years and is now completed, forms three large quarto volumes and contains 491 hand-coloured plates of Lepidoptera, carefully copied from the originals, together with notes by the Editor on all the species depicted. The Farm Weeds of Canada, by Dr. Fletcher, with coloured illustrations of a large number of species, is another noteworthy addition to the useful books in the library. Thirty-eight volumes have been taken out by members during the year, but this does not at all indicate the use that has been made of our books as they are being consulted almost daily by students and members of the Society.

Respectfully submitted,

Charles J. S. Bethune, *Librarian.*

REPORT TO THE ROYAL SOCIETY OF CANADA.

By Arthur Gibson, Ottawa.

As delegate from the Entomological Society of Ontario, I have the honour of presenting the following report of the work of the Society during the past year.

The annual meeting of the Society was held on October 31st and November 1st last, at the Ontario Agricultural College, Guelph, the headquarters of the Society. This meeting was a most successful one and a large number of prominent entomologists and others were in attendance during the two days' session. A feature of the annual meeting of this Society is the reception and discussion of the reports of the directors of the six Districts in Ontario into which the economic work of the society is divided. In these reports mention is made of the insects which have been particularly destructive during the season. The annual report of the Society appeared in March last and in this an account of the proceedings of the above meeting are given, as well as most of the papers which were presented at the sessions. Among these latter the following may be mentioned:

"The Entomological Outlook" (Presidential Address). By Dr. J. Fletcher.

"The Gypsy and Brown-tail Moths in Massachusetts." By Mr. A. H. Kirkland.

"Voices of the Night." By Rev. Thos. Fyles.

"Collecting and Rearing Dragon-flies at the Georgian Bay Biological Station." By Dr. E. M. Walker.

"A Preliminary List of the Scale Insects of Ontario." By Mr. T. D. Jarvis.

"The Lime-Sulphur Wash." By Mr. L. Caesar.

"An Unusual Outbreak of Halisidota Caterpillars." By Mr. Arthur Gibson.

"Additional Insect Galls of Ontario." By Mr. T. D. Jarvis.

"Injurious Insects in Ontario in 1907." By Rev. Prof. Bethune.

"Entomological Record, 1907." By Dr. James Fletcher and Mr. Arthur Gibson.

During the year the Society also held a summer meeting at the Ontario Agricultural College, on July 4 and 5, when interesting papers were presented by Mr. H. H. Lyman on "Thecla calanus and edwardsii"; Mr. C. W. Nash on "Balance in Nature"; Dr. Henry Skinner on "Insects as Carriers of Diseases"; Dr. J. Fletcher on "Nature Study as a Means of Education"; Dr. W. Brodie on "The Life-history of a Colony of the Tent Caterpillar," and Mr. C. W. Nash on "Instinct *vs.* Education." An excursion was also held to Puslinch Lake, about nine miles from the college, many specimens of interest being collected.

The Branches of the Society at Quebec, Montreal, Toronto, Guelph and Vancouver, have all been actively at work during 1907, and much useful work in entomology is being thus encouraged at all of these centres. Regular meetings during the winter have been held by all of these Branches of the Society and many interesting papers have been presented and discussed.

During the year 22 bound volumes have been added to the Society's library at Guelph, besides a large number of periodicals, bulletins and pamphlets. Many of these latter are being bound up into permanent volumes.

This library which is one of the most complete entomological libraries in America is continually being used by members of the Society and by students specializing in entomology at the Ontario Agricultural College.

The collections of insects belonging to the Society have been materially added to during the year and considerable work has been done in going through the cabinets and rearranging the specimens.

The Canadian Entomologist, which is published by the Society, is now in its 40th volume. Volume XXXIX, which ended with the December, 1907, number comprised 423 pages, with 11 full page plates and 23 figures in the text. No less than 73 different entomologists contributed to the volume, and 11 new genera, 216 new species and 5 new varieties are described.

These papers are of a high character and in a report like this it is impossible to mention very many of them. Some of the more important, however, are. "New Micro-lepidoptera," by Mr. W. D. Kearfott; "New species of North American Lepidoptera," by Dr. W. Barnes; "Notes on Chalcolepidius and the Zopherini," by Major Thos. L. Casey; "On the Classification of the Mosquitoes," by Dr. Harrison G. Dyar and Mr. Frederick Knab; "A New Somatochlora, with a Note on the Species known from Ontario," by Dr. E. M. Walker; "Habits of some Manitoba 'Tiger Beetles' (*Cicindela*)," by Mr. Norman Criddle; "Studies in the Genus Incisalia," by Mr. John H. Cook; "The Eupitheciae of Eastern North America," by Rev. G. W. Taylor; "List of Hemiptera taken at Como, Quebec," by Mr. G. A. Moore; "The Classification of the Culicidae," by Miss Evelyn Groesbeeck Mitchell; "The Stridulation of the Snowy Tree-cricket (*Œcanthus niveus*)," by Mr. A. Franklin Shull; "New Coleoptera from the Southwest," by Mr. H. C. Fall; Tenthredinidae of Colorado," by Mr. Geo. P. Weldon; "New Tropical American Hesperidae," by Mr. Geo. A. Ehrmann; "Perlidæ from British Columbia and Alberta," by Mr. Nathan Banks; "*Diplonychus*, Laporte (—*Hydrocyrius*, Spinola), and its Relation to the other Belostomatid Genera," by Mr. J. R. de la Torre Bueno; "New species of Colorado Aphididæ, with Notes upon their life-habits," by Prof. C. P. Gillette: "Further Notes on the Occurrence of Hepialus thule, Strecker, at Montreal," by Mr. H. H. Lyman.

Besides the above technical papers, the following appeared under the heading "Practical and Popular Entomology":

"How Insects are Distributed." By Mr. L. Caesar.

"A Homemade and Effective Insect Trap." By Mr. John D. Evans.

"The Scolytidae or Engraver-Beetles." By Mr. J. W. Swaine.

"The Walking-Stick Insect" (*Diapheromera femorata*). By Mr. J. B. Williams.

"Fumigation with Hydrocyanic Acid Gas for Beginners." By Prof. Glenn W. Herrick.

The Society now has 185 Canadian members. The Canadian Entomologist is sent out to 486 subscribers each month as it is issued. Besides the subscribers there are on the Exchange List, the names of 112 Societies, etc., which receive the Canadian Entomologist regularly.

THE ECONOMIC IMPORTANCE AND FOOD HABITS OF AMERICAN GALL MIDGES.

By E. P. Felt, Albany, N.Y.

The extensive and frequently severe depredations of the Hessian-fly, *Mayetiola destructor*, Say, are too well known to require extended notice in this connection, and the same is also true, though perhaps in a more limited sense, of the Wheat Midge, *Cecidomyia tritici*, Kirby. The genus Contarinia appears to be a very important one to the economic entomologist. It contains the somewhat well known Pear Midge, *Contarinia pyrivora*, Riley, a species which has been responsible in recent years for the destruction of considerable fruit in Connecticut, New York, New Jersey and presumably in adjacent states. A more recently discovered species is known as the Violet Midge, *Contarinia violicola*, Coq., a form which has proved a serious enemy of the extensive violet growing industry located in and about Rhinebeck, N.Y., and one that bids fair to cause more injury in the future unless growers are very careful to avoid conditions favorable for its multiplication. The Sorghum Midge, *Contarinia sorghicola*, Coq., another recent discovery, breeds in sorghum seed and, in recent records, has been credited with causing the common failure of this plant to produce a full crop of seed. A still later note states that this insect destroys all sorghum seed in Texas south of a certain line. The Cotton Midge, *Contarinia gossypii*, Felt, is a species of some economic importance, since it has been reported as injurious to cotton in the British West Indies. Still another form, *Contarinia negundifolia*, Felt, was reared from the leaves of a box elder and is possibly identical with the *Cecidomyia negundinis*, Gill., a species which has been recorded as decidedly injurious to its host plant on the college campus at Ames, Iowa.

There have been several other injuries by Cecidomyiidæ brought to notice recently. One of these is the extensive destruction of linden buds by a form which we have been unable to rear as yet. This insect was so abundant at Rhinecliff, N.Y., as to destroy from 50 to 75 per cent. of the buds on large trees, causing the death of numerous twigs and of a few large branches. Similar injury to young Catalpa trees has recently been recorded by Prof. Gossard and is probably due to the work of *Cecidomyia catalpæ*, Comst. Several years ago a small proportion of the grape blossoms in the Chautauqua grape belt were found infested by Cecidomyiid larvæ. This last season the insect, *Cecidomyia Johnsoni*, Sling., was so abundant in an acre of Moore's early grapes near Fredonia, as to destroy from 60 to 75 per cent. of the crop. Observations have shown this pest to be generally distributed throughout the grape belt, and it is very probable that some other mysterious failures of the crop were due to the work of this insect. A number of species are known to live in the buds of plants, and it is presumable that other bud-inhabiting forms, aside from those mentioned above, have caused or are able to cause serious losses. It is certain that members of the Cecidomyiidæ are capable of inflicting grave injury, and no scientist can state that any one species might not become destructive in the near future. More knowledge respecting this group is necessary before its economic status can be accurately fixed.

It is gratifying to state that some species of Cecidomyiidæ at least, are distinctly beneficial. The members of the genus *Aphidoletes*, Kieff., live at the expense of aphids, and are therefore beneficial. One species, *A.*

meridionalis, Felt, was reared a number of years ago from *Siphonophora liriodendri*. *Aphidoletes cucumeris*, Lintn., undoubtedly preys upon the melon louse, *Aphis gossypii*, Glov., though when it was described by the late Dr. Lintner as a *Diplosis*, it was supposed to be responsible for a bud gall. Another species of *Aphidoletes*, bred from the melon aphis and probably *A. marina*, Felt, was recently received from Prof. C. P. Gillette of Colorado, accompanied by the statement that it was particularly destructive to plant lice in the Insectary and was not uncommon out of doors, attacking different species of plant lice. The genus *Mycodiplosis*, Rubs., is zoophagous and it is gratifying to note that *M. acarivora*, Felt, preys upon the red spider infesting the Citrus trees of California.

The above is sufficient to show that the food habits of this group are of interest to the economic entomologist. We now propose to gvie some brief notes respecting the habits of various members of this family. The Campylomyzariæ include a considerable number of forms most frequently found in forests or in association with decaying vegetable matter. The very characteristic genus *Joanissia*, Kieff., presumably breeds in decaying vegetable matter, since Kieffer records rearing several species from decaying wood, tufts of moss and mold covering a fungus. Members of the genus *Campylomyza*, Meig., are rather common in woodlands. One species, *C. lignivora*, Felt, was reared in considerable numbers from the fungous affected heart wood of pine. The long, yellowish larvæ evidently eroded the tissues to a considerable extent, as the cavities inhabited by them were more or less filled with extremely fine wood flour. *C. pinicorticis*, Felt, was bred from galleries of a *Scolytid* in pine. *Campylomyza coprophila*, Felt, was obtained from manure, while *C. dilatata*, Felt, was reared from a vial containing elm seeds and debris. One species, *Campylomyza pomifloræ*, Felt, occurs commonly in early spring about blossoms of cherry and shadbush. The peculiar *Miastor americana*, Felt, was taken on either beech or chestnut leaves. Several species of *Brachyneura*, Rond., have been reared, *B. eupatorii*, Felt, being obtained presumably from an oval swelling on the stem of thoroughwort *Eupatorium perfoliatum*, and another, *B. vitis*, Felt, was reared from a jar containing the familiar *Lasioptera vitis*, O. S., gall on grape.

The Lasiopterariæ is a very characteristic group, the members of which appear to invariably undergo their final transformations within the tissues of the host plant. The peculiar *Clinorhyncha* seems to be restricted to the blossoms of certain compositæ, since *C. millefolii*, Wachtl., occurs in apparently normal florets of Yarrow, *Achillea millefolium*, while *C. eupatori-floræ*, Felt, may be obtained from similar flowers of thoroughwort *Eupatorium perfoliatum*. *Baldratia*, Kieff., is another exceedingly interesting genus, since most of its species breed in the peculiar, apparently fungous affected blister galls so common on aster and solidago. The sixteen species reared are divided about equally between species of aster and solidago. A few forms have been obtained from comparatively normal leaf tissues, and one interesting species bred from small, oval galls on aster leaves recognized simply by a slight elevation on the under surface. Members of the genus *Lasioptera* and *Neolasioptera* occur almost exclusively in stem galls on herbaceous plants and in subcortical galls on woody plants. The irregular eccentric stem gall of *Lasioptera tumifica*, Beutm., on solidago is an excellent type of one form of gall, while the irregular subcortical gall on Cornus, made by *Neolasioptera cornicola*, Beutm., illustrates the other. The species of both genera winter, so far as known, within the gall, those

inhabiting herbaceous plants usually appearing in rather early spring, while certain of the forms occurring in woody tissues do not emerge till June.

Representatives of the genus *Dasyneura* exhibit a marked preference for leaf folds, leaf buds or loose leaf bud galls. *Dasyneura anemone*, Felt, occurs in a loose apical bud of *Anemone canadensis*, while *D. clematidis*, Felt, inhabits an oval stem gall. The genus *Rhabdophaga*, as we understand it, exhibits a marked partiality for the willow, breeding for the most part in bud galls or woody tissues. Some eighteen species are known to inhabit this plant.

The Oligotrophiariæ is best represented by the genus *Rhopalomyia*, which latter displays a very marked preference for solidago, fifteen species occurring on this plant and subsisting at the expense of the flowers, the leaves, the stems, or even on portions of the underground root stocks. The species are easily reared and, so far as we have been able to determine, each is responsible for a peculiar type of gall. Six species of *Mayetiola* have been reared from willow, *M. walshii*, Felt, producing an apical rosette gall, *M. rigidæ*, O. S., forming a characteristic apical beak gall, while the other species occur in woody tissues.

The Asphondyliariæ is a very well marked group exhibiting considerable similarity in habit. The typical genus *Asphondylia* may well be represented by the common *A. monacha*, O. S., a species which breeds in both solidago and aster. It has been reared from apparently unaffected blossoms of plants belonging to both genera. It occurs in small rosette galls on the narrow-leaved solidago, *Euthamia lanceolata*, and has been reared from what we have designated as the adherent leaf gall on *Solidago canadensis* and *S. serotina*. This latter gall is simply an oval cell formed by two leaves adhering at the margin of the cavity. Most of the species of *Asphondylia* occur in bud galls, and it is probable that some forms are injurious. The allied *Schizomyia* likewise breeds in bud galls or may be responsible for modifications of the same such as the hard, nut-like, polythalamous gall of *Schizomyia pomum*, Walsh, much better known as *Cecidomyia vitis-pomum*. A large, oval or fusiform petiole or tendril gall is made by *S. petiolicola*, Felt. The genus *Cincticornia* is also included in this group and breeds, so far as known, in leaf galls. *Cincticornia caryæ*, Felt, was reared from a conical leaf gall on hickory, while *C. pilulæ*, Walsh, better known under the name of *Cecidomyia*, inhabits the common reddish, ovate hard leaf gall on oak.

The Diplosariæ includes a large number of forms most easily recognized by the two swellings on each antennal segment in the male. Practically nothing is known concerning the life history of the larger, heavier forms of *Hormomyia*, though some of the smaller, lighter forms have been reared, such as *H. caryæ*, O. S., and *H. holotricha*, O. S., both better known under the name of *Cecidomyia*. *H. cratægifolia*, Felt, has been reared from a cockscomb gall on Cratægus leaves. *Cecidomyia resinicola*, O. S., is interesting because the larvæ occur in pitch masses. Many species belonging to this group may be bred from buds or leaves and a few, as mentioned in the preceding economic discussion, from seeds. We have reared a number of species of *Mycodiplosis* and particularly of *Lestodiplosis* from various leaf galls. The habits of these species are not sufficiently well known so that we feel certain that in every instance we have secured the form responsible for the deformity. There is still need of much life history work in this group before certain puzzles as to relationships and food habits can be satisfactorily solved.

Comparatively little is known concerning the food habits of our Epidosariæ. *Asynapta saliciperda*, Felt, has been reared from old, dried *Rhabdophaga batatas*, Walsh, galls, while *Winnertzia pinicorticis*, Felt, was bred from under the bark of *Pinus inops*. This group presents great structural variations and it is to be expected that further investigations will disclose considerable variation in habits.

The Cecidomyiidæ show some exceedingly interesting preferences in the selection of food plants. For example, 39 species have been reared from solidago, 15 of these belonging to the genus *Rhopalomyia;* 28 species have been bred from Salix, 16 from aster and 10 from grape. *Lasioptera* exhibits a marked partiality for aster and solidago. The latter is also a prime favorite with *Rhopalomyia*. The genus *Rhabdophaga* occurs mostly in *Salix* and a number of species of *Mayetiola* also live upon this plant. The species of *Asphondylia*, probably because of their inhabiting buds, do not display a marked preference for any food plant. The Asphondylid genus *Cincticornia* is found largely in leaf galls on Quercus, while the smaller forms of Hormomyia are equally partial to various hickory leaf galls. The statistics just given are based upon rearings of over 300 species. The data presented can not be regarded as conclusive because most of the rearings have naturally been made from plants most easily secured or from which insects were most readily bred. Some idea of the extent and complexity of this work may be gained when it is remembered that we now know some 700 North American species, representing about 50 genera.

After some remarks upon the paper by the Chairman, a discussion arose respecting the nomenclature of galls and the insects that produce them, which was participated in by Messrs. Jarvis and Nash and Drs. Felt and Bethune. The conclusion arrived at was that names employed to designate botanical structure alone should not necessarily be attached to zoological species, that is to say that a name given to a gall with a description of the gall only and perhaps also of the larva found in it should not hold in entomology; that the only specific names to be recognized should be based upon the description of the adult perfect insect. Otherwise it was felt that great confusion must sooner or later arise.

Mr. W. R. Thompson, of the Ontario Agricultural College, Guelph, gave an interesting account of the work now being carried on in Massachusetts for the rearing of native and imported parasites of the Gypsy and Brown-tail Moths. He was engaged during the summer months as an assistant to Mr. C. H. T. Townsend, who is in charge of the parasitic work, especially as regards the Dipterous family Tachinidæ. Mr. Thompson described fully and clearly the various operations carried on in connection with the importation of nests of Brown-tail Moth caterpillars, predaceous beetles, etc.; and the methods employed in rearing the larvæ and obtaining the parasites on their emergence from the host caterpillars. He also explained some of the apparatus used by means of drawings on the blackboard. His narration was listened to with much attention and gave those present an excellent idea of this notable experiment in economic Entomology. As Dr. Howard, who is in charge of the whole work, sent a paper on this subject, which was read at the evening session, Mr. Thompson preferred that his descriptions should not be published.

OBSERVATIONS ON THE SORGHUM MIDGE.

By R. C. Treherne, Ontario Agricultural College, Guelph.

Before commencing the discussion of my subject, I should like it understood at the outset that the observations recorded have not yet been confirmed by repetition, and, no doubt, therefore, some of them may not be entirely correct. The first study of the life-history of any insect is apt to be wrong in many respects, as we find, for instance, was the case with the first published statements made at the beginning of the Mexican Cotton-boll Weevil investigations, I purpose, therefore, to give a mere outline of such observations on the life-history, distribution and habits of the Sorghum Midge as came under my notice during this summer of 1908, and crave indulgence for the apparently inconclusive form of some of my records. Again I ask you to bear in mind that the work was undertaken by a student, the result of whose work still awaits proof.

Sorghum is grown in Louisiana in comparatively small areas, nearly every plantation, however, possessing a patch which rarely exceeds half an acre in size. General, therefore, as the growing of this crop would seem to be, it has for a considerable time been regarded as one which did not mature its seed. Investigations into the cause of this non-maturity did not greatly exercise the minds of the planters for the reason that the crop was not grown for its seed production, but was grown rather for green feed and for the manufacture of molasses. General theories were advanced as to the cause of this non-fruitage, but the attacks of the Sorghum Midge on the ovaries of the sorghum plant now seem to be the most potent and the main cause as yet determined. Yet it would be incorrect to say that the failure of sorghum to mature its seed in Louisiana was entirely due to the work of this midge, for the reason that the Sugar-cane Borer, *Diatræa saccharalis*, F., the moth *Nigretia sorghiella*, Riley, the Sorghum Smuts, the English Sparrows and I have no doubt yet other destructive agencies, are all means which help to prevent the sorghum crop from maturing its seed in the South.

So far as we know, this insect was first mentioned and described by Professor D. W. Coquillet in Bulletin 18, N. S. Bureau of Entomology, on "A Cecidomyiid Injurious to the Seeds of Sorghum." His description was taken from some specimens sent from Alabama in 1895. The midge seems not to have attracted further attention until 1907, when Mr. C. R. Ball, of the U. S. Department of Agriculture made a number of observations on its destructiveness in Louisiana. During this summer of 1908, systematic investigations on the life-history and habits of this midge, were begun, with the result that Professor F. M. Webster, who has the matter in hand, possesses considerable data to verify and to resume work on, if so desired, at an early date next year.

With the adult flies of this species, the two sexes are of practically the same dimensions, the females, however, on a superficial examination, appearing, on account of their length of ovipositor and somewhat plump abdomens, to be the larger. The abdomens of both sexes are brick red in general color, while their heads and thoraxes present black indications. The antennæ of the males are considerably longer than those of the females and it is by this characteristic that the two sexes are most easily recognized. The females are somewhat more sluggish in their movements than the males. The males, on the other hand, are the more active and are usually seen on

the wing hovering around the heads of sorghum in the early morning, evidently awaiting the emergence of the females. The total length of the life of the female is about 32 hours, that is to say, when facilities for the deposition of her eggs are given her soon after emergence. The males live about half as long as the females. No attempts to breed this fly to maturity under artificial conditions were successful.

The egg is elongate in form and cylindrical, tapering towards the end and is about .28 mm long and about .09 mm broad and resembles very nearly the eggs of closely related species. It is laid by the female fly between the glumes of the sorghum spikelet and on or very near the ovary of the plant so that when the young larva develops it may find abundance of food ready at hand without material need of any search. The injury to the ovary of the plant is caused, evidently, by absorption of the juices of the ovary by the larva which appears to carry out the extraction throughout the entire length of its body. The larva when full grown is brick red in general color and the developing pupa possesses the same characteristic shade. When the period for transition from pupa to adult approaches, the pupa works its way upwards and the emergence occurs at the apex of the glumes. After emergence takes place, several seconds are allowed for wing development.

I think I may mention here that there is, at present, in Louisiana an extremely interesting but obnoxious little ant, *Iridomyrmex humilis*, Mahr. This ant is over-running the southern portion of the State and is having considerable attention given to it by reason of its relationship to the agricultural interests of the State. In the sorghum patch in which the experiments with the sorghum midge were carried on this summer, this particular ant abounded. The ants were continually running about the leaves, stems and heads of the sorghum plants attracted evidently by the sweet sap of the plant and the excretions of the aphid which fed upon it. As the adult fly is about to emerge from the pupa, the glumes of the plant are necessarily forced slightly open and the ant, which is omnivorous, is thus allowed to gain access to the helpless pupa. I actually observed an instance where an ant bit off the terminal apex of the glumes and extracted the pupa. Other instances were observed in which the ant was unable to make its way to the enclosed pupa, probably, I suppose, on account of the glumes not being sufficiently open and hence not allowing of a good hold. I have no doubt that in a field in which this ant abounds, the death of many flies may be accounted for.

The total life-history of this species, according to Mr. C. R. Ball, varies from 14 to 20 days. This summer it was estimated that it ran perhaps somewhat longer, between 19 to 25 days. However, this is one of the points that still awaits proof. The entire life-history takes place within the sorghum flower, the egg being deposited there and the adult fly emerging from it when the required developmental period is accomplished. The general habits of this midge, therefore, can be seen to coincide very closely with the habits of already studied and familiar species of the same genus and closely related genera.

In Louisiana this midge is heavily parasitised by *Aprostocetus diplosidus*, Crawford. This parasite is accompanied by a species of Tetrastichus which Professor F. M. Webster considers as probably a secondary parasite.

In reference to the distribution of the midge, I may say that it is more generally to be found over the South than it was first thought. Early in the summer it was known to exist in comparatively few States, but it now appears that it has actually been found in Texas, Louisiana, Alabama, Arkansas, Missouri and South Carolina. For the reason that this midge

has not yet attracted the attention of the Experiment Stations, it is altogether probable that it is of more general distribution than these statements show. Its destructiveness, too, is of a varied description. In the alluvial lands of Louisiana, for instance, the main part of the crop is completely spoilt, while in the hill lands of the State, the crop is not so affected and again in Arkansas and Missouri the attacks of the midge are so inconsiderable that its presence would not be suspected.

I will close these remarks by asking an apology for placing before you records of an insect which is probably of only semitropical distribution, but I thought that, as its method of attack closely resembles the attack of nearly related species in the North and as these are practically some of the first remarks on this particular species, this paper might be of interest.

Mr. Treherne then exhibited a Cotton Plant which was grown in the College greenhouse and pointed out the various stages of growth—the bud, the square, the flower and the boll. The only time during the growth of the plant that poison can be satisfactorily applied against the plant's chief enemy, the Cotton Boll Weevil, is between the budding and the squaring stages. Any poison applied after the plant has formed squares is of no use against the weevil for the reason that once the square is formed, the insect feeds within it and hence does not come in contact with the poison.

Experiments have recently been conducted with powdered arsenate of lead as a new poison for the Boll Weevil. Great hopes are entertained by Prof. Wilmon Newell, of the State Crop Pest Commission of Louisiana that this poison will prove to be satisfactory. If these hopes are realized, arsenate of lead may possibly be of use to fruit-growers and gardeners in the North.

He next showed some specimens of the Fire Ant (*Solenopsis geminata*), which is so useful in excavating the larva of the Boll Weevil from the square; the Argentine Ant which is causing much consternation in the households of the South; the Texas Fever Tick and a parasitic fungus on the White Fly (*Aleyrodes*).

HYDROECIA MICACEA, ESP. IN CANADA.

By Arthur Gibson, Central Experimental Farm, Ottawa.

Of recent years much attention has been paid, by several entomologists, to the boring larvæ and the perfect moths of *Gortyna*, *Hydrœcia* and *Papaipema*. In Canada, the best work on these interesting insects has been done by our esteemed member, Mr. Henry H. Lyman, of Montreal. In the United States, our friend, Mr. Henry H. Bird, of Rye, N.Y., has carefully studied the life-histories of many species, probably the most of which have been described as new to science.

The larvæ of some of the moths of this group are, more or less, of economic importance. The Hop Vine Borer, *Gortyna immanis*, Gn., is well known from its ravages in hop yards. In the annual report of the Dominion Experimental Farms for 1892, Dr. Fletcher treats of this insect at considerable length and gives the life-history. The Columbine Borer, *Papaipema purpurifascia*, G. & R.,* is recorded as a destructive enemy of cultivated plants of the genus Aquilegia. The Stalk Borer, *Papaipema nitela*, Gn., is widely known from its attacks on potatoes, tomatoes and corn. The

*Report, Ent. Soc. Ont., 1904, p. 81.

Burdock Borer, *Papaipema cataphracta*, Grt., is very common in Ontario, and is sometimes very injurious to many kinds of garden plants having thick, succulent stems. It has a wide range of food plants, but in the Ottawa district it has been found boring chiefly in the burdock.

The species, however, which I wish to call special attention to to-day is one which has been reported to the Division of Entomology, on several occasions during the last four years. Attention was first drawn to it in August, 1905, when, early in the month, Mr. George Welch, of Westport, N. S., wrote asking for information as to how to destroy worms which were boring into the pods of his garden peas. He said that the worms were large and quite plentiful. Not recognizing the enemy, Dr. Fletcher wrote asking for specimens. Under date of August 31st, Mr. Welch sent two caterpillars, all he could find at that date, and mentioned that after the end of July they were not so plentiful. One of the larvæ, unfortunately, had died during transportation and the other specimen had changed to the chrysalis state. From this latter a perfect specimen of the moth was reared on Sept. 18th.

On July 13, 1906, Dr. C. A. Hamilton, of Mahone, N.S., forwarded a caterpillar which he had found in a corn stalk. Only one larva was found on that date, but Dr. Hamilton said that other plants had withered away, probably from the same cause. This caterpillar pupated on July 19th and the moth emerged on August 7th.

In 1907, another single larva was received, on July 12th, from Mr. Capel B. St. George, of Tramore, Ont., who stated that he had found it boring in corn in his garden. The moth from this specimen emerged on Sept. 6th.

On June 30th of the present year, Dr. Hamilton forwarded another specimen from Mahone, N.S., which he had found in corn. The moth emerged on August 6th. A larva had also been found a few days previously, but unfortunately had been lost, and a further plant was seen to be injured, but the caterpillar could not be found.

In the collection of insects of the Division of Entomology at the Central Experimental Farm, are two specimens of the moth, which were taken at St. John, N.B., on August 29, and September 12, 1902. These were sent to Dr. Fletcher under the name of *Gortyna medialis*, Sm. In Mr. McIntosh's list of the noctuidæ of New Brunswick,[1] the following note appears:

"*Hydræcia medialis*, Smith; one taken September 2nd, (1898)." In Dr. Fletcher's Entomological Record for 1903,[2] this moth is recorded as having been "very abundant, August and September, St. John, (McIntosh)." From this statement, and in view of the above occurrences at Westport, N.S., it will be seen that this insect is not uncommon during some seasons in the Maritime Provinces. The record of this insect having been found at Tramore, Ont., is very interesting. While the presence of isolated individual larvæ in corn, or other plants, is of no economic importance, still as shown above, the insect has on occasions been noticeably destructive. The habit of the caterpillars boring into the pods of garden peas, as observed by Mr. Welch, is certainly remarkable and is the only instance known to the writer of a larva belonging to this group boring into anything other than a stem or a root.

[1]The Noctuidæ of New Brunswick. Reprinted from Bulletin of the Natural History Society of New Brunswick, (St. John) No. XVIII., 1899.

[2]Report of the Entomological Society, 1903.

The following description of the caterpillar was taken from the specimen received from Dr. Hamilton in July, 1906:

Length, 32 mm. Head, rounded, chestnut brown, shining, mouth parts darker. Body: a dirty, creamy colour, with a pinkish tinge on dorsum, except at intersegmental folds. Thoracic shield pale brown, margined anteriorly with dark brown. Tubercles pale brown, each with a single pale hair. Tubercle IV on seventh abdominal segment is almost as large as the upper half of the spiracle, the upper edge being slightly above the upper edge of the spiracle. Spiracles black. Anal shield blackish. Dorsal vessel distinct. No markings whatever on the body. Feet all pale.

A description of the larva from Mr. St. George was also taken, but the only differences which my notes show, are that the thoracic shield was margined in front with black, and the body noted as being greenish-white with a rosy tint above spiracles except at intersegmental folds.

The moth reared from garden peas from Westport, N.S., was submitted to Mr. Henry Bird, who reported upon it as follows: "The Nova Scotian specimen looks like *medialis*. A series might be quite convincing." As this left some doubt about the exact determination of the moth, a specimen was sent to Sir George Hampson, of the British Museum, who determined it as *Hydrœcia micacea*, Esp., with the statement that it was "exactly like European specimens."

In Miss Ormerod's Report for 1898, an account of injury to potatoes by *Hydrœcia micacea* is given, under the popular name of the Potato-stem Borer. This outbreak which occurred at Fyvie, Aberdeen, Scotland, is described as having been destructive to the growing crop of potatoes, especially in gardens. The injury had been noticed every season for some years and a careful examination invariably showed that the damage had been done by the borer. Miss Ormerod quotes from Mr. Richard South: "This species is known to feed in larval stage in Dock and species of Equisetum." In Stainton's "Manual of Butterflies and Moths," vol. 1, p. 198, the larvæ are said to feed "in the roots of various Cyperaceæ." In Kappel and Kirby's "British and European Butterflies and Moths," it is stated that the larva "lives in the roots of *Glyceria spectabilis*, Iris, etc."

The moth which is known as the Rosy Rustic is stated to be "common and widely distributed in Central and Northern Europe in August and September." Miss Ormerod says: "The moth is from an inch and a quarter to a little over an inch and a half in expanse of the forewings, which are variously described as of a pale brown ground color with a rosy tinge, or of a 'rich, reddish brown'; on the wing is a 'broad dark patch', otherwise described as a 'broad median band', the outer portion being 'very rich, dark brown'. Hind wings 'whitish grey with darker central line', or 'dingy grey brown with a darker crescentic discoidal spot and transverse median bar'; the antennæ nearly white."

The above occurrences of *Hydrœcia micacea* in Canada are, as far as we know, the only American records of this insect.

FURTHER NOTES ON THE COCCIDAE OF ONTARIO.

By Tennyson D. Jarvis, O.A. College, Guelph.

In last year's Annual Report, I gave an account of forty-eight species of Coccids for Ontario. Further collections and investigations have enabled me to add the following to the list.

Kermes galliformis (Riley), Red Oak, Toronto.

Saissetia hemisphaericum (Targ), Cotton, etc., Conservatories in most parts of Ontario.

Aspidiotus abietis (Schr.), Hemlock, Guelph.

Chrysomphalus aonidum (Linn.), Ficus elastica, Conservatory, Guelph.

Ischinaspis longirostris (Signoret), Palm, Conservatory, Toronto.

Undetermined Species of Pseudococcus.

On bark of Apple—*Pyrus malus*, Guelph.
" " Hawthorn—*Crataegus sp.*, Guelph.
" " Horsechestnut—*Aesculus hippocastanum*, Guelph.
" " Beech—*Fagus ferruginea*, Guelph.
" " Willow—*Salix sp.*, Guelph.
" " Lombardy Poplar—*Populus italica*, Guelph.
On leaves of Soft Maple—*Acer saccharinum*, Guelph.
" " Willow—*Salix sp.*, Guelph.
On roots of Raspberries—*Rubus strigosus*, Muskoka.
" " Blueberries—*Vaccinium Pennsylvanicum*, Muskoka.
" " Goldenrod—*Solidago canadensis*, Guelph.
" " Yellow Avens—*Geum strictum*, Guelph.
" " Yarrow—*Achillea millefolium*, Guelph.
" " Wormwood—*Artemisia sp.*, Guelph.
" " Ox-eye Daisy—*Chrysanthemum leucanthemum*, Guelph.
" " Daisy Fleabane—*Erigeron philadelphicum*, Guelph.

Kermes galliformis (Riley).

These scales occur either singly or in clusters on the twigs and branches of Red Oak (*Quercus rubra*). The form of the adult female puparium is globular with a slight incision for insertion on the stem of the food plant.

It is nearly smooth and somewhat shining. The colour is white and beautifully variegated with yellowish, gray and black. Mr. A. Cosens found this fairly common on Red Oak at Toronto.

Saissetia hemisphaericum (Targ.)

The adult female varies from light to dark brown, frequently shaded with darker brown to black.

It is more or less hemispherical or slightly elongate and convex. The surface is smooth and shining to the naked eye but with higher magnification is seen to be thickly studded with little dots. The immature female is usually of a pale yellow with a well defined central and two lateral carinae. It is a very common scale in conservatories throughout Ontario.

Aspidiotus abietis (Schr.).

Puparium of the female oval or elongate oval and the side next the midrib compressed and straight. About 1.5—2 mm. long and 1—1.2 mm. wide. Colour dark brown; back convex. Exuviae central, dull yellow. Common at Guelph on Hemlock (*Tsuga occidentalis*).

Chrysomphalus aonidum (Linn.).

Adult female puparium circular and somewhat convex. Colour reddish brown, turning paler towards the margin. Exuviae central, dark orange and nipple-like. It has been found in the conservatory at Guelph on *Ficus elastica*.

Ischnaspis longirostris (Signoret).

The puparium of the adult female is very long and narrow. Back shining black; exuviae orange coloured. A few specimens were found in a Toronto conservatory.

Distribution of San Jose Scale (*Aspidiotus perniciosus*) in Ontario.

The San Jose Scale is slowly gaining ground in Ontario. The most northern point of infection is at Lorne Park, County of Peel on the northern shore of Lake Ontario.

Fig. 6. The shaded portions of the map shew the counties of Ontario in which the San Jose scale is now established.

Three New Host Plants for Eulecanium Caryae in Ontario.

Rock Elm (*Ulmus racemosa*), Hornbeam (*Ostrya virginica*), Blue or Water Beech (*Carpinus caroliniana*). We have now five host plants for this scale in Ontario.

A New Host Plant for E. Fletcheri in Ontario.

This year *E. Fletcheri* was found at Guelph on Red Cedar (*Juniperus virginiana*).

ONE BROOD FOR THE PINE SCALE (*Chionaspis pinifoliae*) IN ONTARIO.

This scale passes the winter in the egg stage. The eggs hatch in the early part of June and the female reaches maturity about the middle of August when she lays her eggs which do not hatch until the following year.

SOME ENEMIES OF ONTARIO COCCIDAE.

BY J. W. EASTHAM, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Leaving out our wild birds, upon which I have nothing to say, the enemies of Scale insects or Coccidae may be divided into three classes, namely:—

1. Predaceous insects;
2. Hymenopterous parasites;
3. Fungus Diseases.

Amongst predaceous insects the members of the family Coccinellidae or Ladybird beetles are by far the most numerous and most important. Of these insects one of the most beneficial is *Hyperaspis signatus*—a small black beetle with a small red spot on each elytron. The larvae of the species of Hyperaspis do an immense amount of good by destroying large numbers of the egg sacs of the Cottony Maple-scale (*Pulvinaria innumerabilis*). The larvae are large, white and mealy, and much resemble certain species of Dactylopus, for which they might easily be mistaken by a casual observer. The larvae pass from one ovi-sac to another, devouring the eggs as they pass along, but leaving the ovi-sac apparently little the worse externally. During the summer fully 80 per cent. of the ovi-sacs of Pulvinaria in the vicinity of Guelph were destroyed by the Hyperaspis larvae.

Another very common and important species is the Twice-stabbed Lady-bird (*Chilocorus bivulnerus*), Fig. 7, the adults and larvae of which are to be found feeding on no fewer than seven species of scales in this neighbourhood. Its special favourites, however, are the Oyster-shell Bark-louse and Curtis Scales, on both of which it is usually quite common. It is interesting to note that the larvae of this insect are preyed upon to a considerable extent by Lace-wing fly larvae (*Chrysopa*). Figs. 8 and 9. Another species which preys more especially upon *Eulecanium cerasifex* is the 13-spotted Lady-bird (*Hippodamia 13-punctata*), Fig. 10. These larvae are very thorough in their work as they devour everything but the body walls of the scale.

Another common predaceous insect is a small mite *Monieziella, sp.* which is generally found feeding on the Oyster-shell Bark-louse and Curtis scale, especially the former; it is also found feeding on the eggs of *E. cerasifex* but not to any great extent.

Another predaceous insect occasionally to be found is a Lepidopterous larva which eats its way through the cottony masses of *Pulvinaria innumerabilis*, and in this way one caterpillar can destroy many scales. Although several attempts were made I was unable to rear the adult; but in all probability it is the larva of *Laetilia coccidivora*, Comst., an insect whose larvae prey on Pulvinaris to a considerable extent in some parts of the United States.

Turning next to the Hymenopterous parasites, we find that in this district they belong entirely to two sub-families of the Chalcididae or Chalcis Flies—the Aphelininae and Encyrtinae. These two families are readily

distinguished from each other by the fact that members of the Aphelininae have 8-jointed antennae, a divided meso-pleura, and the middle tibiae are not specially adapted for saltatory purposes. The Encyrtinae, on the other hand, are characterized by the large saltatory spine of the middle tibiae, which is generally long and stout, though less frequently it is found dilated at the base, and armed with a double-row of black teeth or spines. This last feature readily marks off Encyrtinae, as no other family, as far as I am aware, possesses this large saltatory spine.

The Aphelininae are generally parasitic upon the Aleyrodidae or, amongst Coccidae, upon members of the sub-family Diaspinae. The commonest member of this family is *Aphelinus mytilaspidis*, a small yellow parasite which attacks several species of scales but principally the Oyster-shell Bark-louse. The larva feeds on either the scale body or eggs according to the time of the year; but like most Aphelinids there is not usually more than one larva to a single scale. The larvae, when full grown, are about 1 mm. long and very stout, being almost as broad as long; the pupae, stout, dark and contracted.

It appears to be double brooded as the adults were reared at the beginning of June and end of August; the adults may be usually observed ovipositing on the young scales during June. Another closely related species

Fig. 7. Twice-stabbed Lady-bird, larva and beetle.

Fig. 8. Lace-wing fly and eggs.

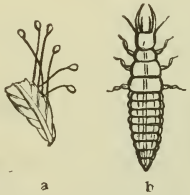


Fig. 9. Lace-wing fly eggs and larva.

Fig. 10. Thirteen-spotted ladybird.

is *Aphelinus fuscipennis* which attacks both San Jose and Curtis Scales. This parasite is widely distributed, one being common on San Jose Scales in some parts of the United States. It differs from the preceding species in having slightly clouded wings.

Another very important member of this family is *Coccophagus lecanii* —a small Chalcid with yellow markings upon the meso-scutum and scutellum. It is this parasite, acting in conjunction with *Hyperaspis signatus* mentioned previously, which so effectively controls the outbreak of Cottony Maple Scale (*Pulvinaria innumerabilis*). It is amongst the Encyrtinae, however, that we find the most important Hymenopterous parasites of the Coccidae. During the last summer some twenty species of parasites belonging to this family were reared by me from various scales—but principally from the various species of Lecanium. No fewer than ten of these species, or 50 per cent. were reared from one species of scale, namely *Eulecanium Fletcheri*.

The most common of the Guelph representatives of this family belong to the genus Comys, of which three species are found in this neighborhood.

Comys scutellata is a large, handsome species which parasitizes *Eulecanium caryae* to such an extent that few scales escape. It is probably a European species, accidently introduced and now widely distributed in North America. *Comys fusca*, a closely allied form, is very common around

Guelph parasitizing the New York Plum Scale (*E. cerasifex*). It is this parasite which is so effective against the Brown Scale in parts of California.

Other common genera belonging to this family are Blastothrix, Chiloneourus and Encyrtus—all of which are found on the Lecaniums of the district. No fewer than 41 specimens of an Encyrtid were reared from a single scale of *Kermes pubescens*, an occurrence which seems to indicate that polyembryony exists, at least among some of the Scale parasites: as it seems incredible that 41 eggs would be deposited in a single scale.

Coming to the fungus enemies we find on record several species from various parts of Ontario, only two of which I have found in the vicinity of Guelph. Of these two *Cordyceps clavulata* is by far the more abundant. It is, however, of not much economic value as it does not appear till late in the season—this year it was nearly the end of July. It attacks chiefly *E. cerasifex* but also *Fletcheri* and occasionally *E. caryae*.

The other fungus is known as *Microcera coccophila* and attacks the Curtis Scale—the attacked scales being entirely destroyed. The small red fruiting bodies of this fungus only appear after rain, disappearing again within the space of a few hours after the rain ceases, and consequently, since the spread of this fungus appears to be dependent upon rain, it is not of any great economic importance, at least in this part of Ontario.

"SOME BEETLE HAUNTS," BY AN AMATEUR BOTANIST.

By F. J. A. Morris, Trinity College School, Port Hope.

In my four seasons of collecting, as a coleopterist, there have been three collecting grounds that have most attracted me: (a) Stumps and tree trunks; (b) Blossoms; (c) Foliage. In all three I have found a considerable range of beetle-guests and am able to record rare or interesting finds. It is probable in the second of these three haunts that I have had most success, but it is with the first that I intend chiefly to deal in this paper.

There are two conditions under which stumps make a good collecting-ground; one is when they are dead and dry, but have the bark still covering them; it was this condition that first drew my attention and held it through my first season as a collector. The other condition is when there is yet some life in the wood so that the top of the stump bleeds. I have found that stumps ooze sap in this way for several seasons after the tree has been cut down. A good way to catch beetle-visitors is to scatter some good sized chips or lay a slat or two of wood or bark on the top. Most beetles are active at night, and when there is a shelter of this sort, they take cover there instead of flying away when the sun rises. Easily the best tree for its range of beetle visitors, as well as for total quantity, I have found the basswood; next to that the white pine; then the maple, the birch and the elm. Often when a stump is dry and apparently not in a condition to attract guests it may be made inviting if the bark is still partly green. I have often pried up the bark with a chisel and laid the strips thus removed on the top of the stump; the smell of the sap or juice fermenting has generally lured some prizes to this bait and trap combined.

The season for collecting in this way may be said roughly to extend from the beginning of May to the middle of July. I began collecting in the spring of 1905, but as I went to England at the end of June I did not make much headway that season. In 1906, however, I did a great deal of collecting and gained quite a lot of experience. One of my first finds was

at the beginning of June while prying the bark from a basswood stump. I discovered something like a dozen specimens of *Saperda vestita*, newly hatched and buried in the inner bark of the tree. I had my killing bottle with me, but as the insects were still soft I put them into a small tin box. Here they crawled about excitedly, squeaking (or rather, stridulating) when

Fig. 11. Dicerca divaricata.

Fig. 12. Cicindela sex-guttata.

Fig. 13. Monohammus scutellatus.

Fig. 14. Monohammus confusor.

Fig. 16. Prionus laticollis.

Fig. 15. Orthosoma brunneum.

handled. On examining them after my return home, I found they had fought in the box, two of them had had their antennae nipped off and several had been deprived of their full complement of legs. I had not yet learned the advantage of laying the detached bits of bark on the stumps as shelter

for nocturnal visitors and so missed a golden opportunity. However, there were a number of basswood stumps in the clearing where I made my first capture and from these I got several more specimens.

About the last day of June in the same season while struggling from a tamarack swamp in which I had found a rare fern (*Botrychium simplex*), I noticed a falling and decaying trunk of elm and on removing some bark I found it infested with a larva closely resembling that of *Saperda vestita;* I took one that appeared nearly full grown, with some of the rotten inner bark, and succeeded in rearing it; some three weeks later it emerged from the pupa as the elm-borer (*Saperda tridentata*). I have taken only one other specimen of this beetle; it settled one fine Sunday night in June on a supper table at which I sat, a guest; the entomologist, however, would not be denied, and in spite of looks of outraged propriety on the part of my fellow guests, and some embarrassment (not mine, but my hostess'), I produced a cyanide bottle and captured the insect.

Early in July I went to Oliver's Ferry, on the Rideau, and in a day or two chanced upon a spot that proved a regular treasure house to the young collector; it was at the side of a path through a wood of young growth, mostly basswood and maple. Here lay a log of basswood with the bark still on it, close by the stump from which it had been cut, and a pile of basswood split and stacked. In the bark of the stump and the log I found larva and pupæ of the *Saperda vestita;* some pupæ that I took home lived and from two or three I secured specimens of the imago. In the hot sunshine beetles lit on the log and on the wood pile, and I tried the experiment of laying detached pieces of bark on the stump, the log, and the split wood; sometimes sandwiching bits of bark between sticks of the wood pile. This simple contrivance of bait and trap yielded splendid results for over a week, at the end of which time the bait was filched by the sun drying all the moisture out. My captures comprised an Elater as large as *Alaus oculatus* and dark pitchy brown in colour; two specimens of a *Chalcophora*, 3 or 4 of *Dicerca divaricata* (Fig. 11), and 15 of a *Chrysobothris* about the size of the apple borer (*Ch. femorata*); a dozen or more of a blackish weevil akin to the strawberry weevil, some two dozen specimens of *Eupsalis minuta*, sexes evenly divided 25 specimens, of *Parandra brunnea*, one specimen of *Tragosoma Harrisii*, and a beautiful specimen of the little *Amphionycha flammata;* this last Dr. Bethune tells me, has seldom, if ever, been reported from Ontario, and it may therefore be interesting to some of you to know that I captured a second specimen of the same beetle about three days later, sunning itself on a leaf of basswood, within 50 yards of the first capture. It was a bright, calm day in July when I captured the first, and very hot with the sun almost at its zenith, and the log on which the insect lit was bathed in sunshine; small as the creature is, the sharp click with which it settled was distinctly audible. As the basswood pile was beginning to fail me, I happened on a clearing where some small maples had been felled. Finding the stumps still moist, I laid chips and bark about their tops. This yielded me several new species—a beetle marked like the *Megalodachne*, but smaller and with the ground-colour light brown instead of dark chestnut; 3 or 4 specimens of a beetle allied to the weevils, I think one of the *Anthribidae;* and, settling on a stump in the sunshine, a magnificent specimen of *Purpuricenus humeralis*, a longicorn of great beauty.

At the end of August I was out fern-hunting at Lake Dalhousie, about 20 miles north of Perth. From a stump of white pine I took the pupæ of a longicorn which later emerged as *Rhagium lineatum*, and while raising some chips from the top of a fresh and resiny stump of white pine I drove

from cover a Clerid that was then new to me; the head and thorax were dull orange, the base of the elytra the same, the rest of the elytra was alternate grey-white and black. Up to that time I had only found two species—a small scarlet one, fairly common, under bark, and one banded with orange and dark blue, which is frequent on certain blossoms. Early next spring, about April the 28th, I found some white pine had been felled in the winter, not many miles from the school in Port Hope. Recollecting my find of the previous autumn, and thinking the fresh resin might be the attraction, I laid some bits of bark and chips on the surface of the stumps. On visiting my traps a day or two later I was agreeably surprised to find 3 specimens of the resin-loving Clerid. About the same time I got 5 more specimens from newly-felled pine, under the chips that had been left on the stump by the axe. Some of these stumps I baited with chips and in all captured about a dozen. I have never found them on dry stumps, but only under fresh chips and associated with new resin. The creature closely resembles a beetle, figured by Curtis in his British Entomology as *Thanasimus formicarius*. It is there said to frequent the Scotch fir, which, of course, is also a pine.

About the middle of May in the same season (1907), I visited the basswood stumps from which the year before I had got the *Saperda vestita*. Some of the bark that I pried up was infested with *Leptura ruficollis*, and I took also from under the bark two pupae of a longicorn closely allied to *Urographis*. Ripping some bark from the sides of several stumps I laid it on the tops. This proved an admirable bait, and among my captures were 3 or 4 specimens of a tiger-beetle (*Cicindela sexguttata*), Fig. 12, 7 specimens of a rove-beetle (*Staphylinus violaceus*), 12 or 14 of the northern Brenthid (*Eupsalis minuta*), a single specimen of a locally rare darkling beetle *Phellopsis obcordata*), 5 Penthes and 6 or 8 *Alaus oculatus*. I may say that I have found the species *oculatus* very common on the basswood, and in one or two cases the beetle, under concealment of the strips of bark, had during part of the night half buried itself in the wood of the stump. The beetle can eat very fast. A friend of mine took 9 or 10 from a rotten basswood log and sent them to me in a stout cardboard box. When I got the parcel, one of the largest specimens had eaten a hole through the corner of the box and was through two folds of the brown paper wrapper. I have never found the allied species of *myops* on basswood but always in white pine, usually under the bark of dead, dry stumps where it is fairly abundant.

Later on in the same season, while wandering about the upper reaches of Gage's Creek, about 6 miles from the school, I passed through a clearing in which hemlock had been felled. Among several other Buprestids settling on the bark of prostrate logs as well as standing trees, were two that were new to me, both very active and only to be caught (unless you had a net) by careful stalking—one a small *Chrysobothris* and the other *Melanophila Drummondi*. This last I had never seen before and have never seen since, but on this newly-felled hemlock, as well as on living trees, it was abundant, and I captured about a dozen specimens. A few days later, at the end of June, I took to the clearing a brother-collector anxious to see *Melanophila Drummondi* in its native haunt, and there I turned him loose. While I was looking about with my eyes focussed for beetles, I distinctly saw a pair of longicorns running on the trunk of a tall elm growing at the foot of the clearing near the stream. From their movements and appearance both I felt sure they were longicorns and at first took them for a pair of *Cyrtophorus verrucosus*, a beetle I am well acquainted with. An instant's reflection told me that at ten yards' distance a beetle the size of *Cyrtophorus* would hardly be visible, and I rushed towards what I was certain must be a prize. Unfor-

tunately the beetles were running in an upward spiral and when I stumbled to the tree over a rotten log they were almost out of reach. I jumped and managed to brush one to the ground, but could not see it by the most careful search. However, I waited patiently for a minute or so, and then to my great delight saw the creature emerge from the ground and re-ascend the trunk. As I captured it I recognized in it the *Physocnæmum brevilineum*, a long-coveted species. Scanning the tree carefully I presently descried 2 more of the beetles running about on the bark, some 20 feet up. I stayed for nearly an hour at the foot of the tree, with hope in my heart and a crick in the neck, as intent as a dog listening to the clatter of a squirrel,—and my reward was three or four specimens of the beetle. As a rule, they appeared at a height beyond range, on the trunk of the tree, walking rapidly downwards, following the corrugations and grooves of the bark. Occasionally, however, they lit on the tree after flight through the air, but they rarely, when disturbed, took to the wing for escape, preferring to run or to release their hold and drop. A six mile walk is nothing when a new longicorn is waiting just around the last corner and I made the tree the turning post of my daily course for nearly a week, by which time I had taken 15 or 16 specimens. The tree was apparently sound, with a magnificent crown of foliage surmounting the massive pillar of its trunk, but the beetle was breeding there. I am pretty sure, and in July of this year, while I was in England, my fellow-collector got several more specimens on the same tree.

Early in July I made an expedition to Garden Hill, some ten miles north of Port Hope. Here they were cutting out the pine from a 20-acre lot and a saw mill was at work. I went out in hopes of getting some specimens of *Monohammus*, a beetle that with a single exception I knew only from cabinet collections. The lumbermen said they had seen numbers of these insects on the logs and in the brushwood, but from inexperience, or ill-luck, I failed to secure many; my bag included one pair of the large grey *Monohammus*, 3 isolated specimens of *Monohammus scutellatus* (Fig. 13), and one specimen of a third species of *Monohammus*, the elytra being in colour a mottle of three or four shades of rust yellow, and the insects in size almost identical with *scutellatus*. By preparing several stumps and logs with chips and stripping the bark from dead trees I got several other longicorn beetles, such as *Criocephalus agrestis*, *Orthosoma brunneum* (Fig. 15), *Tragosoma Harrisii*, and a carcase of *Prionus laticollis* (Fig. 16). Had this been all I would have felt some disappointment, but it wasn't. The place was a veritable paradise of Buprestids, and not only did I get 12 or 14 species in all, but among them several quite new to me, beginner as I was. There were at least two (probably three) species of *Chrysobothris*, two of *Chalcophora*, three or four of *Dicerca*, two or three of *Buprestis*, and a black *Melanophila* with a nasty bad habit of settling on the back of one's neck and giving it a sharp nip.

There could be nothing more enjoyable than roaming about in that clearing, and though it is nearly a year and a half ago, it seems like yesterday. It was glorious July weather. In the distance you could hear the Mourning Dove, and round about in the brushwood and trees were several pairs of Towhees and not a few slate-coloured Juncoes. While ranging up and down, I noticed on a bare, dead trunk of pine a bright looking beetle with apparently a damaged wing, for it stood out from the creature's body at an angle. At nearer view this resolved itself into a brand new Clerid, the largest I had ever seen, and in its jaws was the elytron of an *Elater* off which the monster had just been dining; no midnight assassin, but a cannibal in broad daylight, and the rascal was flaunting his trade in one of the gayest liveries you ever

saw; the head and thorax were orange, the shoulders (or base of elytra) black, round the waist a broad sash of brilliant scarlet, below that another band of black, then a band of grey-white, and the tips of the elytra black. In two all-day visits to this place I caught five of these beetles, three of them red-handed—one on a stump with an ant in its jaws, a third on a fence-post dissecting a grub of some kind, the other two belonged to the blameless order of those who have not yet been found out. One was resting on a rail along which a stream of ants happened to be crawling, and the fifth was just issuing from an ant bore in a dead pine, down which motives of curiosity, doubtless as innocent as idle, had prompted it. The same impulse, I think, rather than any misgivings about my intentions, caused it to disappear down an adjoining tunnel, whence my forceps finally extracted it.

In the season just over (1908) I noticed some felled maple and birch on a hillside 7 miles from Port Hope. At the beginning of June I laid chips about two or three of the stump heads; on the fallen trunks I found an immense number of *Chrysobothris breeding*, while under two of my chips on the maple I took two pairs of *Urographis fasciata*, and resting on a stump near by I captured a *Leptura biforis*.

About the middle of June my attention was drawn to some white pine felled in the winter among some woodlands, known locally as Pine Grove. There were about eight trees in all, lying on the ground within a space of about a mile. On the trunks and branches were crawling a number of small dark Clerids with a mark of crimson and two marks of white on each elytron; there was also two sorts of weevil abundant under chips of wood on the ground, and many Buprestids visiting the logs; but in especial, on the trunks, limbs and larger branches there were *Monohammi* breeding. In about six visits I took well over 100 specimens, and my fellow-collector continued to find longicorns up to the 20th of July or later. Our combined captures would amount to 250 beetles. The great majority of these were *Monohammus scutellatus*, of which I took 100, mostly in pairs. I took besides 8 or 10 specimens of the large grey *Monohammus* (whether *titillator* or *confusor*, Fig 14, I am not sure), and four of both sexes of the rust-yellow species. We also got several specimens of a stout grey beetle resembling *Urographis*, but without the extended ovipositor, and a few of a grey species of delicate structure and extremely fine antennae (perhaps *Liopus*). About the middle of July my friend took some 12 specimens of *Leptostylus parvus*. All this on some ten trunks of newly-felled pine.

Our experience raises a question as to the length of time required by the larvæ to mature. There was a tree among these others that had been blown down early in 1907, and was thus in its second season. It was full of holes, most of them quite fresh, from which mature insects had escaped. We could hear larvæ at work during June inside the log, but we did not see any beetles breeding or laying eggs on the bark, as they were doing on all the fresh-fallen trees. Unfortunately, most of these trees have since been removed. I am inclined to think that the dryer the wood is, the longer the larva takes to reach its full growth, and that if the larva hatches in fresh wood it can mature in a single season. I should think this was true of the *scutellatus*, anyway, even if *confusor* and *titillator* require longer. The well-known stories, most of them authentic, about the mature insect escaping from tables and chair legs several years after the manufacture of these articles, would thus illustrate an exceptional state of things in which the larva was confronted prematurely with dry wood to feed on.

Besides these captures on stumps and logs, I have made several by using a similar trap with fungus substituted for bark. But at present I shall

content myself in my closing paragraphs with a few general remarks on the subject of blossoms, as a collecting ground for beetles.

If you refer to any handbook of North American flora, you will find about 130 natural orders of flowering plants. The vast majority of these, however, do not offer their sweets (or pollen, rather) to those browsing cattle among insects, the beetles, whose short jaws and general habit incline them to visit only small shallow blossoms growing in close clusters (racemes) or in flat bunches or heads. Nearly all the blossoms that form a favourite haunt for beetles are included in the series between order 25 and order 50, beginning with the sumach and the vine and ending with the composites. The only important beetle-food outside that series in my experience, is the milkweed and its ally, the dogbane, which come about No. 70 in the natural orders.

If you look a little more closely at the series from 25 to 50, you will find these fall into two distinct groups of eight, separated from each other by a wall of 10 consecutive orders unattractive to beetles.

The first group extends from the poison ivy and the grape vine, through the New Jersey tea and the spiked maple to the great rose family. Of these, the milkwort and the vetch, from the form of their blossoms, are valueless; the poison ivy and the grape vine are fairly good, but the range of their guests is limited. The New Jersey tea is a plant with hardly a rival, both for range of species and for total number of insects. The spiked maple is also a rich storehouse of beetles. In the rose family I have found the hawthorn best, next to it the rose and the bramble, and then the spiræa and the choke cherry.

The second group of eight begins with the umbellifers, and passing through the dogwood and the elder, closes with the great composite family. Of these the bed straw, valerian and teasel, are comparatively worthless; but the dogwood is an excellent host and so are the two species of elder, while several of the composites are worth careful scrutiny.

I shall carry this principle of selection a little farther, by giving a rough outline of a season's beetle collecting from blossoms. The first blossom to open is the early or red-berried elder (*Sambucus pubens*). It varies considerably from season to season, as well as in any one season, owing to differences of location; but about the 10th of May it will be found flowering and its season may last for ten days. It is immediately followed by the hawthorn, which lasts till, perhaps, the 10th of June. By this time the spiked maple and the dogwoods are in flower, and before this last is over comes a riot of blossom, for the late elder and the New Jersey tea both open in the last days of June.

These blossom haunts, then, extend from early in May till the middle of July. The only other conditions of time that need be mentioned are that the pollen on a given blossom must be in a certain state of ripeness or it does not appear to attract beetles at all, and, as a rule, the sun must be shining on the blossoms. If it is hot and calm besides, then you have ideal conditions.

There is, however, an important condition of space to add to these of time. I have, as a beginner, spent hours in fruitless search over whole hedges and thickets of elder and bushes of hawthorn, when ten minutes at a single shrub with only a few meagre blossoms on it would yield a rich harvest. Why? Because the flowers must be growing near a thicket or a wood. If they are in the open, even a hundred yards or so from timber lands, they are almost useless. This is particularly the case when it is longicorns you are on the look-out for. It is, of course, well-known to coleopterists of experience that a clearing or the border of a wood is the best

locality. It is remarked again and again by Bates in his travels on the Amazon, and it is pointed out by Rye and Fowler in their hints to collectors in Great Britain.

In closing I should like to say that by no means the least pleasure to a lover of nature is to observe the marvellous constancy with which season after season these tiny creatures, the offspring of a last year's brood, return to their ancestral haunt, be it blossom or leaf, true to the clock of the year, almost to a day; in obedience to a law there is no gainsaying, and which yet in the creature's serene unconsciousness seems robbed of any touch of harsh compulsion.

TWO ADDITIONS TO THE LIST OF BUTTERFLIES OF THE ISLAND OF MONTREAL.

By Albert F. Winn, Westmount, P. Q.

One of the great attractions of collecting Butterflies and Moths lies in the probability of coming across, at any moment, something new to the locality in which one is working, even though common elsewhere.

Although the district about Montreal has been fairly well worked ever since the formation of the Montreal Branch of the Entomological Society of Ontario, 35 years ago, not a season passes in which we do not find some moths large or small not previously observed and recorded. But finding a new butterfly is a different matter and it was indeed a pleasant surprise when I came across a specimen of the little pepper-and-salt Skipper, *Amblyscirtes samoset*, Scudder, flying over a very muddy field at Pt. aux Trembles, near the rifle ranges on June 7th, and a few minutes later I took another. My companions also wanted some and a thorough search was made, resulting in Mr. Chagnon also capturing one in an adjoining field. The species is apparently commoner to the north among the Laurentian Mountains, where I have taken it at Montfort and St. Faustin, and also at Calumet on the Ottawa River—always in early June.

A month later—July 12th—while walking across the Westmount Golf Links, with Mr. A. R. M. Boulton, of the Quebec Branch, a small yellow butterfly passed us, which looked like a very much undersized *Colias philodice*. My net was not ready, so my companion offered to catch it for me if I wanted it, but as the day was very warm I said not to chase it as it would probably come back, but it kept straight on. We went the opposite way, to the Nun's Woods at Cote St. Luc, to look for *Haploa confusa*, Lyman, and were busy catching a series of these moths, when another of the little yellow butterflies came along. I was ready this time and in a moment secured the first specimen of *Terias lisa*, Bd. and Lec. (the little Sulphur, Holland aptly calls it) that I had seen alive. Another soon appeared in the same place and Mr. Boulton captured it. As we were close to a fine field of clover we thought the butterflies were probably coming from it and therefore turned our attention to it, but without seeing any more. We resumed our raid on the Haploas, going further into the woods where *H. confusa* was scarcer and *H. Lecontei* more likely to be found. We were again lucky, for on coming out of the woods on the west side into a small cedar swamp another *Terias lisa* was flitting about, which I easily caught. As no more were visible we adjourned to Cartierville for lunch.

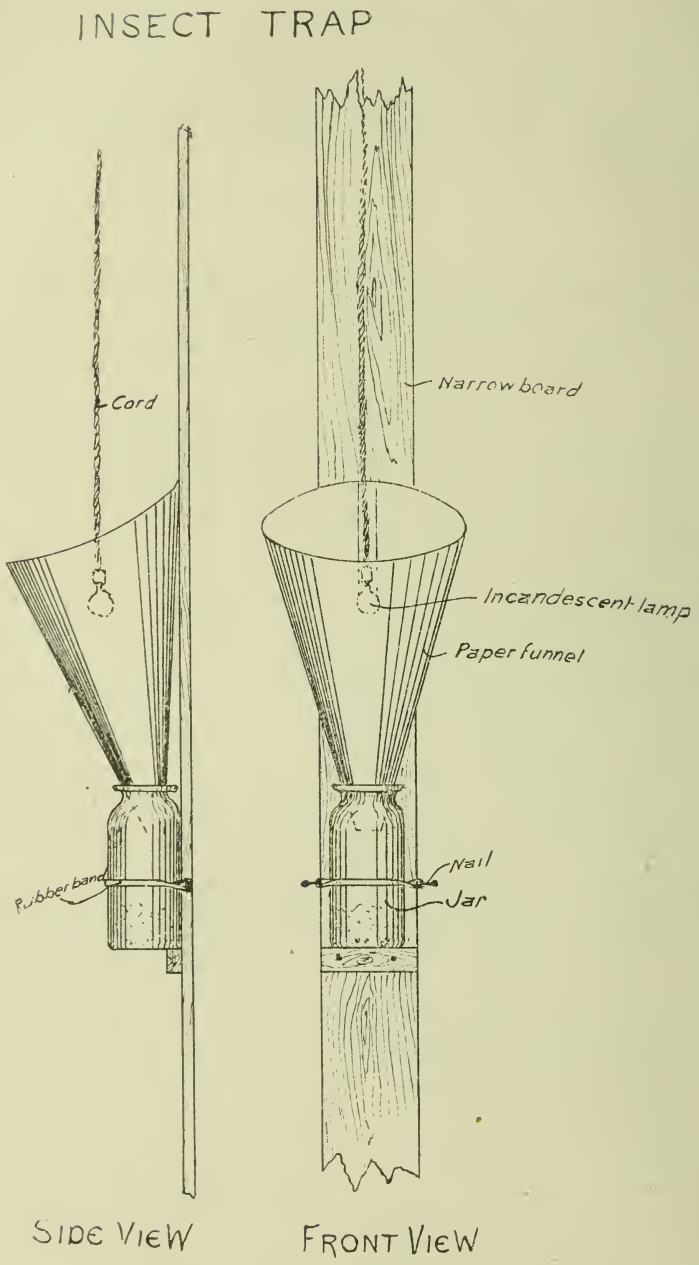

INSECT TRAP
Cord
Narrow board
Incandescent lamp
Paper funnel
Rubber band
Nail
Jar
SIDE VIEW
FRONT VIEW

Fig. 17.

COLLECTING WITH A LANTERN TRAP DURING THE SEASON OF 1908.

By J. D. Evans, Trenton.

The apparatus used during this season consisted of a quart gem jar charged with cyanide of potassium. The jar was prepared in the following manner, lumps of the cyanide of potassium were distributed over the bottom of the jar upon which were placed cork crumbs to the depth of about 1¼ inches—then plaster of Paris formed with water to the consistency of cream poured in to the depth of about 1¼ inches, (although a ½ inch or ¾ inch would have been sufficient.) In all other respects the trap was prepared and set up as described in the Canadian Entomologist for May, 1907. The plaster of Paris gives a better bottom and remains in better condition than the cotton batting filling as there described. This jar remained in good condition for at least three months' service, then getting weak a ⅜ inch hole was bored in the plaster of Paris and lightly stopped with a loose plug of cotton batting and a small quantity of chloroform poured into the hole by the aid of a glass funnel, a charge thus made would last for several nights.

Collecting with the trap was commenced in the first week of June and continued daily uninterruptedly until the end of September, except for a night very occasionally when it was raining—there is no record of these nights during June and July, but perhaps one night in each month would be the limit, but in August the 12th was the only exception and the 28th in September. The 4th September was a very cold night and the trap was not put out.

A daily record of the number of moths taken was not kept during June and July, but frequently the number exceeded 200 and upon one night the number was 434. During August the total number of moths taken was 2,724, the greatest number in any one night being on the 31st, when 220 were taken; the smallest number on the 24th, when 21 were taken. In September the total was 893. The largest catch being on the 5th, 160 moths and the smallest on the 15th and 19th, which were each only 2. These nights being very cool, the 29th and 30th being very cold nights nothing was taken.

Besides the moths, insects of several other orders were taken. Beetles of a considerable number of species, Hymenoptera, Diptera, Hemiptera (principally leaf hoppers of many species), Trichoptera, and Neuroptera. Upon some nights the jar would be almost full of myriads of Phrygania flies, midges, and other insects, and upon one occasion the jar was not only full but the mass extended up some distance into the paper funnel.

One might imagine that the moths would become spoiled with the multitude of occupants, but such is not the case, for many a moth was taken with its scales and fringes in perfect condition, even if in company with large beetles, such as the Lachnosternas.

With the exception of the moths, the captures in the other orders have not yet been named and listed for want of time, but with the moths there have been 281 species listed and a large number yet unnamed more particularly among the Micros.

NOTES ON THE OCCURRENCE OF LACHNOSTERNAS IN 1908.

By J. D. Evans, Trenton.

During the past nearly forty years the writer has collected Coleoptera and paid particular attention to the Lachnosternas, (commonly known as May Beetles or June Bugs), but a dozen or so specimens would be the maximum number taken in any one season and more often the number could readily be counted on the fingers of one hand. *Fusca* was considered the common species, but Dr. J. B. Smith separated and named others in the family or group *fusca* viz. *arcuata*, *insperata* and *dubia*. Since then it has been found that *fusca* is quite uncommon, the common species being *insperata* and *dubia* and the manner of separating these two species as given by the late Dr. Jno. Hamilton is the presence or absence of a tuft of hair on the head next to and between the eyes, in some specimens this tuft of hair may be much abraded.

The Lachnosternas were very numerous, this season the writer took 168 specimens either at lighted windows or in the trap, of which 91, or more than one-half of the number were *fusca*. The females of *insperata* and *dubia* are quite common, being usually about one-third of the number of the males, but with *fusca* it is very different, for the writer has never seen a female *fusca* among a large series taken at Trenton, Belleville, Sudbury and Ottawa and not until this season when one female only was taken as against 90 males. *Ciliata* is another species a few specimens of which are taken almost yearly, but yet the female has never been seen by the writer.

The number of specimens taken of each of the species throughout the season, being from 17th May to 6th July, is as follows: *Insperata*, 44 males, 10 females; *dubia*, 5 males, 14 females; *fusca*, 90 males, 1 female; *ciliata*, 4 males; total, 168.

In connection with this it might be mentioned that Lachnosternas occurred in large numbers this season at Gardenville and Wellington in Prince Edward County, where they have been very destructive to roots of strawberries, potatoes and other plants and in the imago state both at Trenton and Gardenville they were guilty of stripping off leaves from shrubs, raspberry canes and other fruits.

APPARATUS FOR COLLECTING SMALL ARTHROPODS TERRESTRIAL AND AQUATIC.

By Tennyson D. Jarvis, O. A. College, Guelph.

In the February number of the "Entomological News", Vol. XVII., Dr. L. O. Howard, of the Bureau of Entomology, Washington, described an apparatus, devised by Dr. Berlese, of Florence, Italy, for collecting small Arthropods and in great quantities. Being much interested in the study of Acarids our Department immediately had made an apparatus similar in structure. From it we got excellent results and a short time afterward we devised a machine for collecting aquatic insects and Acarids. We have found both collecting traps highly satisfactory. In the terrestrial trap Arthropods have been taken from many orders, but the largest numbers have been received from the Acarina, Araneida and Thysanura.

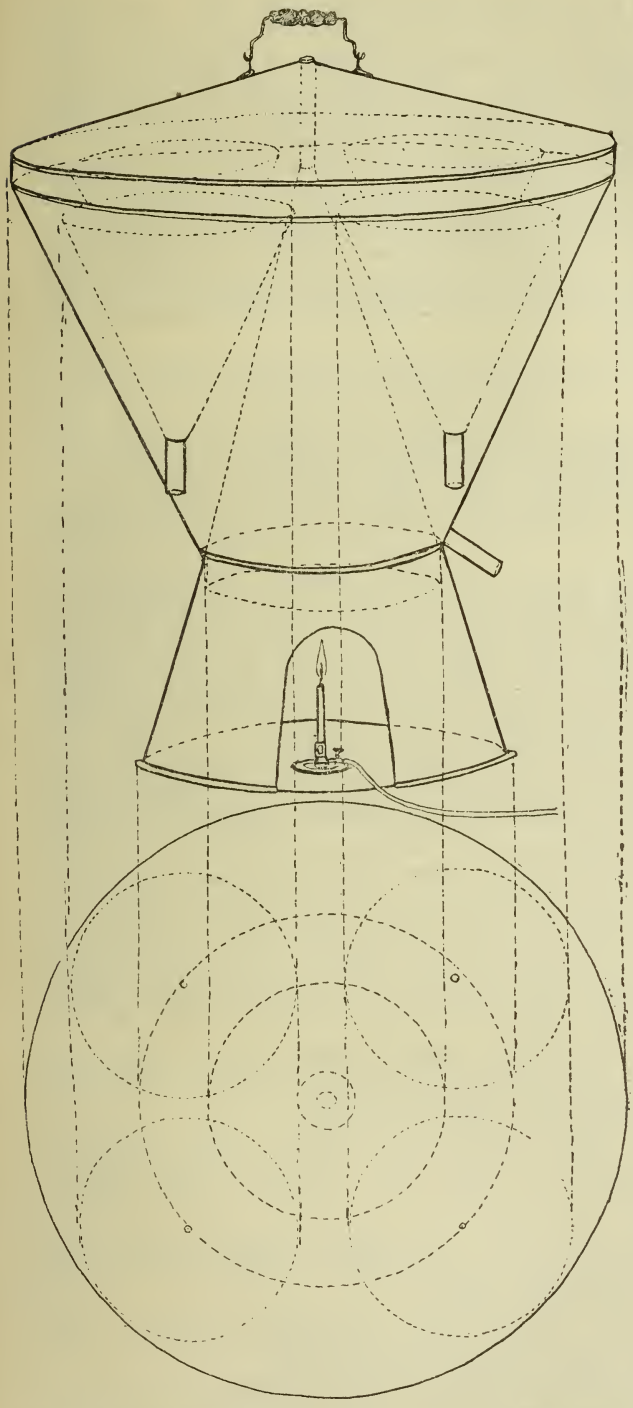


FIG 18. Apparatus for collecting small terrestrial Arthropods.

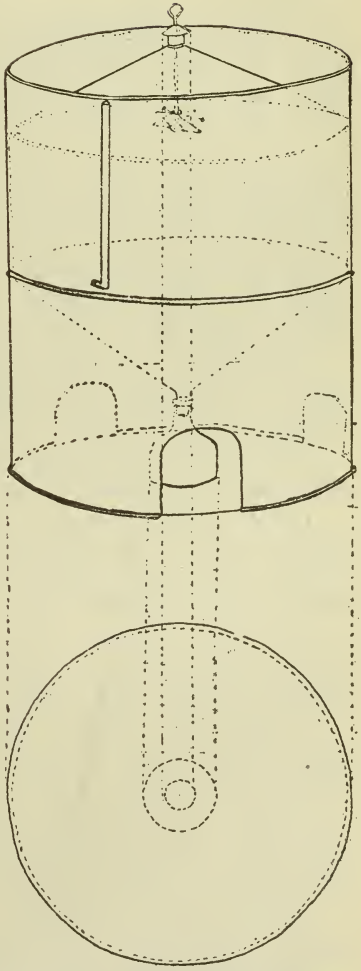


FIG. 19. Apparatus for collecting small aquatic Anthropods.

The terrestrial apparatus is made of copper, lined with tin. It consists of a central cone underneath which heat is applied. Four funnels with smooth tin lining and at the bottom of each is attached a small glass phial which may or may not contain alcohol. The funnels are surrounded by water and the water is kept hot from the gas burner below. On the top of each funnel is placed a shallow or deep tray of metallic network and on them is placed the material to be examined. The water is gradually heated and as the mites become uncomfortably hot they leave their host or other material on which they feed and travel downward into the glass tube below. If the life-history of the mite is desired, they are removed from the bottle and placed on suitable media. If the specimens are to be preserved, the tubes are usually filled with 95 per cent. alcohol or some other suitable preservative. (Figs. 18 and 19.)

A partial list of materials from which mites have been obtained is as follows:

Manure: Mites were obtained from nearly all kinds of manure and were especially abundant in horse and cow manure. From one small lot of horse manure the mites dropped down like a snow storm and filled a 4 cc. phial in a few minutes after the water was heated. Five different species were taken from this one lot.

Bark from Trees: The bark from a host of deciduous and evergreen trees were given a trial on the mite machine, and from nearly every species of tree one or more species of Acarid was taken. Many mites resemble the bark in colour or shape, on which they live, and if it were not for such a device it would mean an endless amount of waste in time and patience. A good example of this is that of a species belonging to the genus Nothrus. This mite in shape and colour resembles bits of bark or lichens.

Ensilage: A large quantity of mites were taken from ensilage from the O. A. College silo. These acarids may be largely responsible for the spread of fungus spores in the silo.

Bone: Some mites were taken from pure bone and others from bone with remnants of flesh adhering to it.

Rock: This is one of the favorite resorts of acarids. Some species evidently live on the sound rock, others on the lichens or decaying organic matter on the rock and still others take refuge in the crevices of rock. Many species were obtained from this source.

Decaying leaves, humus, soil from roots of plants, etc.: Decaying leaves is especially a very favourable resort for acarids, Some live on the decaying matter and others hibernate under the leaves.

Bulbs and Tubers: Here again nearly every kind of bulb and tuber tested yielded one or more species of mite, e.g., Potatoes, Calla Lillies, Hyacinths, Onions, etc.

Fruits: Only a few fruits were tried. The apple is the only one that responded. The mites on the apples were feeding on the wax covering the surface. The King gave the best results.

Roots and Vegetables, etc.: From beets, mangolds, turnips, artichokes, Kohl Rabi, parsnips, squash, mites were obtained.

In root houses and such places the mites carry spores of moulds on their feet and disseminate the fungus.

Moss: A few species were obtained from moss.

Nests: The nests of robins, mice, domestic fowl, were the only ones tried and from each one or more species were obtained.

Vertebrate Animals: Several animals were killed and placed on the sieve and mites were obtained from the following: young mice, mature mice, robins, groundhogs, and muskrats.

Fungi: Only a few specimens were tried. Polyporus and Boletus were infested.

Boards and Sawdust: In this case the mites were probably hiding or hibernating.

Grains: Some of the different kinds of grains that mites were obtained from were: Wheat, barley, corn, oats, mangold seed; whole and ground oats.

Decaying material: Decaying squash, parsnips, potatoes, apples, beets, Kohl Rabi and carrots all yielded mites.

Hay: From Timothy and Clover hay mites were taken.

Cones: One or two species were obtained from Pine cones.

Miscellaneous: Litter from chicken run, grass, road scrapings, living Chickweed, flowers of plants, roots of herbs, granary sweepings, decaying stumps, artichoke stubble, etc.

The aquatic apparatus is made of the same material as the terrestrial one—tin and copper. It works on the same principle as the terrestrial machine, that is when an arthropod becomes uncomfortable it goes up or down to obtain air. The Hexapods usually go up or to the surface of the water and the Arachnids go down, but instead of applying heat a few drops of formalin or alcohol is added to the aquatic material. The trap consists of a central bowl with a metallic sieve above and below. The material to be examined is placed in the bowl and enough water is added to fill the bowl to the level. When the alcohol or formalin is added the aquatic larvae go up to the top of the cone and are pulled out by a little strainer. The Acarids, etc., go down and are caught in a bottle below.

This collecting trap may be taken to a pond or lake and in a short time an immense amount of material can be obtained.

A CATALOGUE OF THE GALL INSECTS OF ONTARIO.

By Tennyson D. Jarvis, O. A. C., Guelph.

The insects which produce galls are confined to the following orders: Acarina, which are not true insects, but mites; the Diptera or flies; the Hemiptera, or bugs; the Lepidoptera, or moths and butterflies; the Coleoptera, or beetles; and the Hymenoptera, or bees, wasps, ants and sawflies.

Their food-plants cover a wide range, some twenty-six orders of plants being affected by them. Some species show a decided preference for certain groups of plants as the following table will show.

—	Acarina.	Diptera.	Hymenoptera.	Hemiptera.	Lepidoptera.	Coleoptera.
Rosaceae	13	14	17	3		1
Cupuliferae	13	5	22			
Salicaceae	13	10	5	3	1	1
Urticaceae	5	7		6		
Compositae		10	3	1	3	
Juglandaceae	2	7		6		
Sapindaceae	7	3				
Vitaceae	2	5				
Tiliaceae	3	2		1		
Oleaceae	5	2				
Anacardiaceae	2			1		
Cornaceae		3				
Coniferae		1		1		1
Geraniaceae		2				
Gramineae		2				
Hamamelideae				2		
Labiateae		3			1	
Araliaceae		1				
Ericaceae			1			
Iridaceae		1				
Leguminosae					1	
Magnoliaceae		1				
Rhammaceae					1	
Rubiaceae	1					
Saxifragaceae				1		
Verbenaceae			1			
Total	61	77	49	24	7	3

Acarina.

Family—Eriophyidæ. Gall Mites.

This is a family of microscopic mites which are quite curious and unusual in structure. They have only two pairs of legs and the abdomen is long and striated. These striations, which differ in the different species, and differ in number on the dorsal and ventral surfaces are of considerable value in classification. The galls produced vary in form, but are always open or provided with an opening through which the mites pass in and out. They are generally lined with minute hairs (trichomes) which may be simple or branched. The different types of phytoptid galls are shown below, figures 20 to 28.

FIG. 20. Erineum on leaf of beech ; natural size and highly magnified.

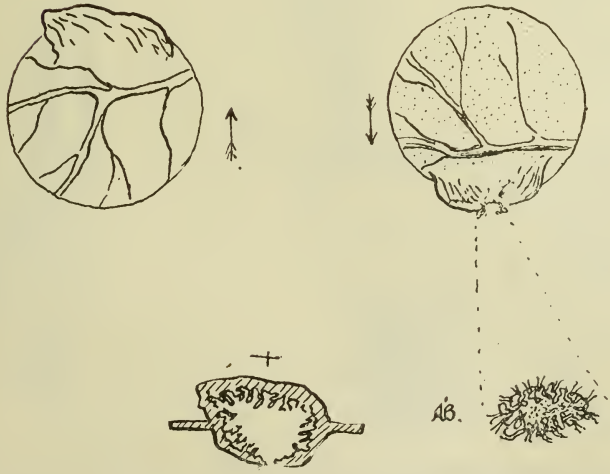


FIG. 21. Capsule Gall : Upper and lower surfaces ; interior and opening of capsule, highly magnified.

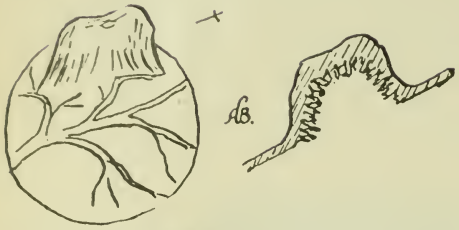


FIG. 22. Dimple Gall and section of interior greatly magnified.

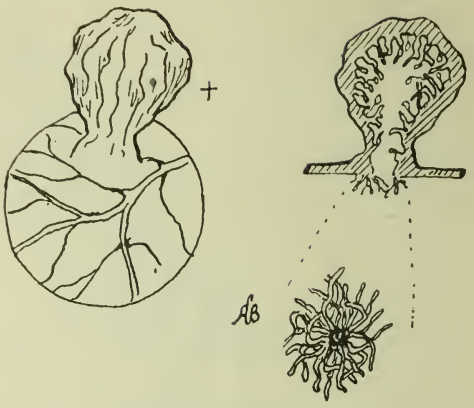


FIG. 23. Pocket Gall : Upper surface of leaf ; interior of gall, much magnified.

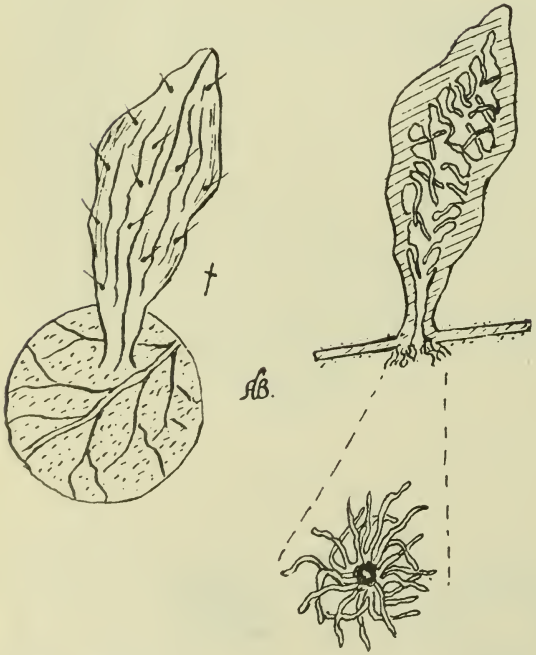


FIG. 24. Pouch Gall on upper surface of leaf ; interior of gall, much magnified.

FIG. 25. Leaf-margin Gall.

FIG. 26. Leaf-distortion Gall, different stages.

FIG. 27. Bud-like Galls.

FIG 28. Serpentine Gall.

A simple apparatus, based upon the principle that most insects seek light, provides an efficient and safe method of obtaining parasites from parasitized material, rearing gall insects, etc. Figures 29 and 30.

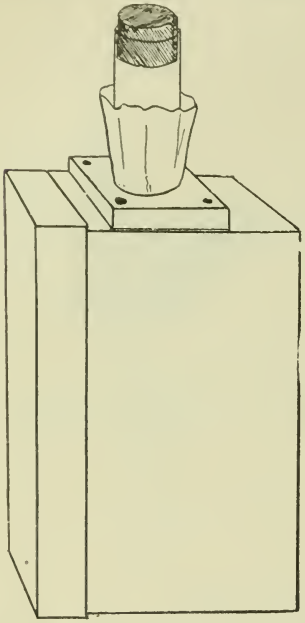


Fig. 29. Apparatus for procuring Parasites. (Side view.)

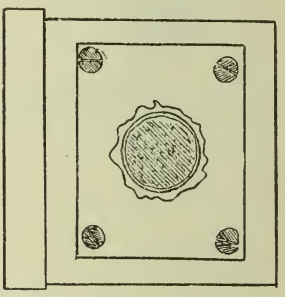


Fig. 30. Apparatus for procuring Parasites. (View from above.)

It consists of a simple cardboard box about 20 x 12 x 12 cm., upon one end of which is fixed by tacks driven through the cardboard from inside, an oblong block of wood about 9 x 7 x 1 cm. with a hole about 2.5 cm. in diameter bored through the centre of it. The cardboard behind this hole is removed neatly leaving a circular hole opening into one end of the box. Into this hole the paper cone, open at both ends, is thrust. A glass tube is thrust into the paper cone. This provides an arrangement which is quite tight and yet easy to handle. The material from which it is desired to obtain insects or parasites is placed in the box. When the insects emerge into the tube it is removed quickly and corked and another tube is put in its place. In case work is being done with very small insects a sheet of cotton cloth covered with a thin layer of cotton batting may be placed over the top of the box and the lid forced down over it, thus preventing the escape of any under the lid. When all the insects which are living have emerged, the material remaining in the boxes may be examined for dead insects.

Coleoptera.

Family-Buprestidæ. Metallic Wood Borers.

A few produce galls, the most important one being the Red-necked Agrilus, producing galls on the Raspberry and Blackberry.

Family-Cerambycidæ. The Long-horned Beetles.

These beetles are of medium or large size. The body is oblong or cylindrical and the antennæ are long, often longer than the body. Only one species of gall maker is known to occur in Ontario; the Willow Branch Borer (*Saperda concolor*).

Family-Curculionidæ. The Curculios or Weevils.

In this family the head is prolonged into a beak which is sometimes longer than the remainder of the body. Specimens of the Red Pine Stem Gall (*Podapion gallicolla*) were received from Mr. A. Cosens, Toronto.

LEPIDOPTERA.

Family-Tortricidæ.

The Tortricids are generally small moths; but as a rule they are larger than the Tineids. *Ecdytolopha insiticiana* is abundant on the Honey Locust and *Eucosma Scudderiana* is common on the Goldenrod.

Family-Tineidæ. The Leaf-miners and Clothes Moths.

The family contains but few gall makers. Species Nepticula occurs on the Aspen and *Stagmatophora ceanothiella* is found at Toronto on New Jersey Tea.

Family-Gelechiidæ.

These are small moths closely related to the Tineids. Two species, belonging to the genus Gnormischema, are abundant on Solidago.

HEMIPTERA.

Family-Aphididæ. Aphids or Plant Lice.

These are small, soft-bodied insects which suck up the juices of plants and which often produce galls. The galls produced vary in form from mere leaf curls to forms of most curious appearance but of quite simple structure. They are all open or furnished with an opening. Twenty-two species of gall producers are recorded for Ontario.

Family-Psyllidæ. Jumping Plant Lice.

The members of this family resemble the preceding to a great extent, but they are not so numerous. The hind legs are formed for jumping. Only two species are so far recorded for Ontario.

DIPTERA.

Family-Cecidomyidæ. Gall Gnats.

These are very delicate, small, two-winged flies with few veins in the wings and with sucking mouth parts. The eggs are laid upon the leaf surface and the larva either feeds there, making an open gall, or makes an incision in the leaf and enters, forming a closed gall, which splits open at maturity at the point where the larva entered. The Larvæ can be readily identified by their color, which is orange, red or pink, and by the development, between the second and third segments of the body, of a peculiar, horny projection called the breast-plate, the use of which is not definitely known. Eleven genera have been recorded for Ontario.

Family-Agromyzidæ.

They are small flies closely related to the Trypetidæ. Only a few are gall makers. One species occurs on Iris and another on Salix.

Family-Trypetidæ.

This family comprises a large number of rather small flies, usually with prettily-marked wings. A few species belonging to the genus Trypeta produce galls on the stems of composites.

HYMENOPTERA.

Family-Tenthredinidæ.

Of this family the Nematinæ produce galls. The head and thorax are wide. The base of the abdomen is broadly joined to the thorax and the abdomen of the female is furnished with a pair of claws. The larvæ have from twelve to sixteen prolegs. These insects have been very thoroughly taken up by Norton in his monograph on the Nematinæ. A large number make galls on Willow.

Family-Cynipidæ. Gall Flies.

This is a family of very minute, four winged insects. In the adult gall-fly the abdomen is unusually compressed and joined to the thorax by a short peduncle, the first abdominal segment. The ovipositor is long and slender. The insect deposits its eggs within the tissues of the plant by piercing it with its ovipositor. The galls produced are closed and the insect emerges at maturity through a hole it cuts in the gall.

The writer's thanks should be here expressed to those who have so kindly assisted in the preparation of this paper. I am under special obligation to Prof. Bethune, O.A.C., Guelph; Dr. E. Porter Felt, State Entomologist, N.Y.; Mr. A. Cosens, Toronto, and Mr. W. R. Thompson, Guelph, and Mr. C. D. Jarvis, Storrs, Conn.

The present list is arranged alphabetically by host plants.

AFFECTING ALDER.

A white, frost-like erineum on under side of leaf in the axils of the veins. Trichomes dense, pellucid.—*Eriophyes* sp.—Alnus incana.

A small, red or green pubescent pocket gall on leaf. Alder Pocket Gall—*Eriophyes* sp.—Alnus incana.

A rounded gall, a deformation of the terminal bud. Alder Bud Gall.—*Dasyneura serrulatæ*—O.S. Alnus incana.

AFFECTING ASH.

Spherical, pulpy green galls about the size of a pea, springing from the upper surface of the midribs or veins. Ash Ball Gall—*Cecidomyiadæ*—Fraxinus sambucifolia.

Elongated, green, succulent galls on the under side of the leaf. Ash Midrib Gall—*Cecidomyia pellex*—O.S. Plate F., fig. 5. Fraxinus americana.

Small, irregular, smooth, more or less spherical capsule gall, protruding on both sides of the leaf. Ash Mite Gall—*Eriophyes fraxini*—Garman, Fraxinus americana.

Pinkish white, elongated capsule galls on the veins of the leaf. Ventrally the galls appear as white, hairy projections following the veins. Ash Vein Gall—*Eriophyes* sp.

A deformation of the terminal buds, their development arrested, producing a mass of small twisted leaf ends. *Eriophyes* sp.—Fraxinus americana.

Leaves dwarfed and distorted in a bundle. Resembles somewhat Cecidomyia solidaginis. Ash Bunch Gall—*Eriophyes* sp. Plate L., fig. 2. Fraxinus americana.

Small, irregular, more or less spherical capsule gall protruding on both sides of leaf. Galls hairy—*Eriophyes* sp. Fraxinus pubescens.

Affecting Barley.

A small gall forming a woody growth which fills up the cavity of the stalk and causes the joints to swell. Barley Joint-Worm Gall—*Isosoma hordei* (Harris). Hordeum vulgare.

Affecting Basswood.

A.—*Galls on the leaves.*

Balloon-shaped galls on the upper surface of the leaf Apex of gall usually serrated. Basswood Balloon Gall—*Eriophyes abnormis* Garman—Plate I., fig. 6. Tilia americana.

Irregular, circular, dark reddish-brown spots about 4-5 mm. in diameter, having in their centre very characteristic tufts of whitish hairs. Basswood Tufted Gall. Tilia americana.

A white erineum or shallow dimple on underside of leaf, much like the Erineum on Acer negundo. *Eriophyes* sp.—Plate M., fig. 4. Tilia europea.

Small swellings about 3 mm. in diameter, protruding from both sides of the leaf. Red above and green below. Basswood Wart Gall—*Cecidomyia verrucicola,* O.S. Tilia americana.

B.—*Galls on Stem.*

Oval swellings of the cortex about 1 cm. long. Texture pith-like, surface smooth and of the same color and appearance as the bark. Basswood Egg Gall. Tilia americana.

Affecting Bearberry.

Red galls about 10 mm. long and 4. mm. broad, upon the leaves. Resulting from the folding over of the edge of the leaf or sometimes both edges, forming a pocket. Bearberry Leaf Gall—*Pemphigus Coweni* (Ckl.)—Arctostaphylos uva-ursi.

Affecting Beech.

A frosty, white erineum in large patches on the under side of the leaf. Trichomes spherically capitate. *Eriophyes* sp.—Plate H., fig. 4. Fagus americana.

Affecting Blue Beech.

Fold of the leaf along the veins forming a long hollow tube. Vein Gall of Blue Beech—*Cecidomyia pudibunda*—O.S. Plate E., fig. 6. Carpinus caroliniana.

Affecting Birch.

A bud deformation, crowded and irregular, often in bunches of large size. Birch Bud Gall—*Eriophyes* sp.—Plate G., fig. 6. Betula lutea.

A rosy pink erineum in large patches on the upper side of the leaf. *Eriophyes* sp.—Betula lenta.

A yellowish-white to brownish erineum forming large patches between the ribs on the under side of the leaf. *Eriophyes* sp.—Betula papyrifera.

A transparently white, granular erineum on the surface of the leaves—*Eriophyes* sp.—Betula pumila.

A capsule gall, very small, yellow to brown. Paper Birch Capsule Gall—*Eriophyes* sp.—Plate M., fig. 5. Betula papyrifera.

A nodular pocket gall, occuring upon both faces of the leaf; yellowish or reddish to purplish. Paper Birch Pocket Gall—*Eriophyes* sp.—Plate K., fig. 1. Betula papyrifera.

Affecting Blue Flag.

An oval enlargement on the inside of the leaf, usually about 1 inch from the tip. Iris Leaf Gall—*Agromyza magnicornis* (Lowe)—Iris versicolor.

Affecting Boneset.

Oval swellings on the stems and leaf stalks. Boneset Stem Gall—*Choristoneura perfoliatum* (Felt)—Plate A., fig. 5. Eupatorium perfoliatum.

Affecting Bramble.

A.—*Galls on leaves.*

Irregular-shaped, woody swellings at the base of the leaflets, or on the midrib of the Blackberry. Wood Leaf Gall—*Lasioptera farinosa* (Wm. Beutm)—Rubus villosus.

Irregular sub-conical stem galls about three-quarters of an inch in length. Blackberry Stem Gall—*Lasioptera nodulosa* (Beutm)—Rubus villosus.

B.—*Galls on stem.*

A mass of hard, small cells covered with a dense thick mass of green filaments clustered around a branch or twig of Blackberry. From 1.5 to 2 cm. in diameter. Mossy Rose Gall—Rhodites rosæ (Linn)—Plate B., fig. 1. Rubus villosus.

Large, oblong, polythalamous stem gall, 1 to 3 inches in length. Surface uneven with deep longitudinal furrows which divide the gall, more or less completely, into 4 or 5 portions. Pithy Blackberry Gall—*Diastrophus nebulosus,* O.S.—Rubus villosus.

Symmetrical swellings of the Blackberry cane. Gouty Gall *Agrilus ruficollis* (Fab.)—Rubus villosus.

Hard woody, somewhat globular, seed-like bodies 2 to 4 mm. in diameter formed in clusters on the stem. More or less covered with curved spines which are about 2 mm. long. Blackberry Seed Gall—*Diastrophus cuscutæformis* (O.S.)—Rubus villosus.

Large, reddish-brown, polythalamous, tubercular or irregular gall about 1 to 1.75 inches long and .5 inches in diameter, arising abruptly on the stem. Green in summer, darkening towards winter. Raspberry Stem Gall—*Diastrophus turgidus* (Bass)—Plate B., fig. 2. Rubus strigosus.

Affecting Bugleweed.

An elliptical or sometimes almost spherical gall formed on the stem. Bugleweed Stem Gall—*Lasioptera lycopi* (Felt)—Plate N., fig. 5. Lycopus virginicus.

Affecting Buttonbush.

Clusters of small dimples on the upper side of the leaf, 1 to 3 mm. high. Buttonbush Dimple Gall—*Eriophyes cephalanthe* (Cook)—Plate K., fig. 5. Cephalanthus occidentalis.

Affecting Chestnut.

A small capsule gall, on the leaf, more or less spherical and 2-3 mm. in diameter. Chestnut Capsule Gall—*Eriophyes* sp.—Castanea sativa, var. americana.

Affecting Cinquefoil.

Oval or spherical galls from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, arising in the axil of the leaves. Cinquefoil Axil Gall—*Diastrophus potentillæ* (Bass)—Plate B., fig. 5. Potentilla Canadensis.

Oval or cylindrical swellings from 1 to 2 inches long on the stems usually near the base of the plant, Monothalamous. Cinquefoil Stem Gall. Potentilla norvegica.

Affecting Currant.

Red or purple elevations or folds on the upper side of the leaf. Currant Leaf Gall—*Myzus ribis*, Linn—Ribes rubrum.

Affecting Dandelion.

Irregular, knotty, pithy swellings, forming oblong irregular galls along and surrounding the leaf-petiole; average length from one-quarter of an inch to fully two inches. Dandelion Petiole Gall—*Gilletia Taraxaci*, Ashmead—Taraxacum officinale.

Affecting Dogwood.

Club-shaped and about $\frac{1}{2}$ to 1 inch long. On terminal twigs. Dogwood Club Gall—*Cecidomyia clavula* (Beutm.)—Cornus florida.

Thin-walled circular elevations on the under side of the leaves. Dogwood Leaf Gall—*Lasioptera corni* (Felt)—Plate A., fig. 2. Cornus florida.

Small, nearly oval Gall situated on the petiole of the leaf. Flowering Dogwood Petiole Gall. Cornus florida.

Affecting Elm.

A.—*Galls on the leaves.*

Round dimples in the backs of the leaves resulting in small elevations on the upper side. About 2 mm. in diameter and surrounded by an areola of lighter green. In the cavity of the gall rests a small, white larva covered with a viscid, transparent secretion. Pimple Gall—*Cecidomyiadæ*—Plate P., fig. 4. Showing larva and gall.

Ulmus americana.

A leafy growth arising from a bud and resembling the Pine Cone Willow gall but more nearly spherical and only about $\frac{1}{2}$ an inch in diameter. Remains green during summer but changes to a dark brown in winter. Red Elm Bud-Gall—Plate P., fig. 6. Ulmus pubescens.

A green plum-like structure on the upper surface of the leaf. About 10 to 12 mm. in length and 3 to 7 mm. in thickness. Plum Gall—*Pemphigus ulmi fuscus*—Ulmus campestris.

There is a similar gall on Red Elm, but differing in the following respects: (1) It is twice as large. (2) The wall is a little thicker. (3) The

surface is rough like the leaf not glossy. (4) The part of the leaf around the base is quite normal in appearance, showing no signs of being weakened through lack of nourishment. Ulmus pubescens.—Plate C., fig. 8.

Hollow, cock's comb-like, thin walled gall; on the upper surface of the leaf. Cockscomb Gall—*Colopha ulmicola* (Fitch)—Plate I., fig. 5. Ulmus americana.

A pulpy thickening of the tissues on the under surface of the leaf, extending for some distance along the midrib. Causes the upper surface to double on itself instead of expanding in the ordinary way. Leaf Fold Gall—*Cecidomyia ulmi* (Beutm)—Plate A., fig. 1. Ulmus americana.

Curling and gnarling of the leaves forming thereby a sort of pseudo-gall. Woolly Aphid Leaf Gall—*Schizoneura americana* (Riley)—Plate Q., fig. 1. Ulmus racemosa.

B.—*Galls on the stems.*

Aphids clustering on the limbs and trunks, causing a knotty unnatural growth of the wood. Woolly Aphid Stem-gall—*Schizoneura Rileyi* (Thomas). Ulmus americana.

Small green to yellowish pocket-galls, more or less spherical, usually on the upper side of the leaves. Elm Pocket Gall—*Eriophyes ulmi* (Garman)—Plate H., fig. 5 and 6. Ulmus americana and U. Racemosa.

An erineum on the under side of the leaf; white at first changing to brown. Trichomes simple, tangled. Rock Elm Erineum Gall—*Eriophyes* sp.—Plate H., fig. 3. Ulmus racemosa.

A very large pouch-gall on the leaves, commencing as a cone or deep dimple. *Eriophyes* sp.—Plate L., fig. 6. Ulmus pubescens.

A cone-shaped pouch gall resembling those on Tilia and much larger than Eriophyes ulmi. On the upper surface of the leaf, often very many on a single leaf but thickest along the midrib usually; shape irregular but usually tapering towards both ends and twice as long as thick, average length being about 5 mm., and average thickness about 2-2.5 mm.; color green. *Eriophyes* sp.—Plate L., fig. 5. Ulmus americana.

Affecting Evergreens.

Irregularly oblong gall, situated near the base of the needle on the new growth. Balsam Fir Needle-gall—*Cecidomyia balsamicola* (Lintner)—Plate A., fig. 3. Abies balsamea.

Oval swellings on the twigs of various species of Spruce. Spruce Gall louse—*Chermes abietis*—Picea nigra, P. excelsa and P. alba.

The gall consists of an enlargement of the smaller branches. Red Pine Stem Gall—*Podapion gallicolla* (Riley)—Pinus resinosa

Affecting False Nettle.

An elongate, fusiform swelling of the stalk. False Nettle Stem Gall—*Cecidomyia (?) bœhmeriæ* (Beutm)—Bœhmeria cylindrica.

Affecting Ginseng.

Spherical or irregularly cylindrical, brown galls upon the roots. Ginseng Root Gall. Aralia nudicaulis.

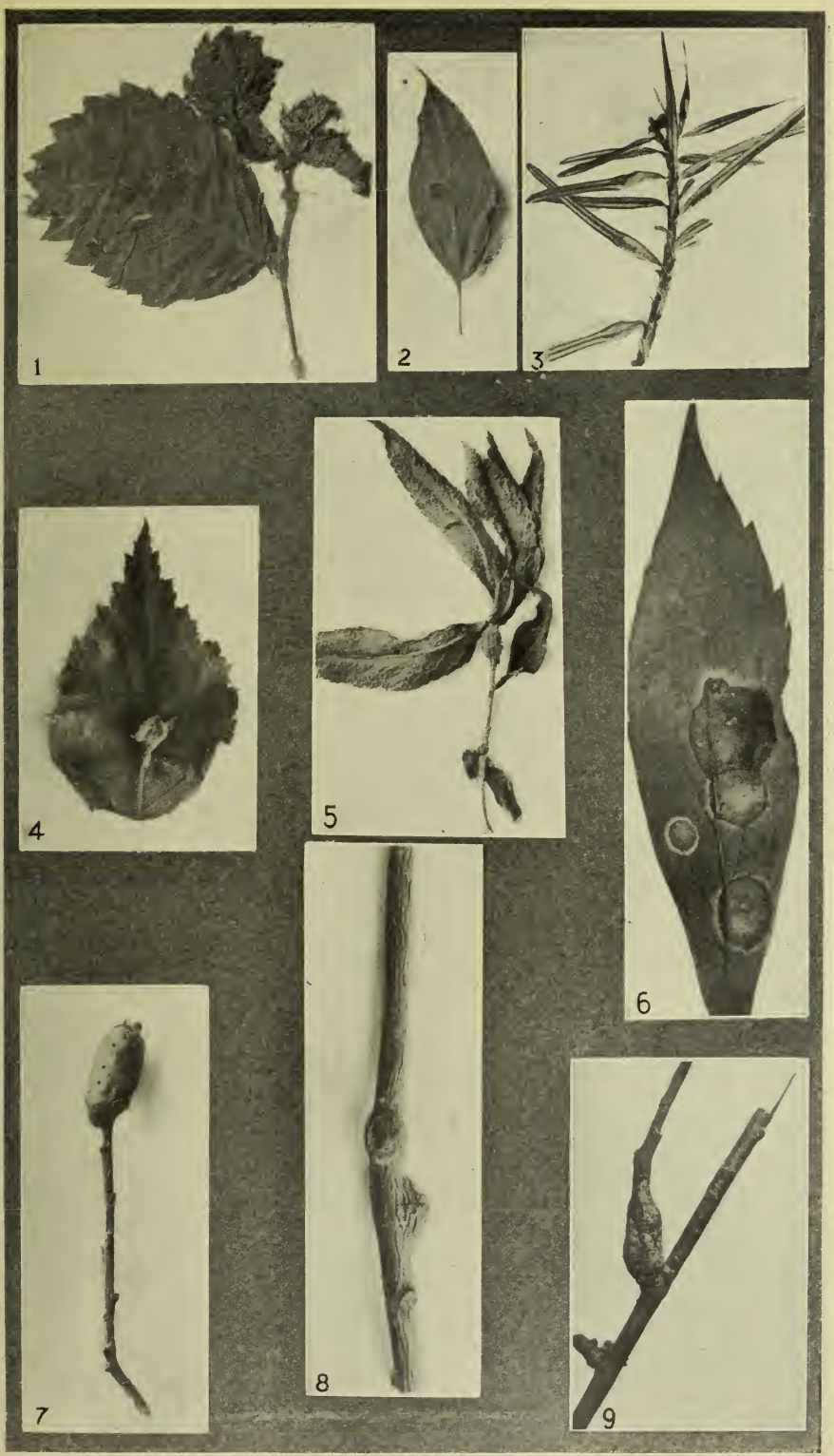


PLATE A.

1. Cecidomyia ulmi Beuten.
2. Lasioptera corni, Felt.
3. Cecidomyia balsamifera, Lintner.
4. Hormomyia cratægifolia, Felt.
5. Choristoneura perfoliata, Felt.
6. Choristoneura flavolunata, Felt.
7. Rhabdophaga batatas, O.S.
8. Agromyza æneiventris, Fallen.
9. Rhabdophaga nodulus, Walsh.

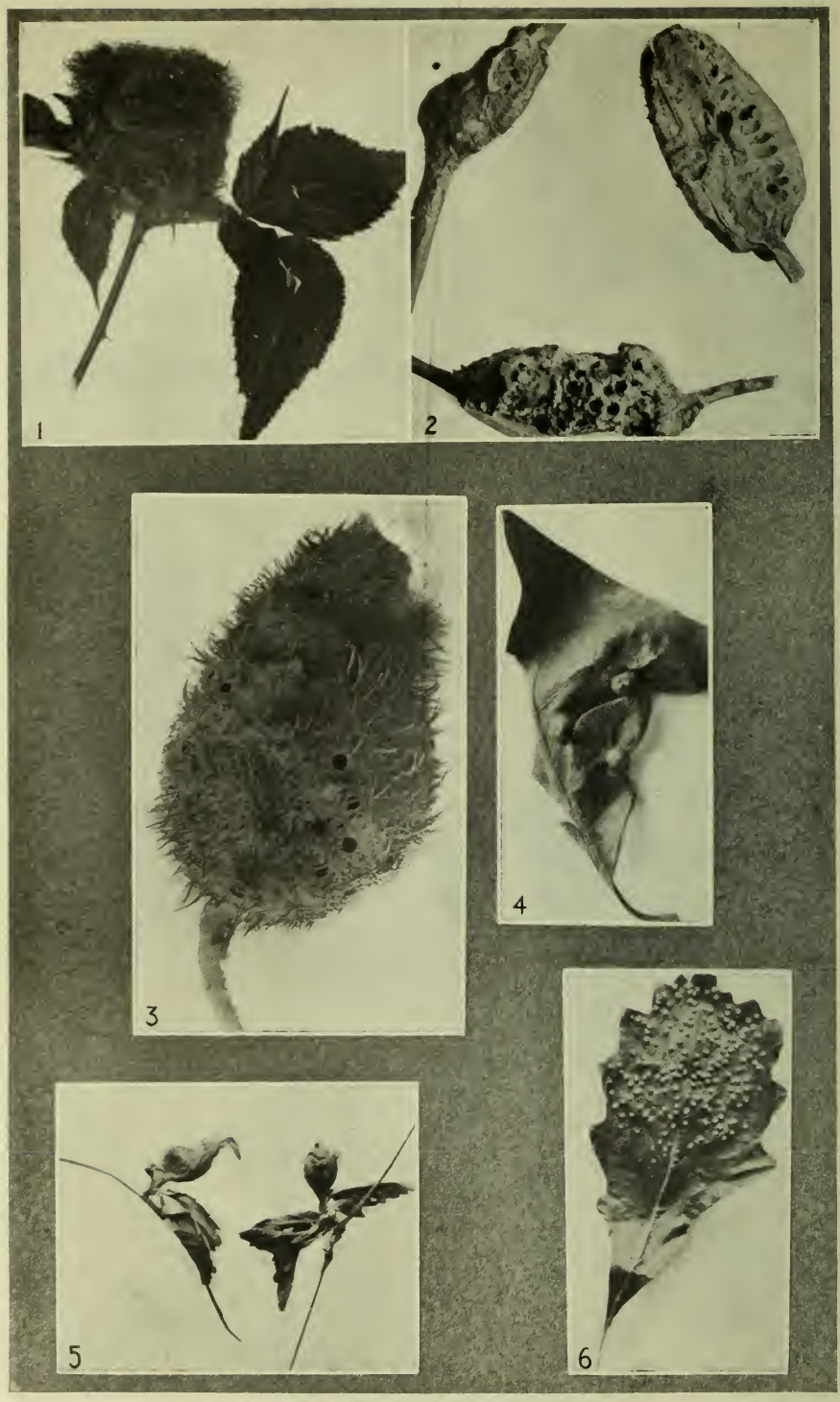


PLATE B.

1. Rhodites rosae, Linn. on Blackberry.
2. Diastrophus turgidus, Bass.
3. Rhodites multispinosus, Gill.
4. Andricus futilis, O.S.
5. Diastrophus potentillæ, Bass.
6. Neuroterus umbilicatus, Bass.

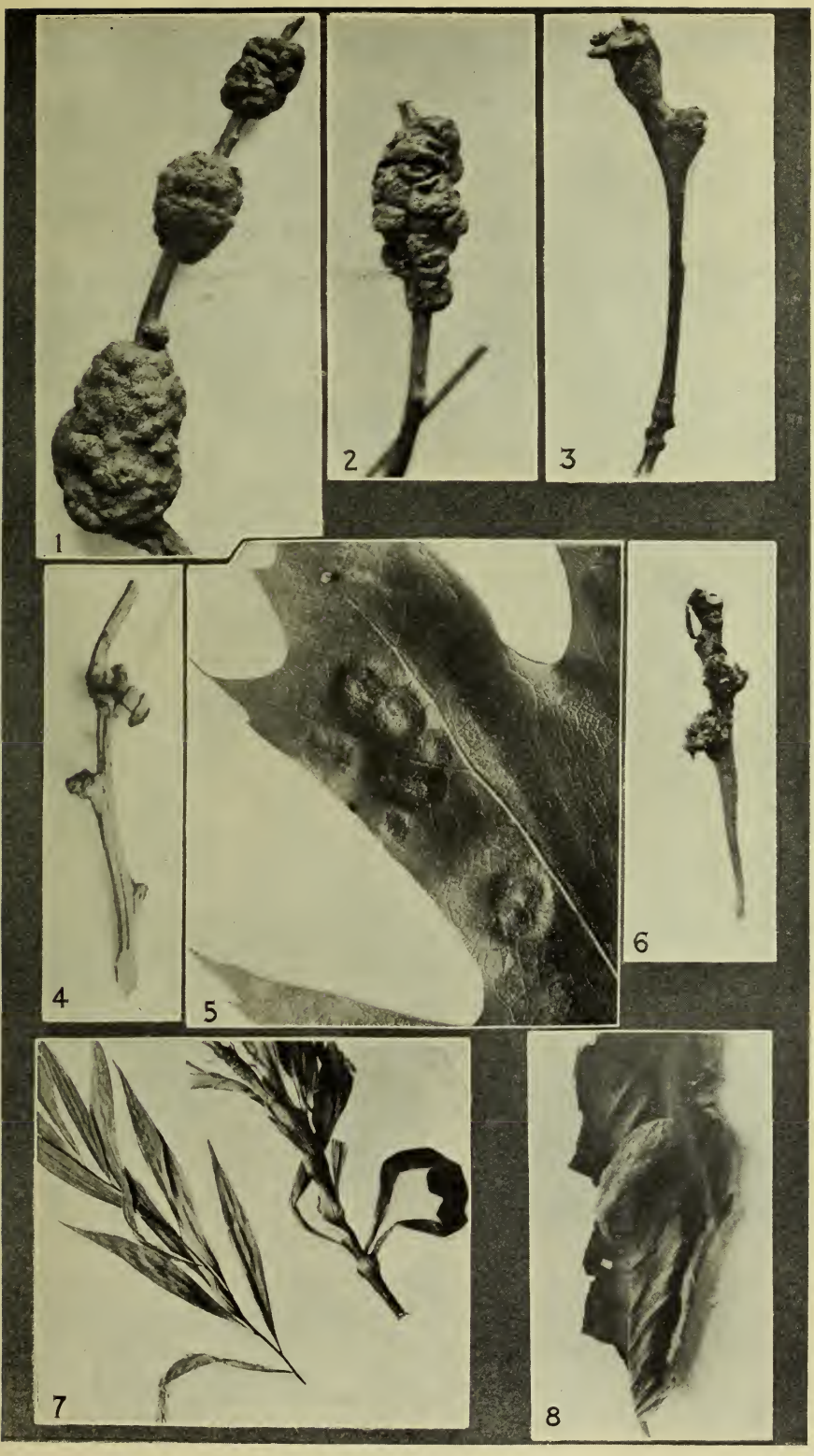


PLATE C.

1. Andricus punctatus, Bass.
2. Biorhiza forticornis, Walsh.
3. Andricus clavula, Bass.
4. Cynips strobilana, O.S.
5. Andricus papillatus, O.S.
6. Andricus topiarius, Ashm.
7. Eucosma scudderiana, Clem.
8. Pemphigus ulmi-fuscus.

PLATE D.

1. Eriophyes sp., Amelanchier Canadensis.
2. Eriophyes sp., Juglans nigra.
3. Eriophyes sp., Populus italica.
4. Eriophyes sp., Vitis cordifolia.
5. Eriophyes sp., Salix fragilis.

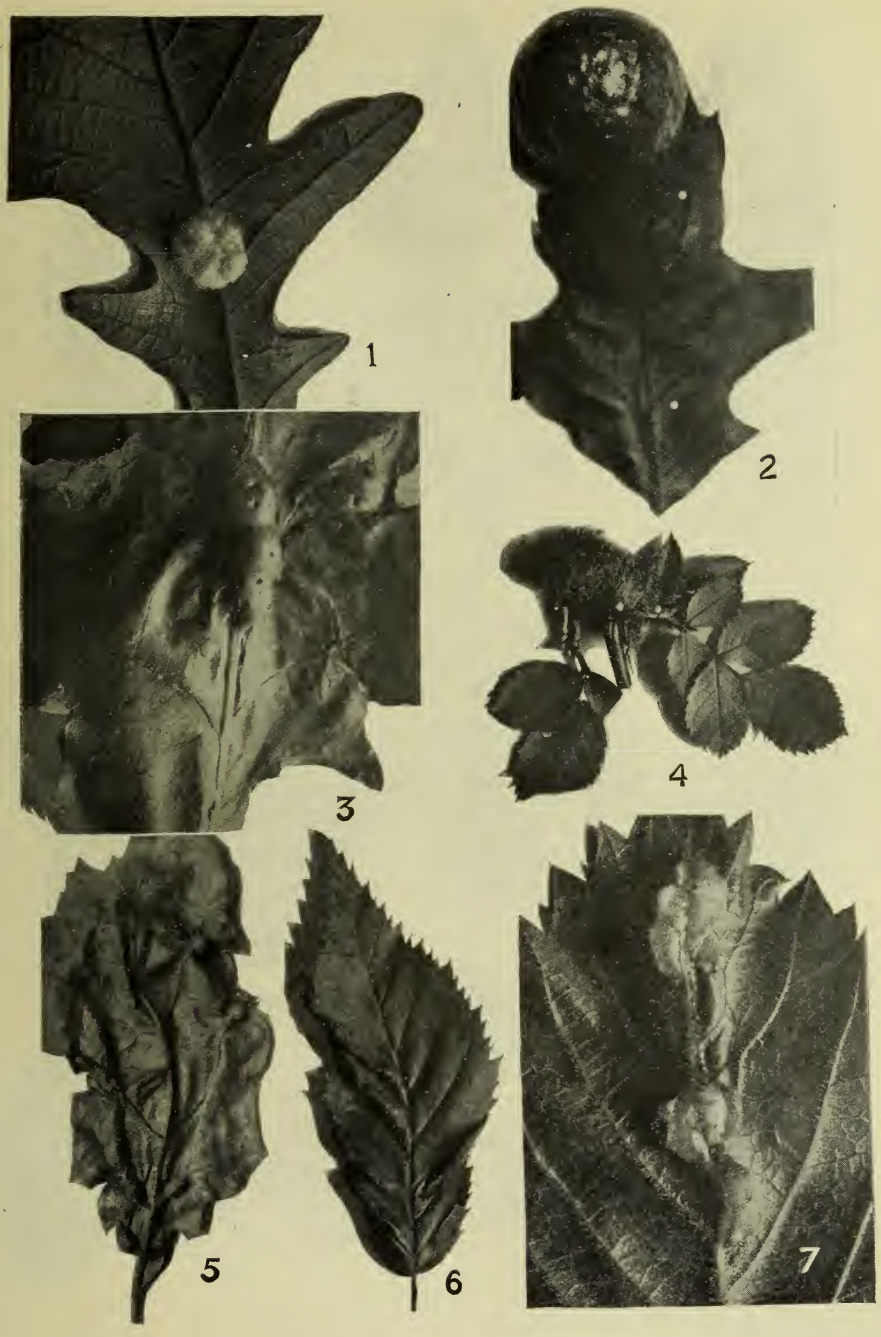


PLATE E.

1. Furry Ball Gall on Oak. (*Andricus lana.*)
2. The Larger Oak-Apple. (*Amphibolips confluentis.*)
3. Oak Midrib Gall. (*Andricus piger.*)
4. Mossy Rose Gall. (*Rhodites rosae.*)
5. Vein Gall on Oak. (*Cecidomyia quercus-majalis.*)
6. Vein Gall on Blue Beech. (*Cecidomyia pudibunda.*)
7. Virginian Creeper Midrib Gall. (*Cecidomyia sp.*)

PLATE F.

1. Ball Gall on Hickory. (*Diplosis caryae.*)
2. Spiny Ball Gall on Wild Rose. (*Rhodites nebulosus.*)
3. Ball Gall on Wood Nettle. (*Cecidomyia urnicola.*)
4. Rose Stem Gall. (*Rhodites globulus.*)
5. Ash Gall. *Cecidomyia pellex.*)
6. Eye Spot Gall of Maple. (*Cecidomyia ocellata.*)

PLATE G.

1. Vein Gall on White Ash. *Eriophyes sp.*
2. Chokecherry Mite Gall. *Eriophyes. sp.*
3. Hawthorn Serpentine Gall. *Eriophyes sp.*
4. Manitoba Maple Wart Gall. *Eriophyes sp.*
5. Poison Ivy Mite Gall. *Eriophyes sp.*
6. Birch Bud-Gall. *Eriophyes sp.*

PLATE H.

1. Sugar Maple Pink frost-gall. *Eriophyes sp.*
2. Mountain Maple frost-gall. *Eriophyes sp.*
3. Rock Elm frost-gall. *Eriophyes sp.*
4. Beech frost-gall. *Eriophyes sp.*
5. Elm mite gall. *Eriophyes ulmi.*
6. Elm mite gall. Enlarged opening on under surface.

Affecting Goldenrod.

A.—*Galls on leaves.*

Circular or somewhat irregularly elliptical, spot-like galls, only projecting very slightly from each side of the leaf. The main part of the spot is light colored, this being enclosed by a dark ring giving it some resemblance to an eye. Lunate Marginal Gall—*Choristoneura flavolunata* (Felt)—Plate A., fig. 6. Solidago Canadensis.

Small, oblong, or seed-like galls, light green in color, on the lower surface of the leaves. Seed Gall. Solidago Canadensis.

Conical leafy structure ½ to 1½ inches high and ½ inch in diameter. Between the thickened parts of the leaflets live from one to many, small, orange coloured larvæ. Terminal Gall—*Asphondylia monacha* (O.S.)—Solidago Canadensis.

Leaves thickened and folded lengthwise, somewhat like a pod; green or red in colour. Leaf-fold Gall—*Chaitophorous* sp. (undescribed)—Solidago Canadensis.

B.—*Galls on the stems.*

Large, elongated, monothalamous gall with a very large larval chamber situated on the stem below the branches. Elliptical Gall—*Gnorimoschema, gallæsolidaginis* (Riley).

Spindle-shaped galls about 3 cm. in length. Situated high up on the stem on the main axis of the plant among the branches, often causing some of these to abort. It passes the winter in the larval stage. Goldenrod Spindle Gall—*Eucosma Scudderiana* (Clemens)—Plate J., fig. 2. Solidago Canadensis.

Elliptical, hollow gall, 1.25 inches in length, .48 of an inch in diameter, the diameter of the plug .08 of an inch. The galls are found a short distance above the ground.—Gnormischema gallæisterella (Kell). Solidago Canadensis.

Apical, bunch-like galls produced by the arrest of growth in the stalk, which causes the leaves to accumulate. Bunch Gall—*Cecidomyia solidaginis* (Loew)—Solidago Canadensis.

Globular, ball-like enlargement about 1 inch in diameter. Ball Gall—*Trypeta solidaginis* (Fitch)—Plate J., fig. 3. Solidago Canadensis.

Consists of small bunch of accumulated aborted leaves about ½ inch in length. Cylindrical Bunch Gall—*Trypeta polita* (Loew)—Solidago Canadensis.

C.—*Galls in flower stalk.*

Bud-shaped, green galls, which are larger and stouter than the normal buds. Bud Gall—*Cecidomyia racemicola* (O.S.)—Solidago Canadensis.

Affecting Gooseberry.

An irregular or rounded cluster of bud-like galls arising from a spherical receptacle on the stem. Gooseberry Bud Gall. Plate O., fig. 6. *Ribes cynosbati.*

Affecting Grape.

A.—*Galls on leaves.*

A white erineum on the underside of the leaf. Trichomes simple. *Eriophyes sp.*—Plate L., fig. 4. Wild Grape.

Small, semi-circular or nearly circular capsules along the veins, about 2 mm. in diameter and but slightly elevated on either surface of the leaf. On

upper surface paler than the leaf, below, with a white nipple surrounded by a furrow. *Eriophyes* sp.—Vitis cordifolia.

Small, rough galls usually on the upper surface of the leaf. The galls are very numerous, and frequently the leaves are absolutely covered with them. Grape phylloxera—*Phylloxera vastatrix* (Planchon)—Vitis sp.

Elongated, conical, red galls, .7-1 cm. in length usually on the upper side of the leaves. Grape Vine Tube Gall—*Cecidomyia viticola* (O.S.)—Plate O., fig. 1. Vitis sp.

Irregular, soft and succulent swellings on stems and leaf-stalks of Grapes; yellow green or red in color. Grape-vine Tomato Gall—*Lasioptera vitis* (O.S.)—Vitis sp.

Oval, red swellings of the petiole. About ½ inch long and ¼ of an inch in diameter. Grape Petiole Gall—Vitis cordifolia.

B.—*Galls on Stems.*

Rounded galls flattened at the base and jointed at the top. On the stems of Wild Grapes. Grape-vine Apple Gall—*Cecidomyia vitis-pomum* (Walsh & Riley).

Affecting Hackberry.

A witch-broom gall on branches and twigs. Hackberry Witch-broom Gall—*Eriophyes* sp.—Celtis occidentalis.

A woody gall with bluntly-rounded apex and slightly constricted at the point of attachment to the leaf. Opposite the gall is a concave depression. Hackberry Nipple Gall—*Pachypsylla celtidis-mammæ* (Riley)—Celtis occidentalis.

Circular spot-like gall on the under side of the leaf with a small nipple in the middle. Hackberry Blister Gall—*Pachypsylla celtidis-vesiculum* (Riley)—Celtis occidentalis.

Affecting Hawthorn.

A fold of the leaf making long, irregular, wavy projections on the upper surface of the leaf. From the midrib to the edge of the leaf is the general direction of the gall. Serpentine Gall—*Acarus cratægi vermiculus*—Plate G., fig. 3. Cratægus sp.

Small, round swellings (capsules) protruding very slightly on both sides of the leaf. About .5-1 mm. in diameter. Galls very numerous where they occur—sometimes more than 100 on a single leaf. Speck Gall—*Eriophyes* sp.—Cratægus sp.

These tiny oval galls can be easily recognized from their peculiar habit of arranging themselves all around the margins of the leaf, thus forming a sort of border for it. They are often so numerous that there is one for each serration. Each gall is about 2 mm. long, 1 mm. wide, and about 5 mm. thick. It extends about equally beyond both surfaces of the leaf and is of much the same texture as the leaf itself, except that towards the apex both it and the apex of the serration on which it is situated tend to become brown. In this brown part there is a small aperture. The gall is monothalamous, and contains a single, yellowish white, short, fat larva, which on July 31st had not yet begun to pupate. Hawthorn Leaf-border Gall—Plate N., fig. 7. Cratægus sp.

Small red, pod-shaped structures slightly tapering towards one end on the upper surface of the leaf. From 5-8 mm. long and about 2 mm. wide. Pod Gall—*Cecidomyidæ*—Cratægus sp.

Tiny, oval structures arranged around the margin of the leaf. Often so numerous that there is one for each serration. Leaf-border-Gall *Cecidomyia* Cratægus sp.

Green or pink, globular, bladder-like structures on the under surface of the leaf. About 5 mm. in diameter. Bladder Gall—*Cecidomyidæ*—Plate O., fig. 5. Cratægus sp.

Very small, monothalamous, conical structures, 1 to 2 mm. high and 1,1.5 mm. wide at the base; formed anywhere on either surface of the leaf and sometimes on the stem of young twigs. Cone Gall —*Eriophyes*—Cratægus sp.

Cylindrical structures, hollow, red or green in color, about 3 mm. in height and diameter and with a hole in the top. Top of gall thickly set with spines. Burr Gall—*Cecidomyia bedeguar*, O.S.—Plate O., fig. 3. Cratægus sp.

Cock's comb-like structure on the upper surface of the leaf. Cock's Comb Hawthorn Gall—*Hormomyia cratægifolia* (Felt)—Plate A., fig. 4. Cratægus sp.

Leaf slightly thickened, purplish in color and rolled in upon itself, the under surface being the one enclosed. Wooly Aphid Gall (*Schizoneura*)—Cratægus sp.

Affecting Helianthus.

Globular gall about ½ an inch in diameter on the leaves. Helianthus Ball Gall—*Cecidomyia bulla* (Walsh)—Helianthus divaricatus and H. Strimosus.

Linear-shaped galls in clusters on the stem. *Cecidomyia helianthi* (Brodie)—Helianthus divaricatus and H. strimosus.

Affecting Hazel.

This gall is found only along the main veins of the leaf. The part of the leaf round the affected portion of the vein become crimped, the crimps all radiating towards the vein as a common centre. Hazel Leaf Crimp Gall (Undescribed)—Corylus americana.

A bud deformation, which attacks bud as soon as it expands, and checks its subsequent development. Hazelnut Bud Gall—*Eriophyes avellanæ*—Corylus americana.

Affecting Hickory

A.—*Galls on leaves.*

Flattened, circular, yellow or whitish galls, an inch in diameter. Hickory Button Gall—*Phylloxera fovela*—Plate N., fig.1. Carya glabra.

Red, elongated galls, consisting of a fold of the main veins running from the midrib to the edge of the leaf. Hickory Vein Gall—*Phylloxera caryævenæ*—Carya Glabra.

Cone-shaped gall about 3 mm. in diameter, on the upper side of the leaf. Green in color; the opening on the lower surface is fringed with hairs. Hickory Cone Aphid-Gall—*Phylloxera caryæfallax*—Plate I., fig. 4. Carya ovata.

Hemispherical gall on the upper surface of the leaf, opening on the under surface by means of a narrow slit, ⅛ to ¼ of an inch in diameter. Hickory Hemispherical Gall Phylloxera caryæ-globuli—*Dactylosyhæra hemispæricum*—Carya alba.

Expansion of the young fruit or ovary to two or three times the size of the normal fruit. The centre of the gall is filled with Aphids. Fruit Gall—*Phylloxera* (undescribed)—Carya ovata.

Conical or sometimes almost spherical, red or purplish gall on the under surface of the leaf along the veins. Hickory Cone Gall—*Cecidomyia sanguinolenta* (O.S.)—Carya ovata.

Smooth and rounded, with a fine elongated tip, 5 to 6 mm. in height and 2 to 3 mm. in greatest diameter. Pale green, turning brown in autumn on the under surface of the leaves. Hickory Seed Gall—*Cecidomyia caryœcola* (O.S.)—Carya ovata.

Sub-globular, pubescent, onion-shaped gall on the under side of the leaves. The pubescence is pale when gall is young and rose-coloured when mature. Hickory Onion Gall—*Cecidomyia holotricha* (O.S.)—Plate R., fig. 6. Hicoria ovata.

Narrow, cylindrical, tube-like gall, on the under side of the leaves. Green when immature becoming brown or blackish when ripe. Hickory Tube Gall—*Cecidomyia tubicola*—Carya alba.

Rounded, brownish, downy gall on the under side of the leaves. Resembles somewhat a diminutive peach. About ⅛ to 1/5 of an inch in diameter. Hickory Peach Gall—*Cecidomyia persicoides*—Carya ovata.

Large, irregular knobs all over the husk of the nut containing thick-walled cells. Hickory Nut Gall—*Cecidomyia caryœnucicola*—Carya alba.

Thin-walled galls about 3 mm. in diameter, hard and brittle, attached to the under side of the leaves by a projection at the base which appears on the upper side as a black dot surrounded by a light yellow areola. Hickory Ball Gall—*Doplosis caryœ*—Plate F., fig.1. Carya ovata.

B.—*Galls on Stems.*

Large, globular or hickory-nut shaped galls on the stem, petiole or mid-rib of the leaf. Variable in size. Hickory Aphid Gall—*Phylloxera caryœ-caulis* (Fitch)—Carya ovata.

Affecting Horse-Balm.

An inverted, pear-shaped gall much resembling the gall in the Wood Nettle. The large end is weakly attached to a vein on the underside of the leaf. Horse-balm Leaf Gall—*Cecidomyia collinsoniœ* (Beutm)—Plate O., fig. 4.

Affecting Huckleberry.

Rounded or elongated galls 1-2 cm. in diameter on the stem of the Huckleberry. Huckleberry Gall—*Solenogopheria vacinii* (Ashm)—Gaylussacia resinosa.

Affecting Genus Juglans.

The Walnut and Butternut.

A brown, velvety erineum surrounding the leaf stalks, or on the main veins, causing a swelling or bending of the stalk or vein. Walnut Cushion Gall—*Eriophyes* sp.—Plate D., fig. 2. Juglans nigra and probably J. cinerea.

A green pocket-gall on the upper side (usually) of the leaf. Walnut "Wart" Gall—*Eriophyes* sp.—Juglans nigra and probably J. cinerea.

Affecting Juneberry.

Small nearly globular, dark brown, pocket galls, averaging 2 mm. in diameter, singly or in clusters on the upper side of the leaf. Juneberry Ball Gall—*Eriophyes* sp.—Plate D., fig. 1. Amelanchier rotundifolia.

Affecting Locust.

Oval swellings on the branches and twigs, generally occurring at the junction of the leaf petiole with the branch. Locust Twig Borer—*Ecdytolopha insiticiana*—Gleditschia triacanthos.

Affecting Maple.

A whitish frost-like erineum with scattered spots of rosy pink, on the upper surface of the leaf, sometimes nearly covering it. *Eriophyes* sp.—Plate H., fig. 1. Acer rubrum.

A pale yellow or white erineum on the under side of the leaf. Trichomes capitate. *Eriophyes* sp.—Acer saccharinum.

A nearly spherical pocket gall on the upper surface of the leaf, varying from light green through red or purple to black. *Phlœcoptes quadripes*—Plate J., fig. 1. Acer saccharinum.

A white or whitish erineum in patches on the under side of the leaf, often limited by the veins. Trichomes capitate. When old the trichomes assume a brown color. *Eriophyes* sp.—Acer saccharum.

A green, reddish or purplish, slender, pouch-gall projecting from the upper surface of the leaf. *Phlœcoptes aceris*—Plate M., fig. 6. Acer saccharum.

A white or whitish erineum in patches on the under side of the leaf. *Eriophyes* sp.—Acer nigrum.

Irregular wart-like swellings (Dimple) on the upper surface of the leaf. The swellings are green at first and turn gray when mature. The average diameter is about 3 mm. Manitoba Maple Wart Gall—*Eriophyes* sp.—Plate G., fig. 4. Acer negundo.

A white, whitish, or pale yellow erineum on the under side of the leaf, in patches often in the axils of the veins. Trichomes long, tangled and distorted.—*Eriophyes* sp.—Plate H., fig. 2, Acer spicatum.

Target-like, circular, flat galls on the leaves of Red Maple, Eye-spot Gall of Maple—*Cecidomyia ocellata*, O.S.—Plate F. fig. 6. Acer sp.

Swellings on the midrib of the leaflets much resembling the Ash Midrib Gall, Manitoba Maple Midrib Gall—*Cecidomyia negundinis* (Gillette.) Acer negundo.

Irregularly elliptical swellings along the veins of the leaves of Hard Maple, red, green or yellow in colour. Hard Maple Leaf-vein Gall—*Cecidomyid* sp.—Plate P. fig. 1. Acer saccharum.

Affecting Muhlenbergia.

Bud galls with very much enlarged glumes. Muhlenbergia Bud Gall—Lasioptera muhlenbergiæ (Naster) Muhlenbergia glomerata.

Affecting New Jersey Tea.

A terminal, spindle-shaped enlargement of the stem, 10-15 mm. long. New Jersey Tea Stem Gall—*Stagmatophora ceanothiella* (Cosens)—Ceanothus americanus.

Affecting Oak.

An irregular dimple upon the blade of the leaf. From beneath it appears as an irregular concavity, lined with a tangled mass of white vegetable hairs. Oak Dimple Gall—*Euriophyes querci*—Plate L. fig. 3. Quercus macrocarpa.

A dense mat of brown hairs growing in large patches upon the under sides of the leaves. Oak Hair Gall—*Eriophyes* sp.—(Undescribed)—Quercus sp.

A dense, white pubescence upon the under side of the leaves causing a distortion and folding of leaf blade. The pubescence is inside the fold, forming the lining of the gall. Oak Fold Gall—*Cecidomyia Niveipila*, O.S. Quercus rubra.

Green or brown, narrowly oval, inflated galls produced along the veins on the under side of the leaves. The surface of the gall is netted with veins. Oak Vein Gall—*Cecidomyia quercus majalis* O.S.—Plate E., fig. 5. Quercus rubra.

Pale red, saucer-shaped galls in clusters on the under surface of the leaf. Oak Spangles—*Cecidomyia poculum* O.S. Quercus alba.

Small, bright red galls, joined to the leaf by a small portion of the surface, so that they are easily detached without injuring the leaf. The surface of the gall is netted with innumerable fissures between which are small elevations with very short spines. When on the under side of the leaf, the gall is white in color. Oak—*Acraspis macrocarpa*—Quercus macrocarpa.

White, furry, hemispherical mass varying from 4-11 mm. in diameter. This is composed of innumerable fine, woody fibres to which are attached small, round kernels. The Larger Furry Ball Gall—*Andricus lana*—Plate E., fig. 1. Quercus macrocarpa.

Small, button-like enlargements upon the upper and lower surfaces of the leaves. Button Gall—*Neuroterus umbilicatus* (Bass)—Plate B., fig. 6. Quercus macrocarpa.

Small, dithalamous, pea-shaped gall on the upper side of the leaf. The surface is fissured or netted with depressions between which are elevations. Oak Pea Gall—*Cynips Pisum*—Quercus alba and macrocarpa.

Hard, woody gall occurring on midrib or petiole. Green or red in color and more or less roughened on the surface. Oak Petiole Gall—*Andricus petiolicola.*

Large globular gall about 4 cm. in diameter. Exterior surface smooth and somewhat irregular. Interior filled with a spongy mass of fibres, very loosely attached to the wall of the chamber. The Larger Oak Apple Gall—*Amphibolips confluentis*, (Harr.)—Plate E., fig. 2.

Small, pale-green, wart-like gall situated in the parenchyma of the leaf and protruding beyond both surfaces but chiefly beyond the lower. Inside are two or three seed-like, oblong kernels, kept in position by white filaments. Oak Wart Gall—*Andricus futilis*, O.S.—Plate B. fig. 4. Quercus macrocarpa.

Round or oval galls growing on the midrib of the leaf. The gall is white or yellowish and covered with fine bright pink or red spines about 1-2 mm. in length. Oak Hedgehog Gall—*Acraspis crinacei*—Plate R. fig. 1. Quercus alba.

Small spherical gall about 3 mm. in diameter upon the veins of the leaves upon the under side of the leaf. It is thickly covered with fine short hair which forms a cushion all around it. Oak Furry Ball Gall—*Neuroterus floccosus*—Plate R. fig. 2. Quercus alba.

Large, smooth, spherical galls from 2-3 cm. in diameter occurring on the under side of the leaves. The small, spherical, larval cell within the cavity is held in position by a comparatively small number of filaments which radiate from it to the surrounding walls. Empty Oak Apple Gall—*Amphibolips inanis* (O.S.). Quercus rubra.

Somewhat circular, about 4 mm. in diameter, projecting on both sides of the leaf. Above dark red, below yellowish, about three times the thickness of the leaf. Oak—*Andicus papillatus* O.S.—Plate C. fig. 5. Quercus rubra.

Irregular woody swellings of the midrib about 7-8 inch in length, surface is glabrous or slightly pubescent and projects on both sides of the leaf. Oak Midrib Gall—*Andricus pige*—Plate E. fig. 3.

Globular, hollow gall, nearly always at the outer edge of the leaf blade. From .9-1 cm. in diameter and comparatively thin walled. Oak Apple Gall —*Andricus singularis* (Bass.) Quercus rubra.

Cluster of dense, narrow leaflets, springing from a bud. Oak Leafy-wreath Gall—*Andricus topiarius* (Ashm).—Plate C. fig. 6. Quercus macrocarpa.

B.—*Galls on stem.*

Spherical gall, hard and woody with a small cavity in the centre. A short joint at the apex distinguishes this species from Globulus. Pointed Bullet Gall—*Holcaspis duricaria* (Bass.) Quercus macrocarpa.

Hard, conical galls occurring in numbers on the stems. Oak Cone Gall—*Andricus ventricosus* (Bass.)—Plate R. fig. 3. Quercus sp.

Small, soft, bladder-like, one-celled structures, each about 1-3 of an inch in diameter. Arranged in a cylindrical cluster along the stem of the branches. Oak Fig Gall—*Biorhiza forticornis* (Walsh)—Plate C. fig. 2. Quercus alba.

Rosette or head of hard, brown, nut-like, wedge-shaped structures fitting closely to one another and attached at the base to a small, spherical receptacle about ¼-1-3 of an inch in diameter. Pine-cone Oak Gall—*Cynips strobilana* (O.S.)—Plate C. fig. 4. Quercus macrocarpa.

Irregularly oval, woody gall encircling the stem. Polythalamous, containing many cream-colored cases attached to the twig, each case looking very much like an oat seed. Oak Seed Gall—*Andricus seminator* (Harr.)—Quercus alba.

Rough, hard, woody, somewhat globular, knot-like gall, encircling the stem and varying greatly in size, but commonly 1-2 inches in diameter. Oak Knot Gall—*Andricus Punctatus* (Bass.)—Plate C. fig. 1. Quercus coccinea.

Bullet-like, corky gall with a small cavity in the centre. On stem of Burr Oak and White Oak. Oak Bullet Gall—*Holcaspis globulus* (Fitch). Quercus macrocarpa and Q. alba.

Club-shaped, hard and woody with often a few leaves growing from it. ½ to 1 inch in length. Club Gall—*Andricus clavula* (Bass.)—Plate C. fig. 3.

Affecting Poplar.

A. Galls on the leaves.

Small, circular, pimple-like elevations on the upper surface of the leaf, with a corresponding depression on the lower surface. Pimple Gall. (Plate P. fig. 3.)—Populus balsamifera.

Leaf folded at its edge to form a red or green pouch over the gall which is narrow and tent-shaped, and is formed from the leaf surface. Aspen Tent Gall—Plate P. fig. 2. Populus tremuloides.

Oblong enlargements of the petiole close to the base of the leaf. *Nepticula* sp.—Populus tremuloides.

Pear-shaped, monothalamous galls growing on the upper side of the leaf and joined to the leaf by a slight constriction. Aspen Ball Gall—Plate P. fig. 5.—Populus tremuloides.

Large, irregular galls on the tips of the twigs, consisting of a double row of lamina; between these two layers are large numbers of aphids. Vagabond Gall—*Pemphigus vagabundus*—Populus deltoides.

Irregular, spherical gall developed at the junction of the petiole and blade of leaf. Poplar Petiole Gall—*Pemphigus populicaulis*—Plate I. fig. 3. Populus deltoides.

Circular, flat or slightly convex, frost-like patches varying from 2-3 mm. in diameter; on the upper side of the leaf. Large-toothed Aspen Frost Gall—*Eriophyes* sp.—Populus grandidentata.

Circular depressions dimple always on the lower side of the leaf. On the upper side it appears as a green red circular elevation. Large-toothed Aspen Convex Gall—*Eriophyes* sp.—Plate M. fig. 1 & 2. Populus grandidentata.

Dimple-like galls on the upper side of the leaf of the Aspen. Aspen Dimple Gall—*Eriophyses* sp.—Plate M. fig. 3. Populus tremuloides.

Irregular, warty protuberances on the midrib or other veins of the leaf and extending beyond both surfaces but chiefly the upper one. Large-toothed Aspen Vein Gall. Populus grandidentata.

Irregular tubercular masses of closely-packed small reddish-green protuberances on the stem. Unsightly Poplar Gall—*Eriophyes* sp. Populus tremuloides.

A depression on the lower surface of the leaf, 4-12 mm. in diameter and 2-5 mm. in depth. Under surface of gall is orange yellow—*Eriophyes* sp. —Plate D., fig. 3. Populus italica. ...

Margin of leaf distorted and curled. *Eriophyes* sp.—Plate T., fig. 1. Populus tremuloides.

B.—*Galls on the stem.*

Irregular swellings caused by a species of Woolly Aphis, on the smaller branches and twigs of the Cottonwood. Woolly Aphid Stem Gall—*Schizoneura* sp. Populus deltoides.

Irregularly oval, about 1-3 to ½ inch long, smooth and about the same color as the bark. Usually on one side of a branch but sometimes nearly encircling it. Aspen Egg Gall—*Agronyzaaoneiventris* (Fallen).—Plate A., fig. 8. Populus tremuloides.

Affecting Genus Prunus.

Reddish, slender pouch-galls, somewhat irregular and pubescent, 3-4 mm. long and .5-1 mm. in diameter. Pin Cherry Pouch Gall—*Eriophyes* sp. Prunus pennsylvanica.

Green or rosy-red pouch gal on the upper side of the leaf, .5-6 cm. in length. The gall is constricted about half way to the leaf. Black Cherry Pouch Gall—*Eriophyes* sp. Prunus serrotina.

Green or reddish pouch gall on the upper side of the leaf, differing from the Black Cherry Pouch Gall in that the aperture is not funnel-shaped. Choke Cherry Pouch Gall—*Eriophyes* sp.—Plate G., fig. 2. Prunus virginiana.

A very long, slender pouch-gall, green or whitish on either side of the leaf. Wild Plum Pouch Gall—*Eriophyes* sp.—Plate K., fig. 2. Prunus americana.

A tubercular growth, encircling base of buds and shoots. Plum Bud Gall—*Eriophyes phloeocoptes*. Prunus domestica.

A club-shaped, monothalamous gall with one or two leaves growing from its side. The gall is an enlargement of the terminal buds of young

shoots. Black Cherry Bud Gall—*Cecidomyia serotinae*. Prunus Serotina.

A malformation of the fruit. The pit or stone is absent and the fruit is enlarged, forming a thick walled pouch about 1 cm. in length by 5 mm. in width. Chokecherry Pocket Gall—*Cecidomyia virginiana*. Prunus virginiana.

Affecting Genus Pyrus.

Apple, Crab Apple, Pear and Chokeberry.

Dimple galls, with the concavity on the upper surface of the leaf. Internal surface corrugated. Apple Dimple Gall—*Eriophyes* sp. Pyrus malus.

Capsule Galls on the upper side of the leaf. Apple and Pear "Leaf-blister" Gall—*Eriophyes pyri*—Plate K., fig. 6. Pyrus malus, P. coronaria and P. communis.

Knot-like swellings on the stems. Woolly Aphis Gall—*Schizoneura langigeria*. Pyrus malus.

Capsule Galls, very small. When mature, brown in color. Chokeberry Speck Gall—*Eriophyes* sp. Pyrus arbutefolia.

Affecting Rose.

A.—*Galls on the leaves.*

Small, thin walled, spherical galls, red or green in colour, and covered with short spines. About .75 cm. in diameter and monothalamous. Spiny Ball Gall—*Rhodites nebulosus*.—Plate F., fig. 2. Rosa Carolina.

Small, circular galls about 3 mm. in diameter on the upper surface of the leaf. Pale green in colour and characterized by the presence of a little nipple in the centre of the gall. Nipple Gall—*Rhodites lenticularis* (Bass.) Rosa Carolina.

Round, woody, globular or irregularly shaped galls, covered with a white mealy substance. Mealy Rose Gall—*Rhodites ignotus* (O.S.)—Rosa sp.

B.—*Galls on the stem.*

Smooth, corky enlargement rising at each end abruptly from the branch; 2-2.5 cm. in length and 1-1.5 cm. in width. Globular Rose Gall—*Rhodites globulus*.—Plate F., fig. 4. Rosa Carolina.

Hard, small cells, clustered around a branch or twig. The cells are covered with a dense, thick mass of green filaments which grow from them; monothalamous and from 1.5-2 cm. in diameter. Mossy Rose Gall—*Rhodites rosae*—Plate E., fig. 4. Rose Carolina.

Large, round or oblong galls from 1 to 2 inches in length; reddish brown and covered with stout spines or prickles. Spiny Rose Gall—*Rhodites multispinosus* (Gill.)—Plate B., fig. 3. Rosa sp.

Spherical, covered with many prickly spines which vary in length, and are sometimes larger than the diameter of the gall. Internally it is hollow with the wall about 1 to 2mm. thick. Yellowish green, sometimes tinged with red. Soft and fleshy in summer, woody and brown in winter. It is found singly or in clusters of from two to ten or more, upon twigs of different kinds of wild roses. (Beutm.)—*Rhodites bicolor* (Harr.). Rosa sp.

Elongated swelling of the branch, gradually tapering at both ends. Smooth or densely covered with short spines. About 2 inches long and polythalamous. Long Rose Gall—*Rhodites dichlocerous* (Harr.). Rosa sp.

C.—*Galls on the roots.*

Large, irregularly rounded, reddish-brown galls from 1 to 2 inches in length; polythalamous. Rose Root Gall—*Rhodites radicum* (O.S.). Rosa sp.

Affecting Spiræa.

A pod-like gall formed by the folding of the leaf along the midvein. Spiræa Pod Gall—*Cecidomyia salicifolia*—Spiræa tomentosa, S. salicifolia and S. betulæfolia.

A bud-like, sessile gall in the axil of the leaf. Meadow Sweet Bud Gall—(Undescribed)—Spiræa salicifolia.

Small, cone-shaped galls on either the upper or lower surface of the leaf. Spiræa Cone Gall (Undescribed)—Spiræa salicifolia.

Affecting Sumac.

The leaf margin rolled tightly upward and inward on both sides. Sumac Leaf-margin Gall—*Eriophyes* sp.—Plate K., fig. 3. Rhus typhina.

Irregular, rounded, dimple gall, convex on the upper or under side of the leaf. Green to red or purple in color; inside clothed with white trichomes. Poison Ivy Dimple Gall—*Eriophyes* sp.—Plate G., fig. 5. Rhus radicans.

Large, smooth, rounded galls, somewhat resembling a tomato in shape, on the under sides of the leaves. Sumac Potato Gall—*Pemphigus rhois*. Rhus typhina.

Affecting Strawberry.

A much elongated, cylindrical enlargement of the petiole of the leaf, 1 to 4 in. long and 1-10 to 1-6 in. in diameter. Its surface, owing to slight annular constrictions has a more or less segmented appearance. The constrictions are seldom more than about .5 mm. deep and as a rule do not occur at regular intervals. Sometimes they are found every 1-16 of an inch, but in other cases they are as much as an inch apart. The surface of the gall is nearly red, or greenish, and is pubescent like the rest of the petiole. The texture is pulpy. The gall is polythalamous, as few as 10 and as many as 35 small chambers having been counted in specimens examined. These are all centrally situated and each contains a single, white larva, August 7, 1907. Occasionally two separate galls or gall clusters are found on a single petiole. Strawberry Petiole Gall. Plate R., fig. 7. Fragaria Virginiana.

Affecting Touch-me-Not.

Globular, succulent, semi-transparent, at base of flowers. Touch-me-not Flower Gall—*Cecidomyia impatiens* (O.S.). Impatiens fulva.

Green, succulent, globular or irregularly rounded swelling on the stem, petiole or leaf. Touch-me-not Stem and Leaf Gall—*Cecidomyia*. —Plate O., fig. 2. *fulva* (Bent)—Impatiens fulva.

Affecting Tulip Tree.

Hollow swellings, varying from 5 to 2.5 cm. in length on the midrib and lateral veins of the leaves. Tulip Tree Midrib Gall—*Cecidomyia tulipifera*—Liriodendron tulipifera.

Affecting Vervain.

An oval, hard and woody gall, an enlargement of the stem. Blue Vervain Stem Gall (Undescribed)— Verbena hastata.

Affecting Viburnum.

A small, blister-like gall, circular in outline, 3-4 mm. in diameter. Viburnum Leaf Blister Gall. Viburnum acerifolium.

Affecting Virginia Creeper.

Green and succulent fold gall on the midrib of the leaf. Midrib Gall on Virginia Creeper—*Cecidomyia* sp.—Plate E., fig. 7. Ampelopsis quinquefolia.

Affecting White Lettuce.

Large, rough, irregular swellings on stem. White Lettuce Stem Gall—*Aulax nabali* (Brodie)—Plate R., fig. 5. Prenanthes alba.

Affecting Willows.

A.—*Galls on leaves.*

Smooth, fleshy, sessile, globular or slightly oval, monothalamous gall, like a miniature apple. About 1 cm. in diameter growing on one side of the midrib of the leaf. Willow Apple Gall—*Pontania pomum*—Salix sp.

Smooth, flattish, glossy enlargements of the petiole or often of the midrib of the leaf near the base. Willow Petiole Gall—*Pontania desmodeoides*. Salix lucida.

Irregularly elongate-oval fleshy galls projecting equally on both surfaces of the leaf. Usually many on a leaf. Willow Flat Gall—*Pontania hyalina*—Salix sp.

Cluster of massed leaves surrounding a small cell containing a yellowish larva. Similar in appearance to the Goldenrod Bunch Gall. Willow Bunch Gall—*Rhabdophaga brassicoides*—Salix sp.

A pale green or purple capsule gall, projecting either above or below the leaf, or both; 1½ to 2 mm. in diameter. *Eriophyes* sp. Salix cordata.

Small, irregular, serrate and roughened pocket-galls or semi-capsules, green or red, strongly pilose above and thickly pubescent beneath. Usually on the upper side of the leaf. *Eriophyes* sp.—Plate K., fig. 4. Salix discolor.

Small, crimson pocket-galls or semicapsules on the upper side of the leaf. 1½ to 2½ mm. in diameter. *Eriophyes* sp. Salix amygdaloides.

A small capsule gall, irregularly hemispherical, greenish yellow, with a projecting aperture usually on the lower surface of the leaf, 1 to 2½ mm. in diameter. *Eriophyes* sp. Salix nigra.

Small irregular, serrate capsule-gall, green or red, usually on the upper side of the leaf; beneath sometimes impressed, more often projecting. 1 to 2 mm. in diameter. *Eriophyes* sp. Salix bebbiana.

Small irregular, serrate capsule-gall, projecting on both sides of the leaf, 1 to 2 mm. in diameter. *Eriophyes* sp. Salix petiolaris.

A bud deformation of the flower catkins and leaf buds or parts of leaves, producing a large, irregular, crumpled mass. *Eriophyes* sp.—Plate D., fig. 5. Salix nigra.

Rosette-like structures on the leaves and stems. Unsightly Willow Gall—*Eriophyes* sp. Salix sp.

This gall has two different forms in the course of its development. There is first the "bead" stage, when each gall looks like a small yellowish-white bead about 1.5 mm. in diameter, two-thirds of the bead appearing on the under and nearly one-third on the upper surface of the leaf. The tip of the bead, on the lower side of the leaf, is perforated. The texture is hard and close and the surface even and somewhat pubescent. The sec-

ond stage seems to occur in July. In this month the galls elongate on the lower surface into nipples 3-4 mm. long and 1-1.5 mm. in diameter. The color is rather lighter than before, except that the end of the nipple itself is often nearly black. The pubescence is much more visible than before. The galls occur either singly or in closely united groups of 2-15, chiefly along or near the midrib. They are monothalamous but no larvae were discovered in the specimens examined. Willow-leaf Bead and Nipple Gall—(Undescribed)—Salix rostrata.

B.—*Galls on stems.*

Large, rough galls on the stems of the Willow. The galls are smooth at first but become rough later in the season. Willow Branch Gall—*Saperda concolor*—Salix sp.

Cone-shaped mass of closely-imbricated leaves at the end of a twig, caused by the arrest of growth at the end of the stem. Pine Cone Willow Gall—*Cecidomyia strobiloides*.—Plate O., fig. 7. Salix sp.

Club-shaped gall formed on the lateral shoots of the Willow, an enlargement of the whole stem. About ¾ of an inch in length. Willow Club Gall—*Cecidomyia rigida*—Salix sp.

Oval galls on the sides of the twigs, hard and woody and usually the same colour as the stem.

Willow Egg Gall, *Euura ovum*—Salix sp.

Oblong-ovate, polythalamous galls, about the same color as the bark while young but gray when mature. Willow Potato Gall—*Rhabdophaga batatas* O.S.—Plate A., fig. 7. Salix sp.

Irregularly woody, oval enlargement of the stem at the joints or nodes. 1-3 to ½ an inch in length. Willow Joint Gall—*Rhabdophaga nodulus* (Walsh). Salix sp.

C.—*Galls of the Buds.*

Altered or transformed buds. The bud scales become elongated and the interior becomes a cavity in which the larva lives. Willow Bud Gall—*Rhabdophaga trilicoides* (Walsh). Salix sp.

Affecting Wild Lettuce.

An irregular, oval, polythalamous, knotty enlargement of the stem varying greatly in size. The interior is soft and pithy. Lettuce Tumor Gall—*Aulax tumidus*—Lactuca Canadensis.

Affecting Witch Hazel.

A conical swelling on upper side of leaf. Witch Hazel Cone Gall—*Hormaphis hamameliais* (Fitch).—Plate I., fig. 2. Hamamelis virginiana.

Round gall covered with long spines. A deformation of the fruit bud. Spiny Witch-Hazel Gall—*Hormaphis spinosus*—Plate I., fig. 1. Hamamelis virginiana.

Affecting Wood Nettle.

Ball-like galls occurring either on the upper or lower surface of the leaf. Wood Nettle Ball Gall—*Cecidomyia urnicola*—Plate F., fig. 3. Laportea Canadensis.

A gall consisting of a malformation of the fruit, much like the ball gall on the leaves. Wood Nettle Fruit Gall—*Cecidomyia* sp.—Laportea Canadensis.

Soft, smooth, spongy, oval or rounded gall of a pale brown colour, on the stem. About 1 cm. in diameter. Wood Nettle Pod Gall—(Undescribed). Laportea Canadensis.

BIBLIOGRAPHY.

Hermann Adler, M.D.

Adler. "Ueber den Generations-wechsel der Eichen Gallivespen," Zeitschrift für wissenschaftliche Zoologie, Bd. 35. Leipzig—"Alternating Generations, a Study of Oak Galls and Gall Flies;" translation by C. R. Stratton, Clarendon Press, Oxford.

J. M. Aldrich.

Aldrich. Bul. 26 of the University of Idaho Agricultural Experiment Station, 1901.

W. H. Ashmead.

Ashmead, 1879. Injurious and Beneficial Insects Found on the Orange Trees of Florida. Canadian Entomologist, 11:159, 160.

A Bibliographical and Synonymical Catalogue of the North American Cynipidæ, with descriptions of new species. Trans. Amer. Ent. Soc. Vol. XII, 291-304.

On the Cynipidous Galls of Florida, with descriptions of new species and synopses of the described species of North America. Trans. Amer. Ent. Soc., Vol. XIV, pp. 125-158.

Description of new Cynipidous Galls and Gall-Wasps in the United States National Museum. Proc. U.S. Nat. Museum, Vol. XIX, pp. 113-136.

1897. Description of some New Genera in the Family Cynipidæ.

1903. Classification of the Gall Wasps and the Parasitic Cynipoids on the superfamily Cynipoidæ. Psyche 10: 7, 59, 140, 210.

W. B. Barrows.

Barrows, 1899. Jumping Oak Gall. Michigan Agr. Exp. Station, Division of Entomology, Bull, 175.

Nathan Banks.

Banks, 1904. A Treatise on the Acarina. U.S. National Museum Proceedings, 1382. 28:1-114.

1905. Descriptions of some new mites. Entomological Society of Washington Proceedings, 7:141.

1907. A Catalogue of the Acarina. U.S. National Museum Proceedings, 1553. 32:595-625.

H. F. Bassett.

Bassett. Descriptions of several supposed new species of Cynips, with remarks on the formation of certain Galls. Proc. Ent. Soc. of Phil., Vol. II, No. 3, pp. 323-333.

Description of several new species of Cynips, and a new species of Diastrophus. Proc. Ent. Soc., Phil., Vol. III, pp. 679-691.

William Beutenmuller.

Beutenmuller, 1892. Catalogue of Gall-producing Insects. American Museum Bulletin, 4:278.

1904. The Insect Galls of New York City. American Museum Journal 4:124.

1904. Catalogue of Gall-Producing Insects found within fifty miles of New York City, with Descriptions of their Galls, and of some new species. Am. Mu. of Nat. Hist., Vol. IV, No. 1, Art. XV, pp. 245-268.
1907. The North American Species of Rhodites and their Galls. American Museum Bulletin, Vol. XXIII., Article XXVII: 629-651.
1907. New Species of Gall producing Cecidomyidæ. American Museum Bulletin, Vol. XXIII., Article XVII: 385-400.
1908. Some apparently new Cecidomyidæ. Can. Ent. Vol. XL. 73.

Dott Mario Bezzi.

Bezzi, 1899. Primo Contributo Allo Studio della Cecidiologia Trentina Con Note Sopra Alcume Altre Galle.

F. T. Bioletti.

Bioletti. California Agricultural Experiment Station, Bul. No. 131, 1901, "The Phylloxera of the Vine."

W. A. Cannon.

Cannon. The Gall of the Monterey Pine. The Amer. Nat., Vol. XXXIV, No. 406 (Oct., 1900), p. 801.

George H. Chadwick.

Chadwick, 1908. A Catalogue of the "Phytoptid" Galls of North America. New York State Museum, 23rd Report of the State Entomologist, 1908.

T. D. A. Cockerell.

Cockerell, 1903. A New Oak-Gall. Can. Ent. 35: 217.
1904. Three New Cecidomyid Flies. Can. Ent. 36 :155-156.
1902. A New Gall-making Coccid. Can. Ent. 34:75.
1902. Some Gall Insects, Cynipidæ. Can. Ent. 34:183-184.
1901. A New Cecidomyid on Gutierrezia.
1900. A New Oak Gall from New Mexico. Can. Ent. 32:91.

Walter E. Collinge.

Collinge, 1906. Report on the Injurious Insects and other animals observed in the Midland Counties during 1905.

J. H. and A. B. Comstock.

Comstock. Manual for the Study of Insects.

Edward T. Connold.

Connold, 1901. British Vegetable Galls. Hutchinson & Co., London.

Melville Thurston Cook.

Cook, 1902, 1904. Galls and Insects Producing them. Ohio Naturalist, 2:263-78; 4:115.
1904. Insect Galls of Indiana. Indiana Department of Geology, Annual Report, 29:801-62.
1906. Algunas Agallas de Cuba Producidas por insectos Tomado del Primer Informe Annual de la Estacion Central Agronomica de Cuba. Publication el 10 de Junio de 1906.

MAXINE CORNU.

Cornu. Etudes sur le Phylloxera vastatrix. Mem. a l'Academie der Sciences, de l'Inst. Nat. de France, Tome XXVI, No. 1.

A. DESPLISSIS.

Desplissis. Phylloxera of the Vine.

R. W. DOANE.

Doane, 1900. Notes on a new Sugar-Beet Pest, with a description of the Species. Entomological News, 11:390-391.

M. LACAZE-DUTHIERS.

Lacaze-Duthiers. Recherches pour service à L'Histoire des Galles. Extrait des Annales des Sciences Naturelles, Tome XXIX.

E. PORTER FELT.

Felt, 1907. Insects Affecting Park and Woodland Trees. N.Y. State Museum Memoir 8, 2:619-20, 630-31, 633-34, 713, 725, 745, 755.
1907. New Species of Cecidomyidæ. New York State Museum bulletins 110, 22. Report of the State Entomologist, 1906.
1907. New Species of Cecidomyidæ 11, 23 Report of State Entomologist, 1907.

W. W. FROGGATT.

Froggatt. Some Account of the Gall-Making Insects of Australia. Natural Science, Vol. V, No. 30, 1894.

CLAUDE FULLER.

Fuller, 1896. Forest Insects. Some Gall-making Coccids.

HARRISON GARMAN.

Garman, 1883. The Phytopti and Other Injurious Plant Mites. Entomologist of Illinois, Annual Report, 12:123-27.
1892. American Phytoptocecidii. Psyche, 6:241.
A Plum Twig Gall Produced by a Mite. 7th Annual Rept. Ky. Agri. Ex. Station, 1894.

C. P. GILLETTE.

Gillette, 1889. Notes on certain Cynipidæ, with descriptions of new species. Psyche 1889: 183-188, 214-221.
1890. A New Cecidomyid infesting Box-elder (Acer negundo) Psyche 1890: 392-393.
1892. Colorado Cynipidæ, Ent. News, 3:246-248.
1893. Colorado Cynipidæ, Entomological News, 4:28-31, and 166-167, and 210-211.

A ARSENE GIRAULT.

Girault, 1903. A New Species of Gall-Wasp (Cynipidæ) from Goldenrod (Solidago). Entomological News 14:323-324.

H. A. Hagen.

Hagen, 1885. Collection of Phytoptocedia. Canadian Entomologist, 17: 21-29.

1885. On the relations of Fungi to Galls and to Larvæ of Cecidomyia living in Galls. Psyche IV: 334.

W. D. Hunter.

Hunter. The Aphididæ of North America. Iowa Agri. Col. Ex. Station, Bul. 60, 1901.

C. F. Jackson.

Jackson, 1908. A Synopsis of the Genus Pemphigus with Notes on Their Economic Importance, Life-history and Geographical Distribution. Proceedings of the Columbus Horticultural Society.

Tennyson D. Jarvis.

Jarvis, 1907. Insect Galls of Ontario. Entomological Society of Ontario, Annual Report, 37:56-72.

1908. Additional Insect Galls of Ontario. Entomological Society of Ontario, Annual Report, 38:85-94.

J. A. Lintner.

Lintner, 1889. In N.Y. State Museum Annual Report, 42:303.

1896. Phytoptus? pruni (Amerl). N.Y. State Museum Annual Report, 50:318, 350.

V. H. Lowe.

Lowe. The Woolly-Louse of the Apple (*Schizoneura lanigera*). Fifteenth Annual Report of the New York Agricultural Experiment Station (Geneva), 1896, pp. 570-582.

Dr. Franz Loew.

Loew, 1885. Ueber neue und schon bekannte Phytoptocecidien; Verhandlung der k.k. zoologische-botanische Gesellschaft in Wien (Vienna). p. 451-70.

Otto Lugger.

Lugger. Bugs Injurious to our Cultivated Plants. Univ. of Minn. Agri. Ex. Station, Bul. No. 69, 1900.

B. Pickman Mann.

Mann, 1883. Contributions to the Knowledge of Parasitic Life in Galls. Psyche, 4:89-91.

A. Nalepa.

Nalepa, 1898. Eriophyidæ (Phytoptidæ) in "Das Thierreich." Lief., 4:8.

Baron R. Osten-Sacken.

Osten-Sacken. On the Cynipidæ of the North American oaks and their Galls. Proc. Ent. Soc. of Phil., Vol. I., No. 3, pp. 47-72.

Additions and Corrections to title 22. Proc. Ent. Soc. of Phil., Vol. I., No. 8, pp. 241-259.

PLATE I.

1. Spiny Witch-Hazel Gall. (*Hormaphis spinosus.*)
2. Witch-Hazel Cone Gall. (*Hormaphis hamamelidis.*)
3. Cottonwood Petiole Gall. (*Pemphigus populicaulis.*)
4. Hickory Cone Gall. (*Phylloxera caryae-fullax.*)
5. Cockscomb Gall on Elm. (*Colopha ulmicola.*)
6. Basswood Mite Gall. (*Eriophyes abnormis.*)

PLATE J.

1. Soft Maple Mite Gall. (*Phloecoptes quadripes*).
2. Two specimens on left. (*Eucosma scudderiana.*)
3. Two specimens on right. (*Trypeta solidaginis.*)

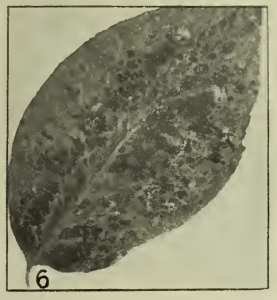
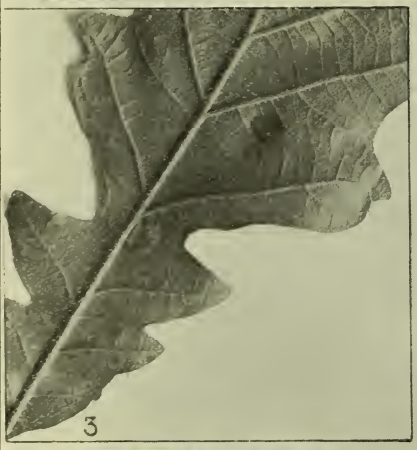


PLATE K.

1. Eriophyes sp., Betula papyrifera.
2. Eriophyes sp., Prunus Americana.
3. Eriophyes sp., Rhus Cotinus.
4. Eriophyes sp., Salix discolor.
5. Eriophyes cephalanthae, Cephalanthus occidentalis.
6. Eriophyes pyri sp., Pyruis communis.



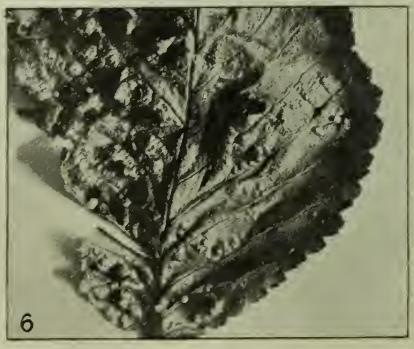


PLATE L

1. Eriophyes sp., Populus tremuloides.
2. Eriophyes sp., Fraxinus Americana.
3. Eriophyes sp., Quercus macrocarpa.
4. Eriophyes sp., Vitis sp.
5. Eriophyes sp., Ulmus Americana.
6. Eriophyes sp., Ulmus pubescens.

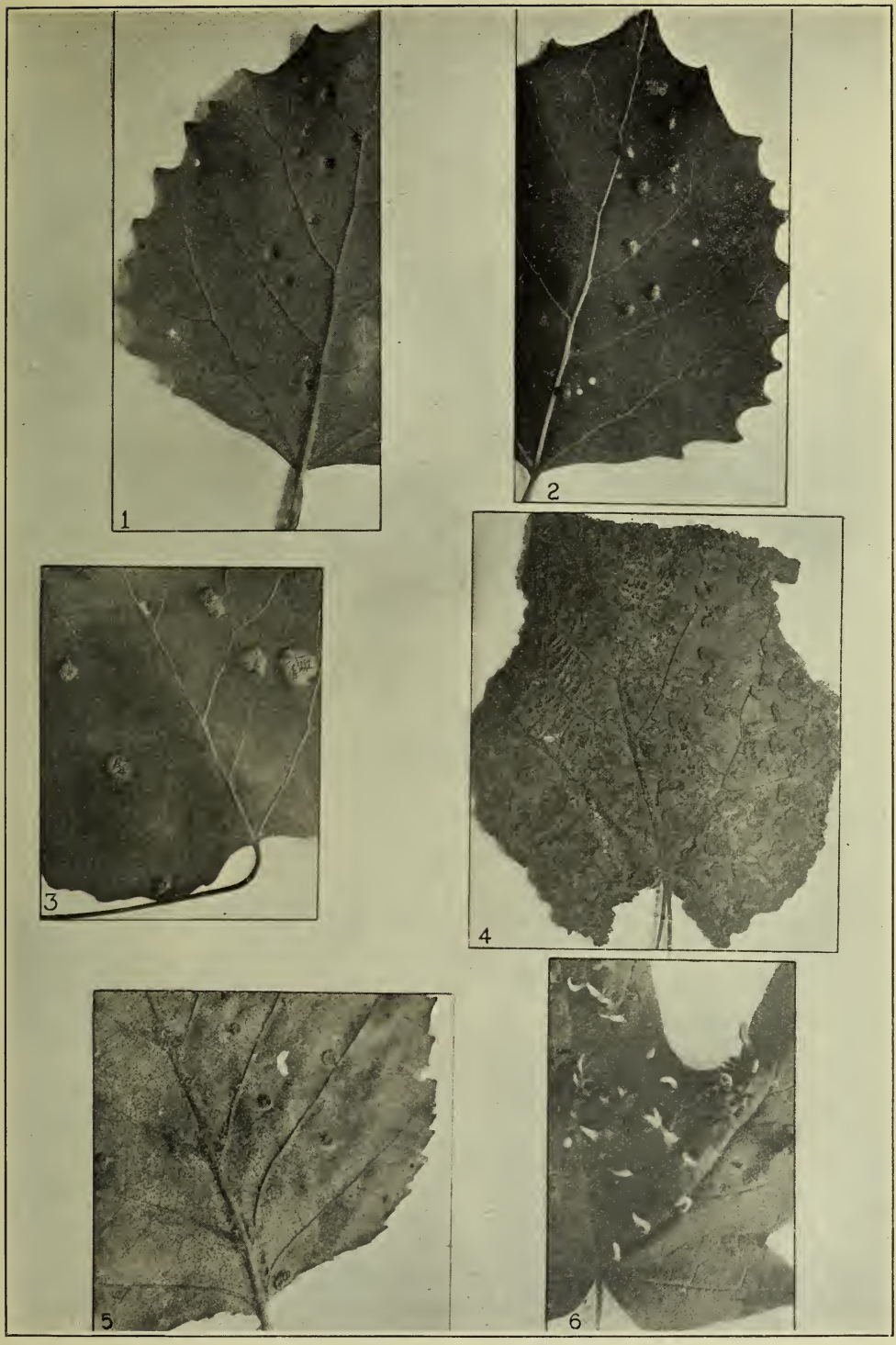


PLATE M.

1. Eriophyes sp., (under surface) Populus grandidentata.
2. Eriophyes sp., (upper surface) Populus grandidentera.
3. Eriophyes sp., Populus tremuloides.
4. Eriophyes sp., Tilia Europea.
5. Eriophyes sp., Betula papyrifera.
6. Phlœcoptes aceris, Acer saccharum.

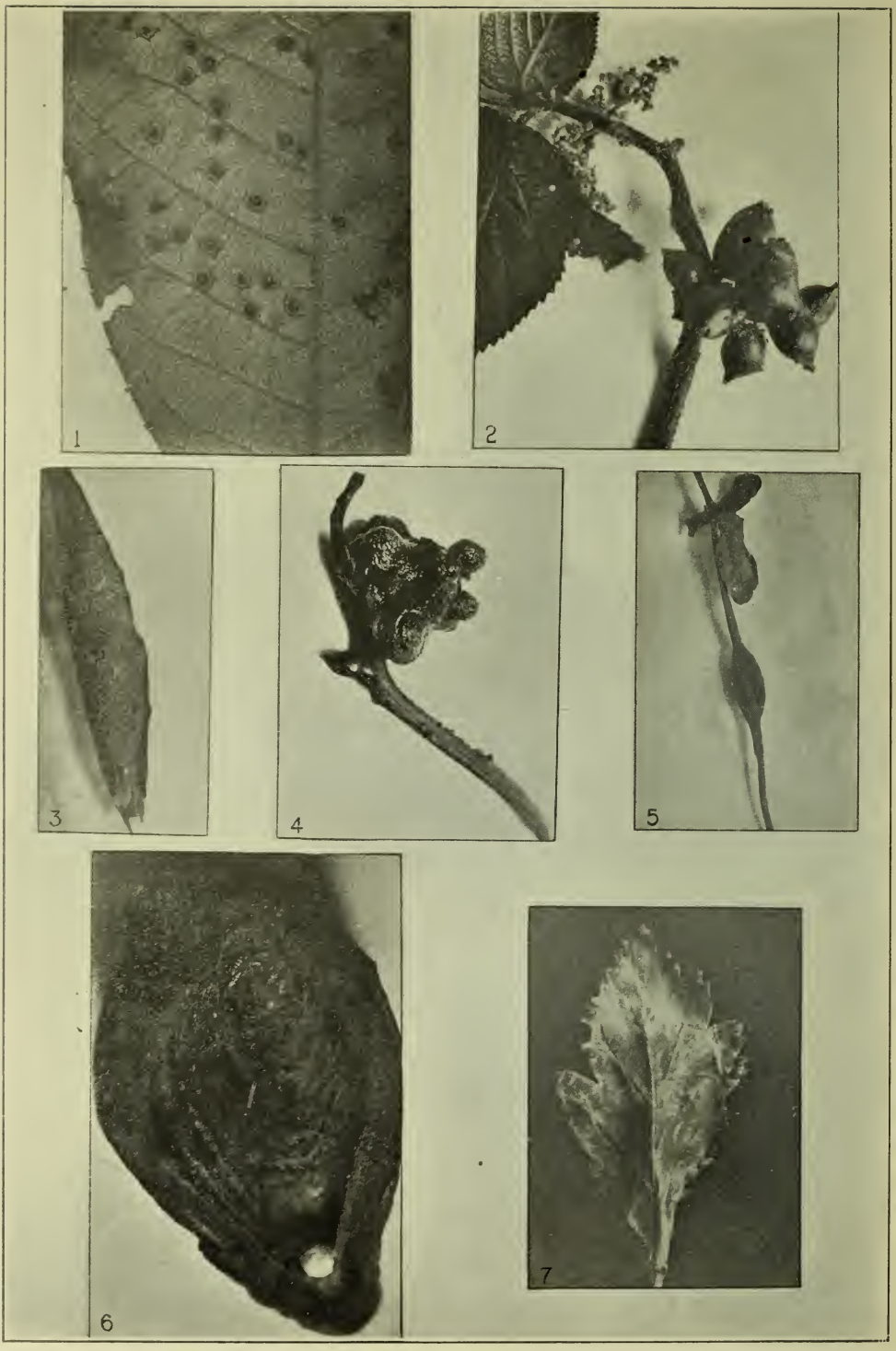


PLATE N.

1. Hickory Gall.
2. Pod or fruit gall, Laportea Canadensis.
3. Golden Rod seed gall, Solidago Canadensis.
4. Cecidomyia caryae-nucicola, Carya alba.
5. Lasioptera lycopi, Lycopus virginicus.
6. Cecidomyia virginiana, interior of gall, Prunus virginiana.
7. Hawthorn Leaf-border gall, Crataegus sp.

PLATE O.

1. Cecidomyia viticola, vitis sp.
2. Cecidomyia sp., Impatiens fulva.
3. Cecidomyia bedeguar, Ceataegus.
4. Cecidomyia? collinsoniae, Collinsonia Canadensis.
5. Hawthorn Bladder gall, Crataegus, sp.
6. Gooseberry Bud gall, Ribes grossulare.
7. Cecidomyia Strobiloides, Salix discolor.

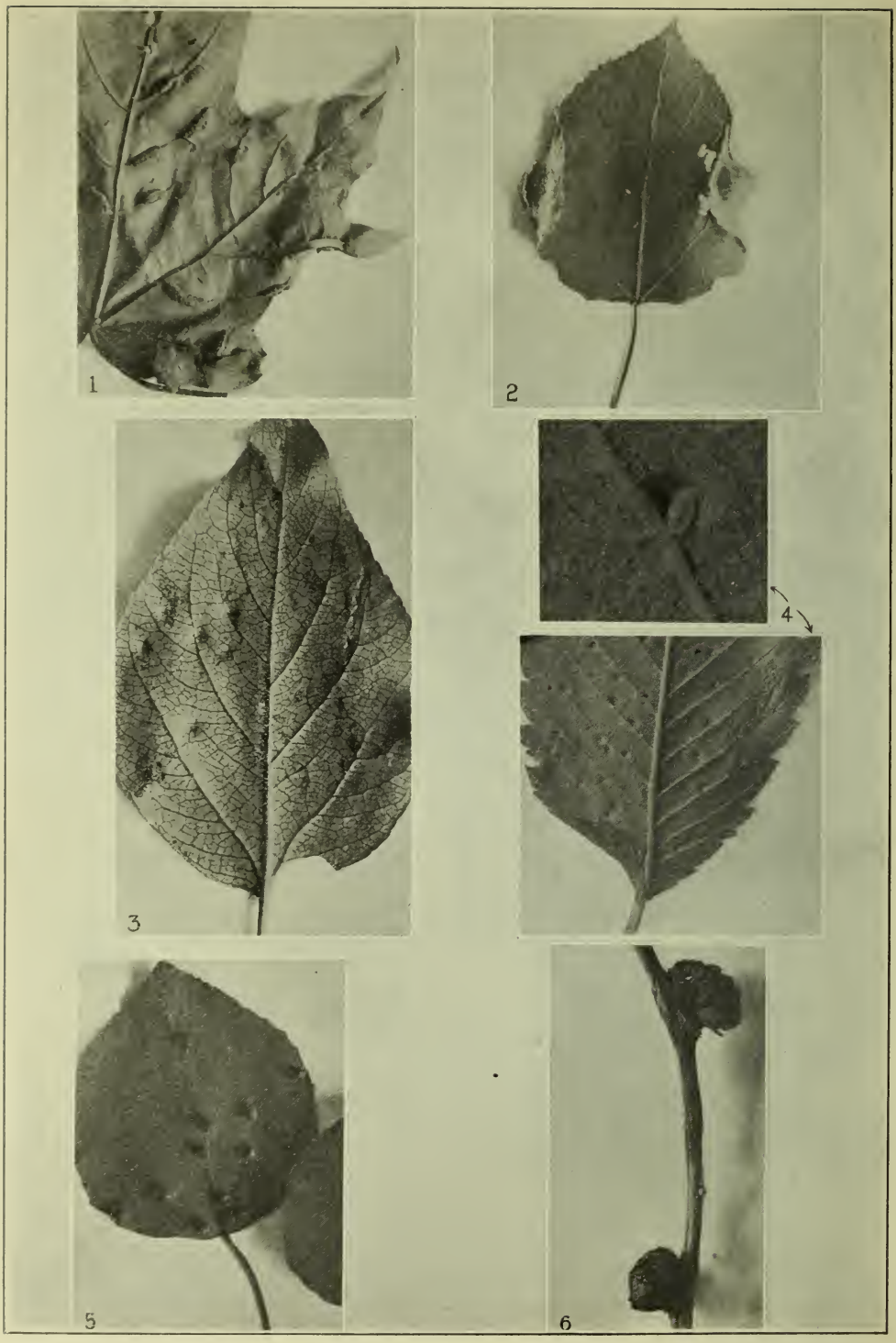


PLATE P.

1. Maple Vein gall, Acer Saccharum.
2. Aspen Tent gall, Populus tremuloides.
3. Balm of Gilead pimple gall, Populus balsamifera.
4. Elm-Pimple gall, Ulmus Americana.
5. Aspen Ball gall, Populus tremuloides.
6. Red Elm Bud gall, Ulmus fulva.

Contributions to the Natural History of the Cynipidæ of the U.S. and their Galls. Proc. Ent. Soc. of Phil., Vol. II., p. 33-49.
id., Vol. IV., p. 331-386
id., Trans. Amer. Ent. Soc., Vol. III., pp. 54-64
Biological Notes on Diptera (Galls) on Solidago. Trans. Amer. Ent. Soc., Vol. II., pp. 299-305.
Two New North American Cecidomyia. Proc. Ent. Soc., Phil., Vol. VI., pp. 219-220.
Monograph of the Diptera of North America. Smith, Miss. Coll., Vol. VIII.
Catalogue of the Described Diptera of North America. Smith, Miss. Coll., Vol. XVI.

A. S. Packard.

Packard. Insects Injurious to Forest and Shade Trees. 5th Rep. U. S. Ent. Com., 1890.

P. J. Parrott.

Parrott, 1907. The Apple and Pear Mites. N.Y. Agricultural Experiment Station Bulletin 283.

Charles H. Peck.

Peck, 1869, in N.Y. State Museum Annual Report, 22:101.

Theo. Pergande.

Pergande. The Life History of Two Species of Plant Lice. Inhabiting both Witch-Hazel and Birch. Tech. Series, No. 9, U.S. Dept. Agr. Div. of Ent., 1901.
North American Phylloxerinæ Affecting Hicoria (Carya) and Other trees. Proc. Dav. Acad. Sci., Davenport, Iowa, Vol. IX., 1904, pp. 185-273.

C. H. Persoon.

Persoon, 1822. Mycologia Europæa, p. 2.

C. V. Riley.

Riley, 1870, in American Entomology and Botany, 2:339.
The Grape Phylloxera, Phylloxera vastatrix, Planchon. 3rd, 4th, 5th, 6th, 7th, 8th Annual Reports of the Noxious and Beneficial and other Insects of the State of Missouri.

Riley and Monell.

Riley and Monell. Notes on the Aphididæ of the United States, with descriptions of species occurring West of the Mississippi. Bull. of the U.S. Geol. and Geol. Survey of the Territories, Vol. V., No. 1, 1879.

G. B. Rothera.

Rothera. On the Ætiology and Life History of Some Vegetal Galls and their Inhabitants. Natural Science, Vol. III., No. 21, 1893.

John A. Ryder.

Ryder, 1879. A probable new species of phytoptus or gall mite. American Naturalist, 13:704.

Wm. Saunders.

Saunders. Insects Injurious to Fruits, 1883.

Henry Shimer.

Shimer, 1869. Descriptions of Two Acarians bred from the White Maple. American Entomological Society Transactions, 2:319.

A Summer Study of Hickory Galls, with description of supposed new insects bred therefrom. Trans. Amer. Ent. Soc., 1869, pp. 386-398.

J. M. Stedman.

Stedman. The Woolly Aphis of the Apple, or the Apple-Root Plant Louse (*Schizoneura lanigera* Hansen). Missouri Agri. Ex. Station, Circular No. 6, 1898.

Cyrus Thomas.

Thomas. 8th Report of the Illinois State Entomologist, 1879.

Dr. C. G. de Dalla Torre.

Dalla Torre. Catalogue Hymenopterorum, Cynipidæ, Vol. II., 1893.

A. Trotter.

Trotter, 1903. Descrizione di varie galle dell' America del Nord. Marcellia 2:63-75.

C. H. Tyler Townsend.

Townsend, 1893. Stem Gall on Ephedra Nevadense. Entomological News, 4:242-243.

A Cabbage-like Cecidomyidous Gall on Bigelovia. Psyche, 6:491.

A Cocks-comb Gall on Rhus microphyla. Psyche, 6:504-505.

On a Fleshy Leaf Gall on Scrub Oak. Psyche, 6: 523.

A Cone-like Cecidomyid Gall on Bigelovia. Psyche, 7:176.

A Psyllid Leaf-Gall on Celtis. Probably Pachypsylla celtidis-pubescens, Riley. Psyche, 7:187-188.

Gall of Eurytoma sp. on the Cat's-claw Thorn. Psyche, 7:202-203.

B. D. Walsh.

Walsh, 1864, 1867. On the Insects, Coleopterous, Hymenopterous and Dipterous Inhabiting the Galls of Certain Species of Willow. Entomological Society of Philadelphia Proceedings, 3:543-644; 6:223-88.

On the Genera of Aphididæ found in the United States. Proc. Ent. Soc., Phil., Vol. I., No. 9, p. 294.

On Dimorphism of the Hymenopterous genus, Cynips, with appendix, containing lists for a new classification of Cynipidæ and a list of Cynipidæ, including description of several species inhabiting the Oak Galls of Illinois. Proc. Ent. Soc., Phil., Vol. II., No. 4, pp. 445-500.

ENTOMOLOGICAL RECORD 1908.

By James Fletcher and Arthur Gibson.

The season of 1908 in most parts of Canada was an exceptionally dry one. The continued drought which began in early June, lasted well on into September in many parts of the Dominion. The weather, too, was extremely hot, and vegetation, consequently, was much injured and reduced in vigour. Insects have been particularly numerous in certain localities, and some kinds of injurious species were very destructive. From the collector's standpoint, the season, on the whole, throughout the country, was probably better than that of each of the three or four preceding years. Some correspondents report that the season in their immediate vicinity has been a particularly poor one, others that it has been an improvement on the recent years. More are of the latter opinion.

As in the past a great many records have been sent in by correspondents. From these have been taken those which, for one reason or another, have been thought to be of most interest. As has been pointed out before, an insect may seem rare to the collector who sends in the record, when in reality, its occurrence may be widerspread, and for this reason not worth recording in the Record.

As in previous years, some of the federal Government officers brought back with them, from their distant fields of labour, small collections of insects of special interest. Mr. Joseph Keele, during the past summer, made some valuable collections at the mouth of the Gravel River and along the McKenzie River adjacent, on the eastern slope of the Rockies. Mr. C. H. Young, of the same Department, spent the months of August and September at the Biological Station, Departure Bay, B.C., with the well-known lepidopterist, Rev. G. W. Taylor, who is now there as Curator of the Station. Mr. Young collected insects of several orders, among which are many of much interest. Mr. Douglas H. Nelles, of the Alaska Boundary Survey, spent the summer in the Yukon District, between White Horse and the 141st Meridian, and made a collection of butterflies. Mr. Andrew Halkett of the Fisheries Museum, returned to Ottawa in November, bringing with him a small collection of various insects taken in Alberta. Dr. Fletcher made a hurried trip to British Columbia in September and October, and while stopping over for a day or two, each at Nepigon, Ont.; Regina, Sask.; Banff and Laggan, Alta.; and Departure Bay, B.C., collected many insects of value. Mr. Gibson spent most of July at Youghall, N.B., and while there made collections in all orders.

Acknowledgments are again due to the leading specialists in the United States who have rendered much help to Canadian students during the year: Dr. L. O. Howard, with his assistants at Washington; Dr. J. B. Smith, of New Brunswick, N.J.; Professor H. F. Wickham, of Iowa City, Iowa; Mr. W. D. Kearfott, of Montclair, N.J.; Mr. E. P. Van Duzee, of Buffalo, N.Y.; Mr. Wm. Beutenmuller and Professor R. C. Osburn, of New York, N.Y., and Prof. J. S. Hine, of Columbus, Ohio. Sir George Hampson, of the British Museum, has also been of much help in identifying specimens of lepidoptera.

N.B.—Owing to the death of my good friend, chief, and ever kind teacher, Dr. James Fletcher, the manuscript of the Entomological Record for 1908 has had to be prepared by me. Dr. Fletcher had, I know, certain records and other notes which he intended to include. I trust, however, that any omissions which may be noticed will be made known, so that they can be included in the Entomological Record for 1909.—*Arthur Gibson.*

Literature.

Among the many valuable publications which have been received during the past year, and which are of interest to Canadian students, mention may be made of the following:—

Banks, Nathan. Catalogue of the Neuropteroid Insects (except Odonata) of the United States. Philadelphia: Transactions, American Entomological Society, 1907. This valuable catalogue of neuropteroid insects was not received in time to be mentioned in last year's Record. The name of the author is sufficient to guarantee the usefulness of this list. Altogether there are nearly 900 species included in the catalogue, arranged under 210 genera.

Bethune, C. J. S. Bibliography of Canadian Entomology for the year 1907. Ottawa: Transactions of the Royal Society of Canada, Third Series—1908-1909, Volume II., Section IV.; separate received December 15, 1908. This paper, which is annually presented to the Royal Society of Canada by the Rev. Prof. Bethune, is a most useful publication. In the above bibliography, 125 references are made to contributions which have appeared during 1907, all of which are of value to Canadian students. With each reference a short explanatory statement is made. We are very grateful to the author for this annual publication. To many, it is the only source of reference to articles which have appeared during the year on Canadian Entomology.

Busck, August. A Generic Revision of American Moths of the Family Œcophoridæ, with Descriptions of New Species. Proc. U.S. Nat. Museum, Vol. XXXV., pp. 187-207; published Oct. 31, 1908. The results of Mr. Busck's work on Microlepidoptera are always of much value. In this paper the genera of the above family are treated of. As very little study had previously been given to the North American species, this contribution will be of great service to students of Tineid moths. Mr. Busck states that there are now 121 described species of this family represented in North America.

Bradley, J. Chester. The Evaniidæ, Ensign-flies, an Archiac Family of Hymenoptera. Trans. Amer. Ent. Soc., Vol. XXXIV., No. 2, April-May-June, 1908; pp. 101-194, 11 plates. This contribution deals with the North American species of Evaniidæ, insects which are usually not well represented in collections. References to species occurring in Canada are given and many new forms described. This paper will prove of much use to hymenopterists. The Ensign-flies, which are so named because they carry the abdomen aloft like a flag, are parasitic.

Caudell, Andrew Nelson. Notes on some Western Orthoptera, with the Description of one New Species. Proc. U.S. Nat. Museum, Vol. XXXIV, pages 71-81; published April 17, 1908. As this paper includes notes on species collected in western Canada in 1906, it will prove of value to those of our entomologists who study orthoptera. 27 different species are recorded, from British Columbia, Alberta and Saskatchewan.

Fernald, C. H. The Genera of the Tortricidæ and their Types. Amherst, Mass.; published by the author, June, 1908. Professor Fernald is to be congratulated on this most valuable piece of work. Over 300 generic names are reviewed. In the *Canadian Entomologist*, Sept. 1908, Mr. Kearfott says: "This work is the first of its kind that has ever been published in the Microlepidoptera. As its title implies, it takes up one by one every Tortricid genus known to the author, from the tenth edition of Linnæus down to the present day, and fixes and names the type species in each genus."

Harrington, W. Hague. Fauna Ottawensis: Hymenoptera—Superfamily III.—Vespoidea; The Ottawa Naturalist, July, 1908. This contribu-

tion to the insects of the Ottawa District is a most welcome one. Mr. Harrington has always paid special attention to the fauna of this locality, and, as our highest Canadian authority on the hymenoptera, the above paper, which mentions 87 different species, is of much value. In the introductory remarks information is given on the Families Ceropalidæ, Vespidæ, Eumenidæ, Chrysididæ, Bethylidæ, Tiphiidæ, Thynnidæ, Myromosidæ and Mutillidæ.

Kearfott, W. D. Descriptions of New Species of North American Crambid Moths. Proc. U.S. Nat. Museum, Vol. XXXV., pp. 367-393; separates published Oct. 31, 1908. In this valuable contribution to the Pyralidæ, 20 new North American species of crambid moths are described, 5 of which are from Canada.

Knab, Frederick. Observations on the Mosquitoes of Saskatchewan. Reprinted from Smithsonian Miscellaneous Collections (Quarterly Issue), Vol. 50; published Feb. 20, 1908. These observations were the result of an expedition to western Canada during the spring of 1907. Nine different species were collected, eight of the genus *Aedes* and one of the genus *Culiseta*. The habits of some of the species are discussed, and notes given on their life-histories.

Mitchell, Evelyn Groesbeeck. Mosquito Life. J. P. Putnam's Sons, New York and London. The Knickerbocker Press, (1907). This most interesting and extremely valuable book came to hand early in 1908. It reviews previous work on these important insects, and includes much original matter not previously published. The titles of the different chapters will give an idea of the extent of the work. I. Systematic Position and Structure. II. Some Habits of the Adults. III. How Far Mosquitoes Fly. IV. Mating. V. Larvæ and Pupæ. VI. Malaria. VII. Yellow Fever and Other Diseases. VIII. Mosquito Remedies and Enemies. IX. Notes on the Commoner Species. X. Collecting and Laboratory Methods. XI. Identification Keys and Systematic List.

Osburn, Raymond C. British Columbia Syrphidæ, New Species and Additions to the List. Canadian Entomologist, January, 1908. In this paper, 50 different species are mentioned, 6 of which are described as new. This article brings the list of British Columbian Syrphidæ up to 128 different species. It is pleasing to note that the large majority of the species were collected by local entomologists. This and Mr. Osburn's previous paper, (Can. Ent., Vol. XXXVI., Aug.-Sept., 1904), will make an excellent foundation for future work, in this family, for British Columbian dipterists.

Smith, John B. Notes on the Species of Amathes, Hbn., Philadelphia: Transactions, American Entomological Society, XXXIII., Nov. 1907; separate received Feb. 3, 1908. This paper, which treats of some of the North American species of noctuids in our lists under the genus *Orthosia*, is a welcome addition to the literature. Ten species of the genus *Amathes* have been found in Canada. This genus has the "Proboscis fully developed; palpi obliquely porrect, fringed with long hair in front, the 3rd joint short; frons smooth; eyes large, rounded; antennæ of male typically ciliated; head and thorax clothed with hair only; the tegulæ produced to a dorsal ridge, the pro- and metathorax without distinct crests; abdomen dorsally flattened, with lateral tufts of hair and some rough hair at base but without crests. Forewings with the termen evenly curved."

Smith, John B. A Revision of Some Species of Noctuidæ heretofore referred to the Genus Homoptera, Boisduval. Proc. U. S. Nat. Museum, Vol. XXXV., pp. 209-275, separates published November 10, 1908. This important contribution on the old genus Homoptera will be hailed with delight

by lepidopterists. There has been so much confusion in the genus, and it was previously very difficult, in many instances, to get exact determinations. Dr. Smith has gone into the subject very fully. Of the 25 species treated of, nine are recorded from Canada. In addition four other species occur in Canada, as mentioned in the *Ottawa Naturalist*, October, 1908. The old name Homoptera is replaced by Phœocyma of Hubner, an earlier name.

Van Duzee, E. P. Studies in North American Membracidæ. Bulletin of the Buffalo Society of Natural Sciences, Vol. IX., pp. 29-129; issued April 18, 1908. This publication will prove of much value to hemipterists. Most of the Membracidæ, or "tree-hoppers," are of uncommon occurrence, and for that reason, probably, the family has not been very much studied. The author gives tables of the sub-families, genera and species, and, at the end, a list of all species known to occur north of the southern boundary of the United States.

The following is a list of the names and addresses of collectors heard from during 1908:—

Anderson, E. M., Provincial Museum, Victoria, B.C.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., c/o King Brothers, Quebec, Que.
Brodie, Dr. W., Provincial Museum, Toronto.
Bush, A. H., 1105 Ninth Ave., Vancouver, B.C.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kalso, B.C.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Denny, Edward, 200 Mitcheson Street, Montreal.
Dent, W. A., Sarnia, Ont.
DeWolfe, L. A., Penticton, B.C.
Dod, F. H. Wolley- Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fletcher, James, Experimental Farm, Ottawa.
Fyles, Rev. T. W., Levis, Que.
Gibson, Arthur, Experimental Farm, Ottawa.
Groh, H., Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harms, J. F., Treesbank, Man.
Harrington, W. H., P.O. Department, Ottawa.
Harvey, R. V., Victoria, B.C.
Heath, E. F., Cartwright, Man.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph.
Keele, Jos., Geological Survey, Ottawa.
Keen, Rev. J. H., Metlakatla, B.C.
Létourneau, Jos. A., Exp. Farm, Ottawa.
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancouver, B.C.
McIntosh, W., St. John, N.B.

Metcalfe, W., 288 Bank Street, Ottawa.
Moore, W. H., Scotch Lake, N.B.
Moore, G. A., 209 Prince Arthur Street, Montreal.
Morris, Frank, Port Hope, Ont.
Nelles, Douglas H., Dept. Interior, Ottawa.
Perrin, Jos., McNab's Island, Halifax, N.S.
Ross, Ernest, Port Arthur, Ont.
Russell, John, Digby, N.S.
Sanson, N. B., Banff, Alta.
Saunders, Henry, 21 Harbord Street, Toronto.
Sherman, R. S., 2285 Sixth Ave., Vancouver, B.C.
Simpson, W., Dom'n Observatory, Ottawa.
Swaine, J. M., Macdonald College, Que.
Taylor, Rev. G. W., Departure Bay, B.C.
Tipping. E. Dalton, Bluff Centre, Alta.
Venables, E. P., Vernon, B.C.
Walker, Dr. E. M., 99 St. George St., Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Willing, T. N., Regina, Sask.
Wilmot, E. S., Vernon, B.C.
Wilson, W. J., Geological Survey, Ottawa.
Winn, A. F., 132 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O. A. C., Guelph, Ont.

NOTES OF CAPTURES.

Lepidoptera.

(Arranged according to Dyar's List of North American Lepidoptera, U.S.N.M. Bull. No. 52).

RHOPALOCERA.

(Dyar's number).

20. *Papilio indra* Reakirt, a. *nitra* Edw. Bluff Centre, Alta., (Tipping).
23. *Lærtias philenor* L. Grimsby, Ont., larva, Aug. 9, (J. W. Daniel).
92. *Euptoieta claudia* Cram. Toronto, "Humber Road, Old Mill," July, (Hahn).
104. *Argynnis electa* Edw. Hope Mts., B.C., not common, July 17, (Sherman).
134. *Brenthis triclaris* Hbn. Mer Bleue, near Ottawa, June 6, three specimens, (Young, Criddle, Gibson).
158. *Lemonias taylori* Edw. Hope Mts., several taken at summit, 5,800 feet, July 20, (Sherman, Harvey, Day).
189. *Phyciodes tharos* Dru. Hope Mts., July 21-23, (Sherman, Harvey, Day). A fine specimen of the aberration *packardii* Saund., was taken at the Mer Bleue, near Ottawa, by Mr. Young.
190. *Phyciodes batesii* Reakirt. On railway track, between Cache Bay and Beaver Meadow, Hull, Que., June 13. (Gibson).
223. *Junonia coenia* Hbn. Orillia, four specimens in two days. It looks as if this butterfly had become a permanent resident, (Grant). Toronto, August, (Miss F. Hahn).

271. *Erebia vidleri* Elwes. Hope Mts., July 20, (Day).
376. *Incisalia henrici* G. & R. A specimen of this butterfly taken at Montreal by the late Mr. Caulfield has recently been identified by Mr. Cook, who says it is the furthest northern record.
584. *Epargyreus tityrus* Fab. Cartwright, Man., one in garden, June 19, second appearance here, (Heath).

HETEROCERA.

678. *Pholus pandorus* Hbn. Ottawa, larva on Virginian Creeper, moth emerged July 8, (Gibson).
747. *Tropæa luna* L. Winnipeg, Man., June 1, (Wallis). Mr. Wallis also reports that a specimen of this rare moth was taken some years ago at Gall Harbour, (Miss Cowley).
836. *Utetheisa bella* L. Hyde Park, Ont., one specimen, end August, (J. F. Weir); Hymers, Ont., Sept. 19, (Dawson).
853. *Estigmene prima* Slosson. Winnipeg, June 2, two specimens, (Wallis).
861. *Phragmatobia assimilans* Wlk., a. *franconia* Slosson, Hymers, June 9, (Dawson).
868. *Neoarctia beanii* Neum. Larva from N. B. Sanson, found on Sulphur Mountain. Moth emerged at Ottawa, June 15, (Gibson).
872. *Hyphoraia parthenos* Harr. Ottawa, a fine specimen at light, July 1, (Baldwin). Rare at Ottawa.
874. *Apantesis virgo* L., a. *citrinaria*, N. & D., Toronto, (Hahn).
888. *Apantesis nevadensis* G. & R., b. *superba* Stretch. Hope Mts., July 20, (Sherman). Penticton, B.C., (Wallis).
889. *Apantesis williamsii* Dodge, a. *determinata*, Neum., July 7, (Dawson), first Ontario record.
890. *Apantesis phyllira* Dru. Toronto, (Hahn).
1,000. *Apatela quadrata* Grt. Hymers, June 22, (Dawson); Orillia, (Grant). *Apatela inclara* Sm. Billings Bridge, Ottawa, (Fletcher). New record for district.
1,034. *Apatela perdita* Grt. Peachland, B.C., July 8, (Wallis).
1,047. *Apharetra pyralis* Sm. Aweme, Aug. 28, (E. Criddle).
1,075. *Baileya doubledayi* Gn. Ottawa, July 20, (Baldwin).
1,084. *Catabena lineolata* Wlk. Ottawa, July 20, (Baldwin). First record for the district.
1,088. *Platysenta videns* Gn. Cartwright, Man., one, July 4, always rare, (Health); Ottawa, June 6, (Gibson).
1,165. *Hadena diversicolor* Morr. Sudbury, (Evans).
1,176. *Hadena didonea* Sm. Trenton, (Evans).
1,216. *Hadena contradicta* Sm. Hymers, June 22, (Dawson). First record received for Ontario.
1,229. *Hadena alticola* Sm. Metlakatla, B.C., (Keen). *Hadena multicolor* Dyar. Victoria, B.C., May 22, (Harvey).
1,255. *Macronoctua onusta* Grt. Trenton, four specimens, Sept. 17, 18, 20, 25, (Evans). Larva again found at Ottawa, (Gibson).
1,341. *Oncocnemis atrifasciata* Morr. Hymers, Aug. 22, (Dawson). *Rhynchagrotis sambo* Sm. Ainsworth, B.C., Aug. 3, 11, (Rev. G. H. Findlay); Kaslo, July and August, (Cockle); Peachland, July, (Wallis).
1,412. *Adelphagrotis stellaris* Grt. Victoria, July 26, (Anderson); Duncans, (Hanham).

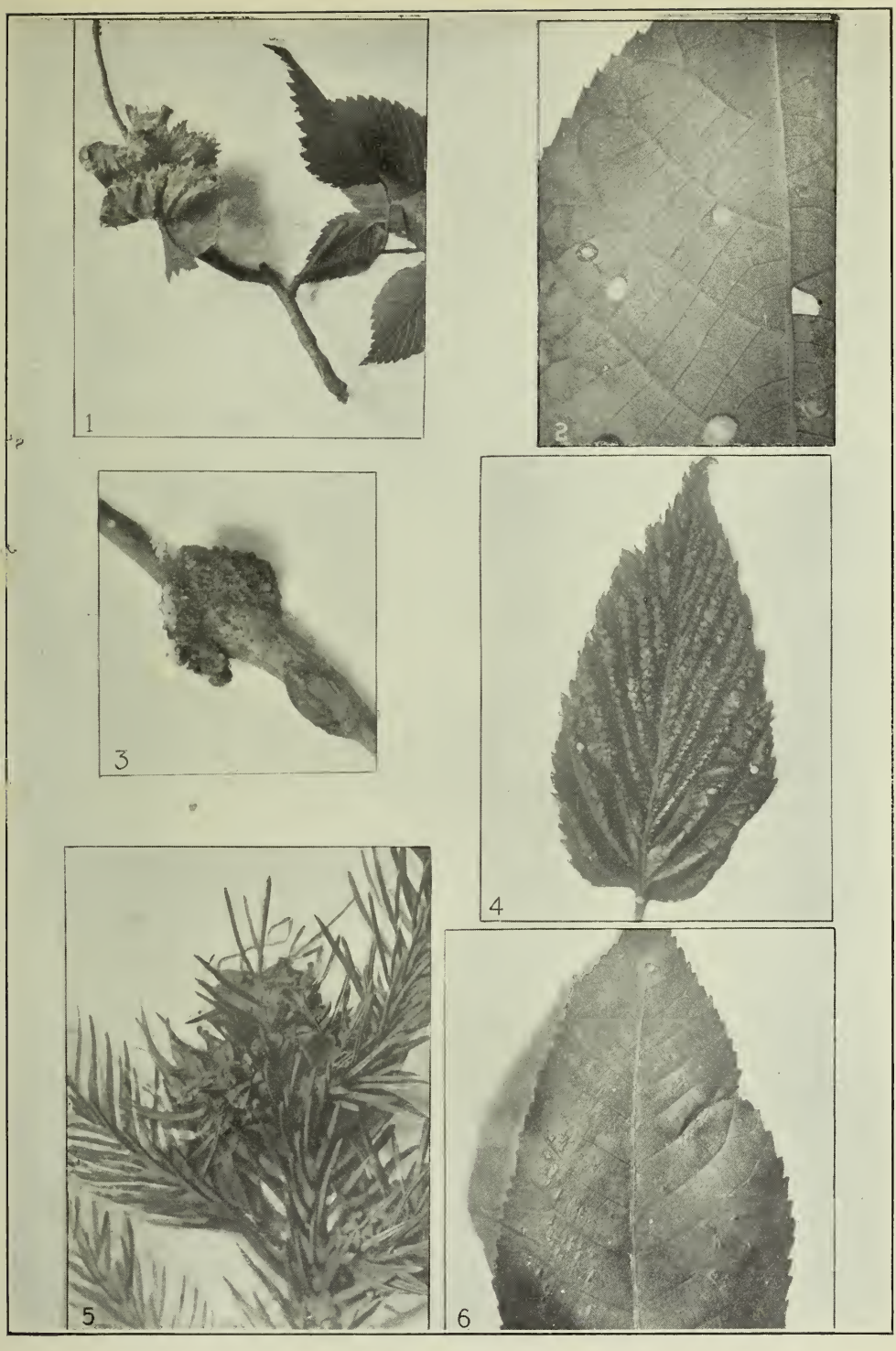
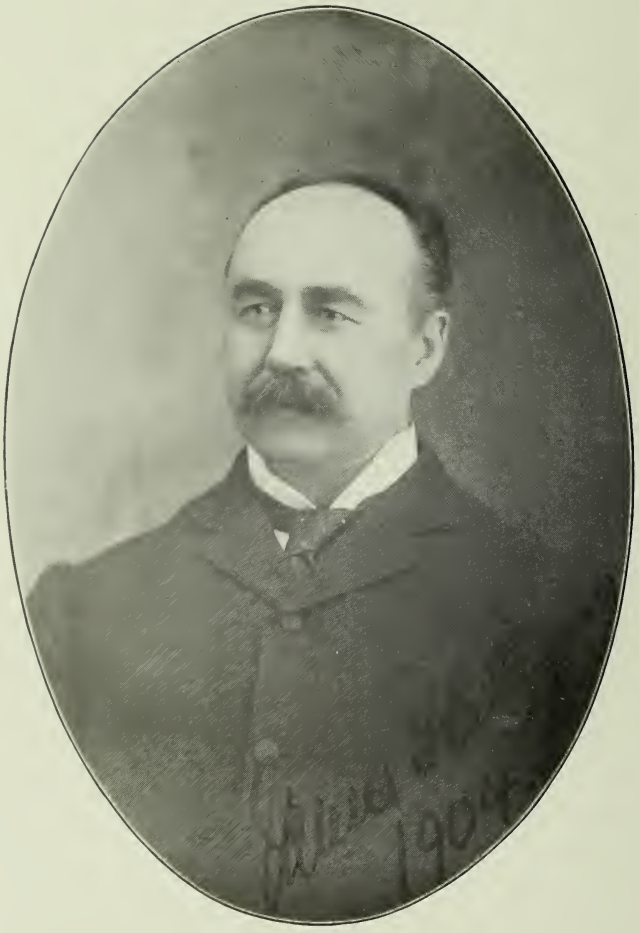


PLATE Q.

1. Schizoneura Americana, Ulmus Americana.
2. Phylloxera sp., Carya alba.
3. Schizoneura sp., Populus tremuloides.
4. Schizoneura sp., Alnus incana.
5. Chermes abietis, Picea excelsa.
6. Phylloxera caryaevena, Carya ovata.



THE LATE JAMES FLETCHER, LL.D., F.R.S.C., F.L.S.

1,430. *Pachnobia monochromatea* Morr. Ottawa, July 3, (Young).
1,431. *Pachnobia littoralis* Pack. Hymers, June 22, (Dawson). Only Ontario record we have.
1,434. *Pachnobia wockei* Moeschl. Labrador, July 19, (Dr. A. P. Low).
Setagrotis dolens Sm. High River, Alta., (Baird).
1,455. *Agrotis geniculata* G. & R. Meach Lake, Que., near Ottawa, Aug. 31, (Fletcher); Truro, N.S., (DeWolfe); Toronto, (Gibson).
Rhizagrotis perolivalis Sm. High River, Aug. 25, (Baird).
1,544. *Feltia gladiaria* Morr. Trenton, (Evans). This is the first Canadian specimen we have seen.
1,600. *Paragrotis perfusca* Grt. Sudbury, Ont., (Evans).
1,682. *Paragrotis fuscigera* Grt. Olds, Alta., June 21, (Willing).
1,697. *Paragrotis dissona* Moesch. Aweme, Aug. 28, (E. Criddle).
Paragrotis cocklei Sm. Departure Bay, Aug. 7, (Young).
1,780. *Mamestra determinata* Sm. Trenton, at light, Aug. 27, (Evans).
1,783. *Mamestra detracta* Wlk. Trenton, July 31, (Evans).
1,789. *Mamestra capsularis* Gn. Among some noctuids named for Mr. Evans, was a specimen of this moth with the label "E. Ontario, Canada," on it. This is the first Canadian record we have.
1,797. *Mamestra gussata* Sm. Ottawa, April 24, (Young).
1,821. *Mamestra rugosa* Morr. Sudbury, (Evans).
1,825. *Mamestra goodellii* Grt. Peachland, B.C., July 18, (Wallis); Ottawa, July 24, (Saunders); Sidbury, (Evans); Mt. St. Hilaire, near Montreal, May 24, (Chagnon).
1,840. *Mamestra sutrina* Grt. Laggan, Aug. 4, (Fletcher).
1,894. *Xylomiges dolosa* Grt. Hymers, May 10, (Dawson).
2,024. *Graphiphora furfurata* Grt. Mt. St. Hilaire, near Montreal, July 2, (Chagnon). The true species (J. B. S.).
2,074. *Pleroma bonuscula* Sm. Victoria, (Fletcher). A new locality for the species, (J. B. S.).
2,108. *Xylina bayleyi* Grt. Duncans, B.C., April, (Day).
Hydrœcia micacea Esp. Specimens of this moth have been reared in the Division from larvæ received from Mahone Bay, N.S., (C. A. Hamilton); Westport, N.S., (Geo. Welch), and Tramore, Ont., (Capel B. St. George). As mentioned in Mr. Gibson's paper, in this report, the above and specimens of the moth taken at St. John, N.B., by Mr. W. McIntosh, and recorded by him under the name of *Hydrœcia medialis* Sm., are the only American records of this European insect.
2,214. *Tapinostola variana* Morr. Trenton, at light, Aug. 6, (Evans); Westbourne, Man., July 28, (Wallis).
Amathes duscata Sm. Aweme, Aug. 28, (E. Criddle).
Amathes acta Sm. Departure Bay, B.C., Sept. 5, (Young).
2,224. *Orthosia inops* Grt. Cartwright, Man., July 30, (Heath); Aweme, Aug. 25, (Fletcher); Aug. 30, (E. Criddle).
2,231. *Orthosia lutosa* Andrews, Peachland, B.C., July 6, (Wallis).
Orthosia verberata Sm. Bartlett Bay, off Glacier Bay, Alaska, June 10, (Nelles). A new locality for the species. (J.B.S.).
2,280. *Pippona bimatris* Harv. Aweme, (Fletcher). Quite a rare species. First Canadian record.
2,390. *Dasyspoudœa meadii* Grt. High River, Alta., (Baird).
2,423. *Heliaca nexilis* Morr. Several on summit of Hope Mts., B.C., July 20, (Harvey).

2,617. *Eustrotia includens* Wlk. Trenton, July 18, (Evans).

2,618. *Galgula hepera* Gn. and var. *partita* Gn. Mt. St. Hilaire, near Montreal, Aug. 30, (Chagnon). Mr. Winn has also taken the species at Montreal.

2,661. *Tarache terminimacula* Grt. Trenton, (Evans).

2,769. *Meliopotis limbolaris* Geyer. Lorne Park, Ont., July 25, (Williams).

2,830. *Catocala concumbens* Wlk. Metlakatla, B.C., (Keen); Fort Selkirk, Yukon, July, (Miss Seymour). Both of these records are of much interest; the latter is the most northern limit of *concumbens* known at the present time, (Beut.).

2,858. *Catocala coccinata* Grt. Westbourne, Man., Aug. 10, (Wallis).

2,871. *Catocala subnata* Grt. Billings Bridge, Ottawa, (Fletcher). First record for the district.

2,900. *Catocala præclara* G. & R., Digby, N.S., Sept. 17, (Russell).

Homoptera norda Sm. Chelsea, Que., near Ottawa, May 30, (Gibson); Ottawa, May 16, 18, (Young); Kaslo, (Cockle); Cartwright, (Heath).

2,900 *Homoptera minerea* Grt. Britannia, near Ottawa, June 20, (Baldwin). In the Entomological Record for 1906, this species is recorded from White River, Hudson Bay Slope, June 2, (Wilson). On further examination Dr. Smith could not confirm this identification, as the specimen was much rubbed and crushed.

2,991. *Homoptera calycanthata* S. & A. In the Entomological Record for 1904, this species is recorded from Kaslo. According to Dr. Smith's Revision of the Genus Homoptera, just published, this record should now refer to his new species *norda*.

3,000 *Homoptera unilineata* Grt. Winnipeg, June 2, (Wallis). Only Canadian record which we have.

3,002. *Homoptera duplicata* Bethune. As mentioned in the Ottawa Naturalist, Oct. 1908, the record of this moth having been taken at Wellington, B.C., (Taylor), should now refer to *largera* Sm. *Duplicata* has been taken at Digby, N. S., (Russell), and Truro, N.S., (DeWolfe).

Homoptera helata Sm. Britannia, near Ottawa, June 20, (Baldwin).

3,038. *Philometra hanhami* Sm. Trenton, Aug. 2, (Evans). An unexpected locality; all the specimens heretofore seen are from Winnipeg, (J.B.S.).

3,066. *Bomolocha bijugalis* Wlk. Cartwright, July 4; recorded previously from Winnipeg by Hanham, first I have taken, (Heath).

3,087. *Gnophœla latipennis* Bdv. Similkameen, B.C., July 22 and 24, (Sherman and Harvey).

3,317. *Eupithecia nevadata* Pack. Duncans, April, (Day).

Eupithecia quebecata Taylor MS. Digby, N.S., Sept. 19, (Russell); Rostrevor, Ont., Sept. 16, (Gibson). First Ontario record.

Eucymatoge togata Hbn. Digby, July 22, (Russell). Mr. Taylor says: "This is a specimen of the European *E. togata*, which I have placed on the American list. I have taken the species at Wellington, B.C. This Nova Scotian specimen is more typical than mine."

3,392. *Hydriomena speciosata* Pack. Departure Bay, B.C., Aug. 10, (Young).

Hydriomena manzanita Taylor. Goldstream, B.C., April 19, 1,000 feet, (Harvey).

Xanthorhœ fossaria Taylor. Victoria, May and June, (Harvey).

3,708. *Cymatophora wauaria* L. Mt. St. Hilaire, Que., June 30, (Chagnon).
3,747. *Sympherta tripunctaria* Pack. Departure Bay, Aug. 25, (Young).
3,799. *Alcis latifasciaria* Pack. Departure Bay, Aug. 22-28, (Young).
3,802. *Alcis latipennis* Hulst. Departure Bay, Aug. 3, (Young).
3,878. *Jubarella danbyi* Hulst. Duncans, April, (Day).
3,922. *Ennomos subsignarius* Hbn. As mentioned in the Ottawa Naturalist, Sept., 1908, enormous numbers of these moths visited Ottawa on July 23. Thousands appeared in all parts of the city.
4,040. *Leucobrephos brephoides* Wlk. Hymers, April 9, (Dawson). This is the first record we have for Ontario.
4,216. *Sesia pictipes* G. & R. Levis, Que., (Fyles).
4,221. *Sesia acerni* Clem. Ottawa, July 8, at light, (Fletcher).
4,496. *Nymphula obliteralis* Wlk. Larvæ found at Ottawa feeding on *Lemna trisula*, (Fletcher).
4,569. *Crambus bidens* Zeller. Aweme, Aug. 9, (Criddle); Mer Bleue, near Ottawa, July, (Young).
4,571. *Crambus trichusalis* Hulst. High River, (Baird); Regina, (Willing); Redvers, Sask., (A. J. Crocker).
4,608. *Crambus zeellus* Fern. Ottawa, July 15, (Gibson).
Crambus cockleellus Kearf. Kaslo, Aug. 10, 11, (Cockle).
Crambus dorsipunctellus Kearf. Rounthwaite, Man., July, (Marmont).
Crambus youngellus Kearf. Mer Bleue, near Ottawa, July 2-10, (Young).
Thaumatopsis gibsonella Kearf. Rostrevor, Ont., Sept. 2-16, (Gibson).
Eucosma annetteana Kearf. Cartwright, May 23, (Heath).
Eucosma medioviridana Kearf. Ottawa, Aug. 17-21, (Young).
5,239. *Ancylis mediofasciana* Clem. Cartwright, May 23, (Heath).
Enarmonia multilineana Kearf. Aweme, June 26, 29, (Criddle).
Gelechia terminimaculella Kearf. Aweme, June 13-16, (Criddle); Rounthwaite, June 15, (Marmont).
Gelechia alternatella Kearf. Aweme, May 12-25, (Criddle).
Coleophora elæagnisella Kearf. Ottawa. Larvæ abundant on *Elæagnus argentea*, moths emerged July, (Fletcher and Gibson).
6,257. *Lithocolletis lucidicostella* Clem. Ottawa, June 11, (Young).
6,301. *Lithocolletis basistrigella* Clem. Ottawa, bred from oak, March 11, (Young).
6,305. *Lithocolletis aceriella* Clem. Ottawa, June 16, (Young).
6,310. *Lithocolletis tilieacella* Chamb. Ottawa, July 17, (Young).
Lithocolletis fletcherella, Braun. Ottawa, bred from Oak, (Fletcher and Gibson).
Argyresthia laricella Kearf. Mer Bleue, near Ottawa, reared from terminal twigs of *Larix americana*, moths issued Ottawa, June 12-23, (Fletcher and Gibson).
6,608. *Hepialus hyperboreus* Moesch. Hymers, Ont., Aug. 23, (Dawson).
6,610. *Hepialus gracilis* Grt. Levis, (Fyles).

Coleoptera.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico).

18*c*. *Cicindela montana* Lec. Lethbridge. Alta., (Harms).
25*a*. *Cicindela audubonii* Lec. Lethbridge, April, (Harms).

25*d*. *Cicindela 10-notata* Say. Lethbridge, April, (Harms).
28. *Cicindela fulgida* Say. Westbourne, Man., Aug. 14, (Wallis). New to Manitoba.
32. *Cicindela vulgaris* Say. Lethbridge, (Harms).
33*c*. *Cicindela 12-guttata* Dej. Lethbridge, (Harms).
34. *Cicindela pusilla* Say. Westbourne, Aug. 14, seven specimens, showing great range of maculation from almost immaculate to very bright and evenly marked, (Wallis).
35. *Cicindela hirticollis* Say. Lachute, Que., Aug. 3, (Criddle and Fletcher).
119*c*. *Carabus oregonensis* Lec. Westbourne, Aug. 19, (Wallis).
148*b*. *Calosoma zimmermanni* Lec. Lethbridge, (Harms).
208. *Promecognathus lævissimus* Dej. Goldstream, B.C., 1,110 feet, July 4, (Harvey).
Amara thoracica Hayward. Mr. Evans has sent in the following record: 1 specimen collected by John Macoun in the N. W. T., in 1880.
990. *Zacotus matthewsii* Lec. Victoria, B.C., Feb. 20, (Harvey).
1,081. *Harpalus amputatus* Say. Vernon, Aug. 18, (Harvey). New to British Columbia.
1,102. *Harpalus innocuus* Lec. Vancouver, May 1, (Harvey).
1,404. *Matus bicarinatus* Say. St. Lambert, Que., Aug., (Chagnon).
1,465. *Rhantus notatus* Fab. Winnipeg, Sept. 11, (Wallis).
1,467. *Rhantus tostus* Lec. Winnipeg, July 24, Aug. 8, (Wallis).
1,482. *Dytiscus hybridus* Aubé. Winnipeg, May 24, (Wallis).
1,483. *Dytiscus verticalis* Say. Mahone Bay, N.S., May 20, (Miss Blanche Colp). Record sent by Dr. C. A. Hamilton, of Mahone Bay.
1,485. *Dytiscus sublimbatus* Lec. Winnipeg, May 8, (Wallis).
1,486. *Dytiscus marginalis* L. Winnipeg, May 8, (Wallis).
1,499. *Graphoderes cinereus* L. Winnipeg, July 4, (Wallis).
1,585. *Hydrophilus ovatus*, G. & H. Ottawa, at light, May 12, (Fletcher).
1,629. *Philhydrus bifidus* Lec. Winnipeg, Aug. 20, (Wallis).
2,627. *Tachinus crotchii* Horn. Vancouver, March 23, (Harvey).
3,074. *Mysia hornii* Cr. Vernon, (Venables).
3,076. *Anatis rathvoni* Lec. Victoria, April 11, (Harvey).
3,402. *Triphyllus humeralis* Kirby. Found in large numbers, near Montreal, in fungus, early May. Mr. Fall tells me that this belongs to the Malandryidæ and should be transferred to that family, (Chagnon).
Exoma pleuralis Casey. Metlakatla, B.C., (Keen).
4,001. *Helodes apicalis* Lec. Vancouver, April 14, (Harvey).
4,011. *Cyphon brevicollis* Lec. Wellington, April 17, (Harvey).
4,029. *Stethon pectorosus* Lec. Ste. Anne de Bellevue, Que., several found by Mr. Swain and me, in July, under bark of fallen tree, (Chagnon).
4,068. *Sarpedon scabrosus* Bonv. Vancouver, (Harvey). New record for British Columbia. Two specimens of this rare beetle were taken many years ago at Ottawa, (Harrington and Fletcher).
4,105. *Cardiophorus fenestratus* Lec. Vancouver, April 28; Victoria, July 8, (Harvey).
4,440. *Corymbites protractus* Lec. Vancouver, April 28, (Harvey). New to British Columbia.
4,450. *Corymbites tarsalus* Melsh. Vancouver, April 27, (Harvey). New record.

4,506. *Asaphes oregonus* Lec. Goldstream, July 4, (Harvey).
4,568. *Chalcophora angulicollis* Lec. Near Princetown, B.C., July 23, (Harvey).
5,467. *Aegiolia cylindrica* Esch. Vancouver, April 14, (Harvey).
5,528. *Aphodius granarius* L. Vancouver, May 9, (Harvey). New record.
5,923. *Cremastochilus pilosicollis* Horn. Vernon, in ants' nests in early spring, (Venables).
6,174. *Calloides nobilis* Say. Wakefield, Que., on oak, July 7, (Gibson).
6,223. *Desmocerus cribripennis* Horn. Hope Mts., B.C., July 17, (Sherman).
6,246. *Toxotus obtusus* Lec. Vernon, (Venables).
6,323. *Leptura instabilis* Hald. Vernon, on lupin, June, (Venables).
6,323*a*. *Leptura convexa* Lec. Vernon, on lupin, June, (Venables).
6,340. *Leptura quadrillum* Lec. Grouse Mt., Vancouver, B.C., July 9, (Sherman).
6,556. *Zeugophora consanguinea* Cr. Vernon, (Venables).
Acanthocinus ædilis S. A specimen of this fine European beetle was found at Ottawa among some packing in a box of chinaware received from Germany, (R. B. Whyte).
6,560. *Syneta simplex* Lec. Vancouver, Aug. 2, (Harvey). New record for British Columbia.
6,968. *Haltica evicta* Lec. Nicolum R., B.C., July 13, (Harvey).
6,988. *Epitrix subcrinita* Lec. Vernon, (Venables).
7,396. *Cœlocnemis dilaticollis* Mann. Penticton, B.C., (Mrs. Fowler). Record sent by Mr. Wallis.
7,721. *Rhinosimus æneirostris* Mann. Vancouver, April 14, (Harvey).
7,724. *Calopus angustus* Lec. Duncans, in a spider's web, March 15, (Hanham).
8,158. *Cantharis sphæricollis* Say. Princetown, B.C., July 22, (Harvey).
8,438. *Lepyrus geminatus* Say. Hope Mts., July 21, (Harvey).
8,543. *Erycus puncticollis* Lec. Under rotten logs on shore of Long Lake, March 31; on leaves of wild raspberry, same place, May 24, (Venables).
9,942. *Hister umbrosus* Casey. Vernon, under carrion, (Venables).
9,944. *Hister electus* Casey. Wellington, July 2, (Harvey). New record.
11,073. *Cryptorhynchus lapathi* L. Durndurn, Sask., in Carolina poplar. end May, (Dr. W. A. Wilson).

Diptera.

(Arranged according to a Catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI., No. 1,144. The numbers refer to the pages of the catalogue.)

92. *Eriocera longicornis* Walk. Mamamattawa River, Hudson Bay Slope, June 21; Little Current River, Hudson Bay Slope, July 8; Nagagami River, Hudson Bay Slope, June 20, (Wilson).
Anopheles occidentalis D. & K. Negagami R. 7th portage, June 7, (W. J. Wilson).
131. *Aedes sylvestris* Theob. Ottawa, June 20, 1901; June 18, 19, 1906, (Fletcher).
Aedes riparius, D. & K. Winnipeg, (F. Knab); Ottawa, June 11, (Fletcher).
Aedes campestris D. & K. Regina, June 14, 15; Carnduff, May 28; Qu'Appelle, June 9, (Willing).

131. *Culex restuans* Theob. Ottawa, Aug., Sept., (Fletcher).
133. *Tæniorhynchus perturbans* Wlk. Ottawa, June 20, July 1, (Fletcher).
167. *Dilophus breviceps* Loew. Mamamattawa River, June 21, (Wilson).
169. *Simulium bracteatum* Coq. Vancouver, April 24, (Harvey).
196. *Chrysops discalis* Will. Maple Creek, Sask., June 12, (Willing).
Chrysops lupus Whitney. Youghall, N.B., July 27, (Fletcher).This is of interest as it had not been taken so far east before, (J. S. H.).
202. *Tabanus carolinensis* Macq. Ottawa, May 20, (Fletcher).
203. *Tabanus epistates* O.S. Meach Lake, Que., near Ottawa, June 18, (Fletcher).
204. *Tabanus illotus* O.S. Megiskon River, Ont., July, (Wilson).
204. *Tabanus insuetus* O.S. Prince Albert, Sask., July 27, (Fletcher).
Tabanus osburni Hine. Banff, Aug. 2, (Fletcher).
206. *Tabanus punctifer* O.S. Vernon, July 11, (Venables).
207. *Tabanus septentrionalis* Loew. St. Albert, Alta., July 20, (Fletcher).
217. *Atherix variegata* Walk. Mamamattawa River, June 21, (Wilson).
Cophura albosetosa Hine. Hope Mts., B.C., July 19; Similkameen, July 20, (Harvey and Sherman).
Anthrax harveyi Hine. Hope Mts., July 20-23, (Sherman and Harvey).
236. *Bombylius lancifer* O.S. Bowen Island, Vancouver, B.C., May 24, reported by R. V. Harvey. First record for Canada, (J.S.H.).
236. *Bombylius metopium* O.S. Hope Mts., July, (Harvey). First record for Canada, (J.S.H.).
281. *Machimus avidus* Van der Wulp. Victoria, July 22, (Harvey). First record for Canada, (J.S.H.).
282. *Asilus angustifrons* Will. Goldstream, Vancouver Island, Aug, 20, (Harvey). First record for Canada, (J.S.H.).
347. *Chrysotoxum derivatum* Walk. Hope Mts., July 20, (Sherman).
348. *Chrysotoxum ypsilon* Will. Banff, Alta., one specimen, (Sanson). I recently recorded the first record for Canada from a specimen taken at Kaslo, B.C., in 1903, by Dr. Dyar. This Banff record is the first east of the Great Divide, and bears testimony to what I have written once or twice, that the various species of insects find distribution over the Divide much easier in Canada than in the Rockies further South. (R.C.O.).
361. *Melanostoma kelloggi* Snow. Mer Bleue, near Ottawa, June 19, (Fletcher).
Xanthogramma tenuis Osburn. Ottawa, Sept., (Fletcher). This is an exceptionally good find, (R.C.O.). The species was described in Can. Ent., Jan.; '08, from a specimen taken in the Hope Mts., by Mr. R. V. Harvey.
367. *Syrphus pauxillus* Will. Gabriola Island, B.C., June 6, (B. R. Elliott).
Syrphus insolitus Osburn. Victoria, one pair, April 18, (Harvey).
385. *Eristalis compactus* Walk Banff, one specimen, (Sanson). Only one previous record for Canada, at Martin Falls, the type, (R.C.O.).
387. *Eristalis occidentalis* Will. Regina, June 18, (Willing). Much farther east than ever before recorded. I have specimens from Banff, the farthest eastern record previously, (R.C.O.).

389. *Eristalis transversus* Weid. Little Current River, July 16, (Wilson).

400. *Chrysochlamys cræsus* O.S. Victoria, B.C., July 1, one specimen, (Hanham); Goldstream, B.C., July 4, (Harvey). I recently published the first record for Canada based on a specimen taken by Harvey at Victoria, 8, VI., '06, (R.C.O.).

Specomyia occidentalis Osburn. Gabriola Island, June 6, (B. R. Elliott).

572. *Helomyza limbata* Thom. Grouse Mt., July 9, (Sherman). First record for Canada, (J.S.H.).

Hymenoptera.

In last year's Record mention was made of some Bombi which had been determined by Mr. H. J. Franklin. During the past year further collections of these insects have been examined by Mr. Franklin, and from a complete list of the species named by him, the following are thought worthy of mentioning here. Unfortunately, little work seems to have been done in the important order of hymenoptera in Canada during the year, consequently very few other records have been received.

Bombus praticolus Kirby. St. Albert, Alta., (Fletcher); Metlakatla, B.C., (Keen).

Bombus mixtus Cress. Metalakatla, (Keen); Mt. Cheam, B.C., (Fletcher); Banff, Alta., (Sanson).

Bombus appositus Cress. Kelowna, B.C., (Fletcher).

Bombus edwardsii Cress. Mt. Arrowsmith, B.C., Duncans, B.C., (Fletcher); Banff, (Sanson).

Bombus kirbyellus Curtis. Bartlett Bay, Alaska, at sea level, (Nelles). One of the rarer species (H.J.F.).

Bombus borealis Kirby. Beaver Lake, Alta., (Halkett). Not a very common species, (H.J.F.).

Bombus sitkensis Nylander. Mt. Cheam, (Fletcher); Skagway District of Northern British Columbia, (G. White-Fraser).

Bombus californicus Smith. Olds, Alta., (Willing); Duncans, (Fletcher). Not very common in western Canada; not present in eastern Canada, (H.J.F.).

Bombus nigroscutatus Franklin MS. Skagway District of Northern British Columbia, (G. White-Fraser). Apparently rare in Western Canada; not present in eastern Canada, (H.J.F.).

Bombus terrestris, var. *moderatus* Cress. Banff. (Sanson). Rare in Western Canada; not present in the east, (H.J.F.).

Bombus couperi Cress. Nepigon, (Fletcher); Anticosti, (Dr. Jos. Schmitt). One of the rarer species, (H.J.F.).

Bombus rufocinctus Cress. Ottawa, Sept. 20, (Fletcher); Radisson, Sask., (Fletcher). This species is rare in eastern Canada, and extremely variable in colouration, (H.J.F.).

Bombus vagans Smith. Rostrevor, Muskoka, Ont., Sept., (Gibson); Regina, Sask., Banff, (Fletcher); Westbourne, Man., Aug. 26, (Wallis).

Bombus virginicus Oliv. Mer Bleue, near Ottawa, June 6, (Gibson).

Psithyrus consultus, Franklin, MS. Nelson, B.C., Mt. Cheam, Regina, (Fletcher).

Psithyrus suckleyi, Greene, Duncans, Banff; Mt. Arrowsmith, (Fletcher).

Prosopis basalis, Smith. Winnipeg, June 10, (Wallis).

Pompilus terminatus, Say. Penticton, B. C., Aug., (Miss B. Farmer).
Ichneumon feralis, Cress. Winnipeg, Aug. 23, (Wallis).
Ichneumon caliginosus, Cress. Westbourne, Man., Aug, 24, (Wallis).
Ichneumon acerbus, Cress. Treesbank, Man., April 17, (Wallis).
Rhyssa persuasoria, L. Hymers, Ont., Sept. 6, (Dawson).
Ephialtes gigas, Walsh. Hull, Que., June 13, (Gibson).
Thyreodon morio, Fab. Stonewall, Man., July, (Wallis).
Macrophya oregona, Cress. Hope Mts., July 17, (Harvey).
Tenthredo melanosoma, Hartg. Hope Mts., July 17, (Harvey).

Hemiptera.

Several collectors have, during the year, given special attention to the hemiptera. Most of the species mentioned below were identified by Mr. E. P. Van Duzee. The Ottawa species, probably none of which are very rare, are included as they are the only records we have for the district.

Telamona reclivata, Fitch. Ottawa, July 14, (Metcalfe); Sept. 2, on basswood, (Groh)..
Telamona ampelopsides, Harr. Ottawa, July 14, (Gibson).
Cyrtolobus vau, Say. Ottawa, June 29, on red oak, (Fletcher).
Cyrtolobus griseus Van D. Ottawa, on oak, Aug. 25, (Metcalfe).
Scolops sulcipes, Say. Ottawa, Sept. 5, on Goldenrod, (Groh).
Liburnia foveata, Van D. Mer Bleue, near Ottawa, June-Sept., (Metcalfe).
Aphrophora signoretii, Fitch. Regina. Sask., Aug. 8, (Fletcher).
Bythoscopus pruni, Prov. Ottawa, June 21, (Gibson).
Gypona flavilineata, Fitch. Ottawa, Sept. 7, (Gibson).
Gypona scarlatina, Fitch. Wakefield, Que., July 7, (Gibson).
Gypona albosignata, Uhl. Trenton, Ont., Sept. 1, (Evans).
Deltocephalus abdominalis, Fab. Near 60 Mile River, along 141 Meridian, Yukon Territory, (P. Reilly).
Phlepsius irroratus, Say. Ottawa, Oct. 8, (Fletcher).
Athysanus extrusus, Van D. N.W.T., 1881, (John Macoun); record sent by J. D. Evans.
Dorycephalus platyrhynchus, Osborn. Aweme, Man., July 13, (Fletcher).
Typhlocyba bifasciata, G. & B., Ottawa, June 22, (Gibson).
Cicadula 6-notata, Fall. Ottawa, on aster, Aug. 31, (Fletcher).
Thyreocoris unicolor, P. B. Aylmer, Que., in pappus of *Sonchus arvensis*, Aug. 29, (Groh).
Eurygaster carinatus, Van D. Vernon, B. C., June 6, (Venables).
Carpocoris remotus, Harvath. Vernon, Aug. 12, (Venables).
Brochymena affinis, Van D. Peachland, B. C., June 27, (Wallis).
Leptoglossus occidentalis, Heidemann MS. Vernon, B.C., Sept. 27, (Venables).
Nysius scolopax, Say. Vernon, (Venables).
Geocoris decoratus, var. *solutus* Mantodon. Ottawa, June 4, (Fletcher).
Geocoris limbatus, Stal. Mer Bleue, near Ottawa, uncommon, (Metcalfe).
Geocoris uliginosus, var. *limbatus*, Stal. Vernon, Sept. 4, (Venables).
Lygus monachus, Uhl. Ottawa, on basswood, July 1, (Metcalfe).
Lygus tenellus, Uhl. MS. Ottawa, on basswood, June 25, (Gibson).
Lygus invitus, Say. Ottawa, on basswood, June, (Metcalfe).
Calocoris bipunctatus, Fab. Annapolis Royal, N.S., (V. A. Eaton).

Neoborus pettiti, Uhl. MS., Ottawa, on white ash, Aug., (Metcalfe).

Neoborus saxeus, Dist. Ottawa, on white ash, Aug., (Metcalfe).

Plagiognathus obscurus, Uhler, Aylmer, Que., near Ottawa, Aug. 29, (Groh).

Triphleps tristicolor, White. Ottawa, Dec. 6, (Fletcher).

Gerris sulcatus, Uhl. Beaver Meadow, Hull, Que., May; Toronto, April, (Metcalfe).

Gerris rufoscutellatus, Latr. Ottawa, May; Toronto, April 1, (Metcalfe).

Acanthia ligata, Say. Little Current River, Hudson Bay Slope, July 11, (Wilson).

Corythuca marmorata, Uhl. Ottawa, rare, June, (Metcalfe).

Microvelia americana, Uhl. Beaver Meadow, Hull, May, (Metcalfe).

Acanthia humilis, Say. Ottawa, (Metcalfe).

Acanthia confluens, Say. Ottawa, (Metcalfe).

Acanthia reperta, Uhl. Ottawa, (Metcalfe).

Acanthia signoretii, Guer. Ottawa, (Metcalfe).

Ranatra quadridentata, Stal. Pickerel point on Ottawa River, near Ottawa, July, (Metcalfe).

Ranatra kirkadyi, Bueno. Ottawa, (Metcalfe).

Hydrometra martini, Kirby. Ottawa River, Pickerel Point, July, (Metcalfe).

Orthoptera.

During the year some good work has been done in this important order. Dr. E. M. Walker writes: "I have examined some 800 specimens from the Prairie Provinces and British Columbia, collected chiefly by Messrs. T. N. Willing and N. Criddle, Prof. W. J. Alexander and the late Dr. Fletcher. These will form the basis of a paper which I have about completed. Besides this material I have yet to report on collections made at Go Home, Georgian Bay, the Temagami region, Fort William and Nepigon, Ont."

The following records have been sent in by Dr. Walker as worthy of being included here:—

Nomotettix cristatus (Scudd.). Go Home, Georgian Bay, June-July, 1907, (Walker).

Tettix acadicus, Scudd. Temagami, Sept, 1908; Fort William, Aug. 1907, 1 female (Walker); Aweme, Man., May-June, 4 males, 5 females (Criddle).

Tettix brunneri, Bol., Temagami, Sept., 1908, 1 male, long-winged, (Walker).

Platybothrus brunneus, (Thom.). Regina, Sask., June 5, 1903, 1 male, (Willing).

Encoptolophus parvus, Scudd. Aweme, Sept. 6, 1907, 1 male, (Criddle); Walsh, Sask., Aug. 23, 1901, 4 males, 12 females; Regina, Sept. 19, 1903, 1 female, (Willing).

Hippiscus neglectus, (Thom.). Aweme, July 14, 1904, 2 females, (Criddle).

Circotettix undulatus, (Thom.). Cowley, Sask., July 29, 1901, 1 female; Medicine Hat, Oct. 1, 1903, 1 female, (Willing).

Circotettix carlinianus, (Thom.). Maple Creek, Sask., Aug. 2, 1902, 1 female, (Willing).

Melanoplus angustipennis, (Dodge.). Aweme, Aug. 18, 1906, 1 male, (Criddle).

Melanoplus angustipennis coccineipes, Scudd. Aweme, July, Aug., Oct., 1904-07, 4 males, 1 female, (Criddle).

Melanoplus foedus, Scudd. Swift Current, Sask., Aug. 5, 1901, (Willing).

Phoetaliotes nebrascensis, (Thom.). Walsh, Sask., Aug. 23, 1901, 1 short-winged female, teneral, (Willing).

Oecanthus quadripunctatus, Beut. Aweme, Aug-Sept., 1904, 2 males, 2 females, (Criddle).

ODONATA.

Some interesting collections of these insects have been made in 1908, and much material collected in previous years, has been gone over and carefully identified. Dr. E. M. Walker has been most helpful in naming material, and we are all very grateful to him for his continued kindnesses. Dr. Walker says: "In the Odonata, about 400 specimens from the Prairie Provinces have been examined. These were taken by Messrs. Willing, Criddle, Alexander, Fletcher, and Wallis. A list of these will give a fair idea of the Odonata fauna of this region, which is at present a *terra incognita* in this order. A considerable number of species was also collected by Mr. A. G. Huntsman, of the Biological Department, University of Toronto, at the new marine Biological Station on Vancouver Island, B.C. A good deal of material from the East has also been gone over. It comprises collections from the vicinity of Sault Ste. Marie, belonging to Mr. E. B. Williamson, of Bluffton, Ind., from Georgian Bay, Fort William, Nepigon and Temagami, made by the writer, and from Youghall, New Brunswick, by Mr. Arthur Gibson."

Dr. Walker has provided the following records:—

Lestes congener, Hagen. Aweme, Man., Aug. 29, 1907, 1 male, (Criddle); Westbourne, Man., July-Aug., 5 males, 6 females, (Wallis).

Nehalennia irene, Hagen. Westbourne, Man., July 27-29, 1908, 1 male, 2 females; Winnipeg, July 7, 1908, 1 male, 1 female, (Wallis).

Agrion lunulatum, Evans. Aweme, July 4, 1905, 1 male, (Criddle); Winnipeg, July 6, 1908, 1 male, (Wallis); Carnduff, June 18, 1905, 1 male; Regina, 2 males, 1 female, (Willing). This is the first time this Old World species has been reported from North America. I had thought it a new species, but Mr. K. J. Morton, of Edinburgh, Scotland, who has specimens from Redvers, Sask., pointed out to me its true relationship. The Canadian specimens differ slightly from European ones with which they have been compared and may be distinct, but more material will be necessary to determine the point (E. M. W.).

Agrion resolutum, Hagen. Youghall, N.B., July 20, 1908, 1 male, (Gibson); Little Carp River, Algoma, Ont., June 29, July 6, 1907, 5 males, 2 females, (Donaldson); Winnipeg, Man., July 7, 1908, 1 male, (Wallis).

Enallagma civile, Hagen. Winnipeg, July 9, 24, 1 male, 1 female, (Wallis).

Aeshna sitchensis, Hagen. Westbourne, Aug. 19, 1 male, (Wallis).

Aeshna constricta, Say. Westbourne, July 29, Aug. 26, 1 male, 3 females. This is the extreme northwestern limit of this species' range, so far as known, (E. M. W.).

Somatochlora forcipata, Scudd. Silver Creek Falls, Algoma, July 9, 1907, 1 male, (Donaldson).

Cordulia shurtleffi, Scudd. Silver Creek Falls, July 9, 1907, 1 male, (Donaldson); Youghall, N.B., July 18, 1 male, (Gibson).

Leucorhinia borealis, Hagen. Aweme, July 15, 1907, 1 female, somewhat teneral, (Criddle). This species is but little known and is represented in very few collections. The determination was verified by Dr. Calvert, (E. M. W.).

Neuropteroid Insects. (Except Odonata.)

During the year some small collections of neuropteroid insects have been submitted to specialists. The names of some of the species have been received; others have not yet been reported upon. The species mentioned as having been collected by Mr. W. J. Wilson, of the Geological Survey, Ottawa, were taken in the Hudson Bay Slope, and, through the courtesy of Dr. L. O. Howard, have been recently identified by Dr. Nathan Banks, who also examined Mr. Wallis' specimens. The numbers below refer to the pages in Dr. Banks' catalogue published in 1907 by the American Entomological Society.

Archiptera.

10. *Pteronarcys regalis* Newm. Winnipeg, June 1, (Wallis).
11. *Isogenus frontalis*, Newm. Kabina Kagami River, Aug. 1, (Wilson).
13. *Isoperla bilineata*, Say. Little Current River, July 16, (Wilson).
13. *Isoperla ebria* Hag. Treesbank, Man., June, (E. Ellis).
14. *Nemoura perfecta*, Walk. Little Current River, July 20, (Wilson).
15. *Capnia vernalis*, Newp. Mamamattawa River, June 21, (Wilson).

Neuroptera.

21. *Chauliodes californicus*, Walk. Kaslo, B.C., July 27, (Cockle).
22. *Sialis infumata*, Newm. Little Current River, July 16, (Wilson); Norman, Ont., July 19, (Wallis).
33. *Panorpa rufescens* Ramb. Winnipeg, July 1, (Wallis).
34. *Boreus californicus*, Pack. Kaslo, on snow, (Cockle), Banff, (Sanson).

Tricoptera.

35. *Phryganea improba*, Walk. Westbourne, Man., Aug. 5, (Wallis).
36. *Glyphotælius hostilus*, Hag. Kabina Kagami River, Aug. 1, (Wilson).
36. *Limnephilus indivisus*, Walk. Westbourne, Aug. 17, (Wallis).
36. *Limnephilus extractus*, Walk. Westbourne, Aug. 20, (Wallis).
Limnephilus moestus, Banks. Westbourne, Aug. 20, (Wallis).
37. *Limnephilus ornatus*, Banks. Winnipeg, June 19, (Wallis).
37. *Anabolia bimaculata*, Walk. Westbourne, Aug. 1, (Wallis).
37. *Colpotaulius medialis*, Banks. Westbourne, Aug. 20, (Wallis).
37. *Colpotaulius perpusillus*, Walk. Westbourne, Aug. 20, (Wallis).
38 *Pycnopsyche similis*, Banks. Kabina Kagami R., Aug. 11, (Wilson).
42 *Brachycentrus fuliginosus*, Walk. Nagagami R., Station 52, June 23, (Wilson).
45. *Leptocerus resurgens* Walk. Westbourne, Aug. 1, (Wallis).
46. *Œcetina avara* Banks. Westbourne, July 28, (Wallis).
47 *Hydropsyche cockerelli*, Banks. Nagagami R., June 6, (Wilson).

ARANEIDA.

Among some insects brought back from the Hudson Bay Slope in 1903 by Mr. W. J. Wilson, of the Geological Survey, Ottawa, was a small collection of spiders. These have recently been kindly named by Dr. Banks, through Dr. Howard. Owing to the northern locality at which the specimens were collected the list is given in full.

Epeira silvatica, Em. Kabina Kagami River, Aug. 11.
Epeira patagiata, Clerck. Mamamattawa River, June 21.
Gnaphosa conspersa, Th. Nagagami River, June 15.
Amaurobius bennetti, Blk. Nagagami R., June 6.
Tetragnatha extensa, L. Little Current River, July 16.
Lycosa pratensis, Emer. Kabina Kagami River, Aug. 11.
Lycosa kochi, Keys. Kenogami River, July 2.
Agræca pratensis, Emer. Kabina Kagami River, Aug. 9.
Agalena nævia, Htz. Little Current River, July 17.

INSECTS OF THE YEAR 1908 AT OTTAWA.

By Arthur Gibson, Central Experimental Farm, Ottawa.

The season of 1908, at Ottawa, has been a remarkable one, owing to the long continued drought. The months of June, July, August and September were particularly dry, the rain fall from the end of May till the beginning of October being only 6.80 inches. Vegetation consequently suffered very severely, but insects were more plentiful than usual and some serious outbreaks occurred.

Early in the season Cankerworm larvæ were abundant, their attacks being specially noticed on basswood, beech and birch. These insects seem to be on the increase again. The injury ceased about the 15th June, after which date very few caterpillars were noticed.

The American Tent Caterpillar, *Malacosma americana*, Fab., is also on the increase. On May 16th the work of the young caterpillars was very conspicuous on many trees near the city. On May 30th a large number of the nests were noticed at Chelsea, Que., about 7 miles from Ottawa. At that date some small wild cherry trees were almost stripped of their foliage.

On the same date at Chelsea, I found a nest of caterpillars of *Archips fervidana* on red oak. The nest was rather conspicuous, being several leaves drawn together somewhat in the shape of a ball. The caterpillars were all inside. This insect is better known in the United States where it has been recorded as destructive to several kinds of oak. In the Ottawa district it has never appeared commonly. When mature the caterpillar is nearly an inch long, of a yellowish-green colour, with the head and thoracic shield black. Moths from the above larvæ emerged on July 20th.

The Turnip Flea Beetle, *Phyllotreta vittata*, Fab. This small, very active, shining, black beetle was very troublesome in many gardens. The beetles did much harm to young turnips and were also very destructive to the first sowing of radishes. Where Paris green and land plaster, or Paris green and flour, were dusted on the plants, one pound of the former to 20 of the latter, the injury was soon stopped.

Root Maggots were more abundant than in 1907. The flies of the Radish Maggot were noticed flying around the young plants on May 16th. About the middle of June many plants examined were seen to be infested.

Unfortunately there is nothing new in the way of a remedy, that we know of, for these very destructive insects. For radishes preparations con-

taining carbolic acid, applied once a week after the plants appear above ground, until they are ready for the table, have given about the best results.

The Hessian Fly, *Mayetiola destructor*, Say., was present, in the district, in destructive numbers in spring wheat. Plants were noticed to be infested about the end of May, and in some places the attack was quite serious. On the Central Experimental Farm, in fields where the soil was poor and where the unfavourable weather conditions had weakened the plants, probably as many as 50% were infested by the Hessian Fly. In other fields where the soil was better, the plants were stronger and better able to withstand the unfavourable conditions of the season, and in these fields the loss from Hessian Fly would amount to about 5%. From collected material, both sexes of the flies emerged in the Division on June 20th, 22nd and 23rd.

For some years we have noticed at Ottawa, that the young leaves of spinach were fastened together at the tips of the shoots by a small lepidopterous larva. This year we made some observations on the insect and were successful in rearing the moths, specimens emerging on July 18th. It is one of the micros and we hope soon to have its determination. During the present year the insect was particularly abundant, and in my own garden, and one or two others which I visited, it practically rendered every plant unfit for use.

Sparganothis flavibasana, Fern. This interesting and rare tortrix was again destructive to the Caprifolium group of Loniceras in the Arboretum and Botanic Garden of the Central Experimental Farm. The larvæ were quite numerous on some of the bushes. In 1907, however, they were in much greater numbers and did very noticeable damage. The caterpillar draws together the upper pair of leaves, fastening the same along the edges, so that the newly formed berries and itself are within this tent-like structure. Their presence on a bush is thus easily detected. The injury is done chiefly to the cluster of young berries, or immature fruit, which is eaten, and among which the caterpillar makes a web of whitish silk. In 1907, the larvæ were plentiful on June 19th, and many specimens were collected by Mr. Kearfott and me, from which moths were reared on July 2nd to July 6th. This year larvæ were collected on June 6th, from which we got moths on June 27, 29, 30 and July 9. Pupæ were also found where the larvæ had been feeding. When mature the caterpillar is 15 mm. long when at rest, 17 mm. long when extended. It is cylindrical in shape, bright apple green in colour, and the segments are wrinkled. Dorsal vessel distinct. No markings on the skin. The head is black and shining. The thoracic shield is black, margined in front with white. Tubercles on body are inconspicuous, each bearing a single pale, slender, hair. The feet are all concolorous with the body.

Eriophyes species. The small pocket galls of the genus *Eriophyes* were very noticeable during the past season. The foliage of elm, basswood, maple and wild cherry were particularly disfigured by the work of these mites. Basswood trees were examined on June 12th and were found to be heavily infested by *Eriophyes abnormis*, Garm. Quite a few of the galls were on the under side of the leaves. The leaves of the soft maples, at Ottawa, have been much disfigured of late years by the galls of *Eriophyes quadripes*, Shimer.

At an excursion of the Ottawa Field-Naturalists' Club, held to the Mer Bleue, and nearby vicinity, on June 20, some interesting material was collected. The Mer Bleue is an extensive peat bog, about 12 miles from Ottawa, and is one of the best hunting grounds which we have in the district. The small, curious caterpillars of the plume moth, *Pterophorus eupatorii*, Fern.,

were found in numbers feeding on the leaves of the Joe Pye Weed, *Eupatorium purpureum*, L., and in some pasture fields the Hard Hack, *Spiræa tomentosa*, L., was seen to be badly infested by a cecidomyid. Many of these plants were entirely covered by these galls. Since, the small fly has been reared and specimens have been determined by Dr. E. P. Felt, as *Rhabdophaga salicifolia*, a species which has been found abundant in Massachusettes and New York on the above plant and also on the Common Meadow-sweet, *Spiræa salicifolia*, L. A single worn specimen of the rare butterfly, *Argynnis triclaris*, Hbn., was taken in the Mer Bleue by Mr. Young. On June 9th three fine examples of this insect were captured in the bog, one by Mr. Criddle, one by Mr. Young, and the other by the writer. Dr. Fletcher has, once or twice previously, collected this butterfly at the Mer Bleue, which is probably the most southern locality known for this insect.

The Fall Webworm, *Hyphantria textor*, Harr., was particularly abundant all over the district. Their conspicuous nests were present in large numbers on willow, maple, elm, birch, apple, hawthorn and wild cherry. On July 25th the caterpillars were about half an inch in length and a little over a week later they were nearly an inch long. It is a pity, and a disgrace to every one who has trees, that this insect is allowed to increase to such an extent and render trees so unsightly by the conspicuous nests made by the larvæ. It is a simple matter for hundreds of owners of trees to cut off these nests when they are first noticed, and trample upon the caterpillars under foot.

The Snow-white Eugonia, *Ennomos subsignarius*, Hbn. On the evening of July 23rd last, enormous numbers of these moths appeared in all parts of the city, being attracted to the electric lights. An account of this visitation is given in the *Ottawa Naturalist*, September, 1908. The large numbers of these insects present on that evening caused a good deal of comment. Some of the electric light poles and the sides of buildings were literally covered with the moths and looked as if they had been whitewashed, or given a coat of white paint. The sparrows of the city had a great feast early the following day. Next morning the wings of the insects were to be seen all along the main streets. At the entrance to some of the larger buildings, the wings were so numerous that some little time had actually to be taken to sweep them away. In Dr. E. P. Felt's valuable report for 1907, which has just come to hand, it is stated that the caterpillars of this moth were found in immense numbers defoliating beech trees in Ulster County, New York, during the summer of that year. Possibly they were present in large numbers in other districts. These caterpillars when seen, were mostly mature, and were pupating by July 26th. Moths from these larvæ emerged soon afterwards and eggs were deposited. The insect, therefore, has been steadily increasing for the last two or three years. No caterpillars have been seen in the Ottawa district during the present season, and it would be most interesting to know where all the moths came from. Their sudden great abundance was certainly remarkable. According to the meteorological observations taken at the Central Experimental Farm, by Mr. W. T. Ellis, there were no strong winds at Ottawa during the week beginning July 19th, nor in fact during the week previous to that. The prevailing winds from July 19th to July 25th were south and southwest, but the word "calm" in Mr. Ellis' report signifies that there was practically no wind blowing when the records were taken. During the whole week above mentioned the number of miles recorded is only slightly over 191, while the average of wind for a week is over 900. Of course, the upper currents may have been very much stronger.

The occurrence of the Apple Leaf Hopper, *Empoasca mali*, LeB., in such enormous numbers was undoubtedly the most notable outbreak of the year in Eastern Ontario. At Ottawa injury was done chiefly to potatoes, although beans and other vegetables were severally attacked. The presence of the insects in destructive numbers was noticed towards the end of June, and the injury continued throughout the summer. These insects, which are pale green in colour, slender, about an eighth of an inch in length when mature, feed on the under sides of the leaves by sucking the juices out of the plants. When they are young and before they have developed wings, they can be destroyed by spraying the infested crop with whale oil soap, one pound in five gallons of water, or with the ordinary kerosene emulsion. Some potatoes which were sprayed early in July, before the young leaf hoppers acquired their wings, were freed from the pest, and were not since injured to any appreciable extent. The severity of this outbreak has been much aggravated this season by the exceptional drought and heat, which weakened the plants, and made them more than usually susceptible to injury by the insects.

The Potato Flea-beetle, *Epitrix cucumeris*, Harr., was present in potato fields in the district in considerable numbers. On August 21st it was found to be abundant on potatoes on the Experimental Farm, working with the Apple Leaf Hopper, *Empoasca mali*. This flea-beetle is sometimes, in hot dry seasons, one of the worst enemies of the potato. Dr. Fletcher recommends spraying the vines with Bordeaux mixture, as this treatment has given far better results than spraying with Paris green.

In early August the Destructive Pea Aphis, *Nectarophora pisi*, Kalt., did severe injury to sweet peas in gardens. The plant lice were present in large numbers and from specimens collected later, a number of parasites of the genus *Praon* were reared. The parasitized plant lice were rather numerous on the vines. Field peas near Ottawa were also much attacked by this pest, several complaints of very serious injury being received at the Division.

Other kinds of plant lice were much in evidence during the season. Apple trees were badly infested by the Apple Aphis. Some young trees examined on August 12th were practically covered with the aphides. Some seedlings were sprayed on August 8th with whale oil soap, 1 lb. to 4 gallons of water, and with the ordinary kerosene emulsion, but neither of these mixtures killed all of the insects. The kerosene emulsion did the better work. Vegetable marrows were much reduced in vitality by the attacks of an aphis. Towards the end of the season, Swede turnips, cabbages, and cauliflowers, were attacked by the Turnip and Cabbage Aphis. Early in October, celery plants were severely injured by plant lice, and many rendered useless. The Woolly Aphis of the Apple and the Woolly Aphis of the Alder were also more than usually abundant.

Cutworms, as usual, did much harm in some gardens early in the season. At East Templeton, near Ottawa, they destroyed many tobacco plants. Mr. Letourneau, of our office, who visited the locality early in August, reported to me that cutworms had been much complained of by the farmers of the district. A rather interesting occurrence of the Variegated Cutworm, *Peridroma saucia*, Hbn., was discovered in one of the greenhouses at the Central Experimental Farm, on August 24th. On September 1st, larvæ about ½ an inch long were brought into the Division. In all about 75 larvæ were collected, which had been found feeding on Primulas. No other plants were injured. In confinement they grew rapidly and buried on September 12th, 13th and 14th, the moths emerging in the office on October 20th and 22nd. (Fig. 31).

The caterpillars of the Small White Cabbage Butterfly, *Pontia rapæ*, L., were very troublesome in the Ottawa district during the past season, and many market gardeners complained of their ravages. The remedy of dusting the plants with pyrethrum insect powder, 1 lb. in 4 lbs, of cheap flour, after the whole has been mixed together and kept in a tight jar for 24 hours, is so simple that it is most remarkable that the annual loss by this insect is allowed to take place.

The Codling Moth, *Carpocapsa pomonella*, L., was injuriously present in many orchards in the district. A number of trees near the city were examined on August 12th, and it was estimated that about 25% of the apples on some of the trees were wormy.

The work of the Pear-tree Slug, *Eriocampa cerasi*, Peck., (Fig. 32), which does much harm to pears, cherries and plums, was noticed on plum trees on August 25th. Many of these slimy, greenish-brown, slug-like, larvæ were present on the trees and had done very apparent injury to the foliage. Specimens were found as late as October 5th feeding on the leaves. Spraying with any of the recognized poisonous mixtures, or dusting the trees at short intervals with freshly slaked lime, will destroy the larvæ.

Many householders complained of the ravages of the Clothes Moth. This insect was certainly very abundant in Ottawa during the past summer and did a great deal of damage to furs and woollen goods in houses. The best remedies for these insects are of a preventive nature. All articles liable to attack should be well shaken, brushed, and put away before the moths appear in the spring. As the caterpillars feed only on substances of animal origin, clothing, etc., to be protected may be wrapped tightly in linen, cotton or paper, and left in this way until required for autumn and winter use.

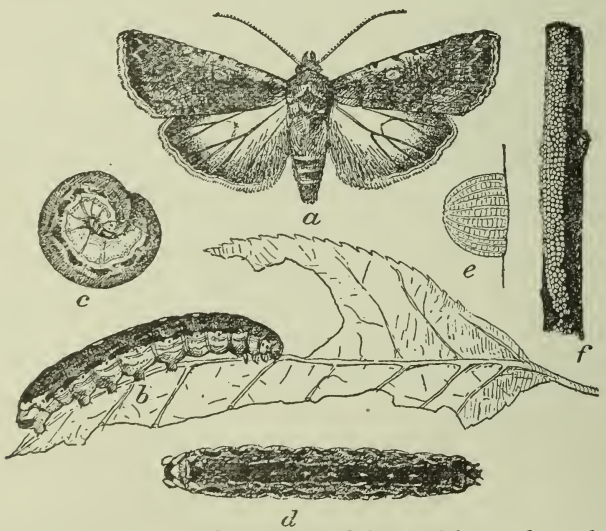


Fig. 31. *Peridroma Saucia; a*, moth; *b*, normal form of larva, lateral view; *c*, same in curved position; *d*, dark form, dorsal view; *e*, egg from side; *f*, egg mass on twig (after Howard, Division of Entomology, U. S. Dept. Agriculture).

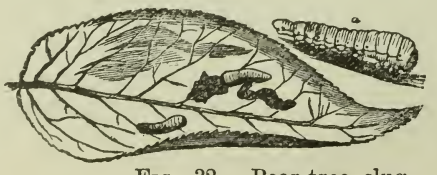


Fig. 32. Pear-tree slug.

PRESENT CONDITION OF THE WORK CONNECTED WITH THE IMPORTATION OF THE FOREIGN PARASITES OF THE GIPSY MOTH AND THE BROWN-TAIL MOTH.

By L. O. Howard, Washington, D.C.

In sending this paper to be read before the forthcoming meeting of the Entomological Society of Ontario, the writer assumes that the members of the Society, through the reports by Doctor Fletcher and through the reading of reports published by the Bureau of Entomology of the U. S. Department of Agriculture, as well as from the lecture delivered before the Society last year by Mr. A. H. Kirkland, are informed concerning the progress of this work down to the close of 1907, and what follows is supplementary to that information.

In the autumn of that year the parasite laboratory was moved from Saugus, Mass., to Melrose Highlands, Mass. The new location is much more accessible to Boston and to most of the field colonies of the parasites. The buildings, including several substantial structures built for laboratory purposes by the State of Massachusetts, are much beter fitted for the work. Upon the whole the results of the year's importations have been very promising.

In planning the work several new features have been introduced. The parasites that are constantly being sent over by agents belong to three main groups, namely those of the order Hymenoptera, including the Ichneumon flies, the Chalcis flies and others; those of the order Diptera, including the Tachina flies, and those of the order Coleoptera, including the predaceous ground beetles. The amount of material received has been so great, and the character of the different life histories of the insects involved has been so diverse that it has seemed of great importance to have a thoroughly trained expert, skilled in the biology of each group, placed in charge of each group. This has been done, and an expert has had charge of the Hymenoptera, another of the Diptera, and another of the Coleoptera.

Further, the condition of European sendings by mail and by express during the summer of 1907 was by no means uniformly good. The sendings from eastern Europe which are subject to long railway journeys in addition to the sea voyage, frequently arrived in bad condition. Therefore an innovation was made and a general laboratory depot was established at Rennes, France, under the general supervision of Mr. René Oberthür, and a skilled assistant, Mr. A. Vuillet, was placed in specific charge. Nearly all of the European sendings were shipped to Rennes, were examined, repacked, carried personally by Mr. Vuillet to Cherbourg or to Havre on the known days of sailing of certain steamers, then placed in the hands of the chief stewards of the vessels and carried in the cold room to New York where they were admitted without customs examination and sent direct to Boston. This method has resulted in a much beter average condition of the material received, and has facilitated the rapidity with which the work is being accomplished. The courtesy of the steamship officials is highly appreciated.

The third innovation has been an attempt to secure Japanese parasites of the gipsy moth. It has been known for some years that the true gipsy moth, or one of its varieties, or at least a most closely related species. occurs in Japan, though not in great numbers, and that it is apparently held in check by its parasites. Rev. H. Loomis, an American living in Yokohama, has repeatedly written to the State authorities of Massachusetts and to the

Chief of the Bureau of Entomology conveying this information, and attempts have been made by mail and otherwise to send these parasites to the United States, but without success. Later information received from one of the most skilled economic entomologists of Japan, Mr. Nawa, indicated that there exists in Japan an important egg-parasite of the gipsy moth. Remembering that the Massachusetts gipsy moth came originally from Europe it seemed altogether desirable to introduce first the European parasites, and it seemed probable that these would by themselves reestablish the balance of nature. Then too, the importation of the Japanese species seemed somewhat dangerous, on account of the chance that the Japanese Gipsy moth might prove even more voracious and destructive than the European moth; but, after consideration, it was thought best to leave no stone unturned and to neglect no chances in the search for effective parasites. The European service of collectors and agents and advisers had been well organized and instructed during three annual visits of the Chief of the Bureau to Europe, and it was therefore decided to interrupt the European trip for the present year and to send an agent to Japan. Professor Trevor Kincaid, of the University of Washington at Seattle, was chosen on account of his skill as a collector, his comparative proximity to Japan, and the fact that he is personally acquainted with many persons in Japan. He sailed on the 2nd of March, and the results of the expedition have more than justified the expense involved. A very large amount of parasitic material has been received from him in good condition at Boston, and very many parasites from Japan have been colonized in the woodlands of New England.

Still another decided innovation has been the carrying on of active winter work with parasites, especially those secured from imported nests of the brown-tail moth which began to come in from Europe in December. It was found quite possible to breed these parasites in artificially heated rooms, feeding them upon hibernating native brown-tail moth larvæ brought in in their nests from out of doors, feeding the latter upon lettuce and other hothouse foliage and in the early spring securing more normal food for them by sending it up in boxes by mail from Washington and points south. In this way the breeding of the parasites of the genus Pteromalus was carried forward uninterruptedly throughout the winter, and, as during the breeding of successive generations they multiplied exceedingly, it was possible later in the year to liberate a vastly greater number of individuals than would have been possible had the imported species been allowed to hibernate normally in the nests. In the course of this work Mr. W. F. Fiske, in charge of the breeding operations, has invented a rearing tray which has been of the utmost advantage and which will greatly facilitate parasite rearing work in the future.

Still a fifth innovation and one of great value has been the discovery and practice of retarding the development of brown-tail moth eggs by keeping them in cold storage until the arrival of the European egg-parasites which will oviposit upon and breed in these cold storage eggs as freely as those which they attack in the state of nature. This process it has been ascertained may be carried on for a long time, and successive generations of these egg-parasites may be reared from eggs retarded in their development by cold storage. It is thus easy to breed and to liberate an almost infinitely greater number of these egg-parasites, and under favourable conditions, than would be possible from a simple importation of European parasitized eggs which would have to arrive in America at a specific time. These latter innovations have been due to the ingenuity of Mr. Fiske to whom great praise should be given.

In the same way great advance has been made in the rearing of the Tachinid parasites, under the charge of Mr. C. H. T. Townsend who has devised methods and made observations that have greatly added to our knowledge of the biology of these insects and have resulted in the accumulation of a store of information of the greatest practical value not only in the prosecution of the present undertaking but in any problem of parasitic introduction or control that may arise later. Extraordinary and almost revolutionary discoveries have been made in the life histories of certain of these flies, and without this knowledge the greatest success in handling them practically could not have been reached.

Similarly Mr. A. F. Burgess, in charge of the Coleoptera, has succeeded in a very perfect way in rearing and liberating the important European predatory beetle *Calosoma sycophanta,* as well as some other insects of the same family. Altogether during the fiscal year the following material has been imported:

Brown-tail egg-masses, about 26,000.
Hibernating nests of the brown-tail from 50,000 to 60,000.
Larvæ and pupae of the brown-tail, about 178,000.
Gipsy moth egg-masses, 7 boxes, each containing very many masses.
Gipsy moth larvæ and pupæ, about 161,000.
Gipsy moth larvæ from Japan, 8 large boxes containing several thousand larvæ and parasitic cocoons.
Predatory beetles, 2,892.

It will be noticed that only about half as many of the hibernating nests of the brown-tail were imported during this fiscal year as during last, but the smaller number is offset by the larger numbers of larvæ, pupæ and egg-masses, so that the gross amount received is about the same as that of the previous year. The material received from Japan listed above came in before the 1st July, but in all there have been received about 40 boxes, nearly all of large size. From one shipment of the cocoons between forty-thousand and fifty-thousand adults of one of the most important parasites of the genus Glyptapanteles were reared and were liberated directly in the open.

The colonization work has been going on rapidly during the summer of 1908, and of the species colonized the following have been the most numerous:

Pteromalus from the brown-tail moth nests, 114,000.
Trichogramma from the brown-tail moth eggs, 11,600.
Telenomus from brown-tail eggs, 4,560.
Apanteles of the brown-tail, 12,875.
Japanese Glyptapanteles, 45,000.
Meteorus from brown-tail, 1,080.
Pimpla from brown-tail pupæ, 2,051.
Unclassified Tachinids, 4,177.
Named Tachinids, 1,600.
Calosoma sycophanta, adults and larvæ, 978.

Thus making nearly 200,000 of the most active enemies of the gipsy moth and the brown-tail moth liberated under the most favourable conditions during the year.

The result of the colonization work of previous years has not become very evident. It is altogether likely that the species introduced have found conditions favourable to their increase and that at the present time they exist in considerable numbers. The area, however, is so extensive as to make their occurrence in ordinary collections a matter of chance rather than

of likelihood. There has been during the past two years a tremendous destruction of the larvæ of both brown-tail moth and gipsy moth from bacterial and fungus diseases. These diseases have appeared in spots, but unfortunately some of these localities were those where colonies of parasites had been established, and in the wholesale destruction of the caterpillars by disease the introduced parasites must have suffered severely. Knowledge has been gained, however, which will make it more easy to select better localities for colonization in the future. Several of the parasites have been found to have established themselves, and notably the predatory beetle, *Calosoma sycophanta*, has been found in numbers. At least seven species have been found under conditions which indicate their establishment.

There have been imported in all 23 species of Hymenopterous parasites, of which 16 are European. 6 are from Japan, and one at least is common to both regions. Eleven of these have been reared from the gipsy moth, six from the brown-tail moth, and six from both insects.

A number of species of secondary parasites have been reared, and have been killed.

Of Dipterous parasites, at least 29 distinct species have been imported, of which nearly all are parasitic upon both gipsy moth and brown-tail moth.

Of Coleoptera, five species have been imported, all of which will feed upon both gipsy moth and brown-tail moth.

This makes a total of 57 beneficial species, enemies of gipsy moth or brown-tail moth or both, that have been brought over in the course of this work.

The outlook is more favourable than at any period during the progress of the work. Success seems an ultimate certainty, but the time at which perfectly obvious results will be apparent is as yet uncertain.

THE STRAWBERRY WEEVIL (*Anthonomus signatus*).

By William Lochhead, Macdonald College, Que.

This insect is reported as having done considerable damage in 1908 in certain localities, particularly Prince Edward County. It is a small brownish weevil about 1-10 inch in length, with a snout about half as long as the body. The specific name *signatus* is given it on account of the dark spot near the middle of each wing cover.

There is probably but one brood a year. The weevils make their appearance about the time of the earliest blooming of the staminate varieties, and continue their depredations for three or four weeks. "The female first deposits an egg in the bud, then punctures or cuts the stem below it so that in a few days it drops to the ground. Within the severed bud the larva hatched from this egg develops and transforms to the pupa and afterwards to the beetle" (Chittenden, Circular 21, U.S. Bureau of Entomology). The larva hatches from the egg in from 4 to 7 days, and feeds on the pollen within the buds. It becomes full grown in less than a month, and transforms to pupa, and to adult within the cavity of the bud. The pupal stage lasts about a week, and the entire cycle lasts about five weeks.

The adult weevil soon makes its way out of the bud, feeds for a few days; then finds a suitable hiding place for the remainder of the year.

Remedial Treatment: (1) As the weevils are always found on flowers that bear pollen, it is advisable in districts where the weevils are injurious

to grow mostly pistillate varieties, and only enough of staminate plants to pollinate the pistillate plants.

(2) Chittenden says that covering the bed is nearly a perfect preventive. This covering may be of muslin, and should be in position at least a week before the first blossoming occurs, and left in position until the first berries are picked.

(3) Another remedy is to grow profuse blooming varieties.

(4) Trap crops of very early blooming varieties such as the "Chas. Downing" may be planted. Upon these the weevils collect, and many can be killed by the application of arsenical sprays.

(5) Clean culture may be of considerable value in controlling the weevils —the removal of volunteer plants, and the burning over in early spring of underbrush and weeds.

(6) Certain substances, such as dilute crude carbolic acid (1 part in 100 of water), and Bordeaux, seem to act as repellents, and their application would appear to be of value.

WHAT ENTOMOLOGY THE FARMER AND FRUIT-GROWER SHOULD KNOW.

By William Lochhead, Macdonald College, Que.

This title was suggested to me after reading an address on this topic by Dr. S. A. Forbes, State Entomologist of Illinois. I must also confess to the appropriation of many of the ideas in Dr. Forbes' address, for they represent the matured thought of a distinguished Entomologist of long experience, and one who has done much valuable work along economic lines. The ideas, however, are not new; they have been expressed, perhaps partially, time and again at the meetings of this Society, at Farmers' Institute meetings, and at Fruit Growers' Conventions. They require however to be expressed often, and in all kinds of meetings, to effect a lodgment with the people and to be incorporated into the practical work of the orchard and farm. That, then, is my reason for dealing with this subject at this time.

1. *The farmer and fruit grower should know the principal injurious insects that affect the crops of the farm, orchard and garden.*

As intelligent business men they should be able to identify those agencies that make for losses, and to acquaint themselves with the best up-to-date methods of controlling these agencies. The habit of the insects should be studied, in order that the methods of control may be as effective as possible. Haphazard experimenters are out of place just as much in successful farming as in successful manufacturing. For example, he should know when the Codling Moth of the apple makes its appearance to lay eggs, when the young worms attack the apple, in order that he may apply his poison sprays at the best time to kill them. He should know the life-habits of the white grubs which live two years in the ground as grubs, become pupæ and beetles in the fall of the second year; the beetles not emerging until the following May or June to mate and lay eggs. When infested grass land is broken and the adult beetles are prevented from laying their eggs in that field, he must not expect an entire absence of white grubs, for the young white grubs will continue to feed until their food supply is exhausted. "He will not turn pigs into his grass lands late in fall, to clear

them of the grubs, for these bury themselves a foot or two below the surface on the approach of frost."

2. *The farmer and fruit grower should know the injuries done by the principal injurious insects.*

Every crop is attacked at some part at some stage of its existence. For example, the apple tree may be injured in its seedling stage by the leaf-blister-mite on its leaves and the woolly aphis on its roots; the growing tree by borers, plant lice, oyster-shell scale, San Jose scale; and the fruit by the codling worm and the railroad worm. The turnip is attacked by the flea-beetle, during its young stage, and by the turnip aphis and others during its growing period. The corn plant may be injured by the attacks of the seed-corn maggot and wire worm on the seed in the ground, by the white grub and wire worm on its roots, by the cut worm on its stems, by the corn worm on its leaves, and by the grain moths on the stored grain.

The farmer and fruit grower should be able to diagnose the causes of the most serious insect troubles by the nature of the injuries inflicted, as he would diagnose the cause of any ailment of his live stock. It is possible after a careful study of the injuries to plants to identify the particular insects that are causing the injuries, and to deal with them effectively. Sometimes one has to rely entirely on the nature of the injuries for the identification of the insect. Cutworms, for example, work at night and lie concealed in the day time. It is easy to distinguish the work of sucking insects from that of biting insects, but this easy distinction is of prime importance in any rational control of a pest. We sometimes hear of gardeners and fruit-growers using paris green for the control of plant lice. A little elementary knowledge of Entomology on their part would have saved them money, and would have given them success instead of failure.

3. *The farmer and fruit grower should know the characters of the chief orders of insects*, and should be able to recognize the order to which any common injurious form belongs from a glance at the *larva* or *adult*. There are for all practical purposes but seven orders or divisions into which the chief injurious insects may be placed. He should know what orders or groups pass through a *complete* metamorphosis,—from egg to larva, to pupa, to adult,—during their life-history, and what orders have an *incomplete* metamorphosis, *i.e.*, have the young somewhat like the adults; the meaning of the terms *cocoon, chrysalis, larva, pupa*; the difference between a *caterpillar* and a *grub;* between a *grub* and a *maggot;* and of what order each is characteristic; what orders have biting mouth parts, and what orders have sucking mouth parts. All this information is needful and preliminary to an intelligent control of injurious insects.

4. *Every Farmer and Fruit Grower should know the Effect of Crop Rotations, Good Cultivation, etc., i.e., Cultural Methods in Insect Life.*

Cultural methods stand opposed here to *artificial* methods, such as spraying. Where crop rotation is not practised the white grub and wire worms sooner or later take possession of grass lands, and the cultivated lands for a year or two after they are broken. But a good crop rotation, where the crop is changed frequently makes it impossible for any insect to pass through its life-stages without being seriously disturbed and its food supply destroyed. Some rotations are preferable to others when certain

insects become injurious. For example, where corn is the chief crop, a rotation of *clover, corn, oats* is better than *forage grasses, corn, oats,* for the reason that many insects which are injurious to hay and grass land are also injurious to corn.

Where a system of short crop rotations has been in use injurious insects such as the wire worm and white grub are seldom troublesome. The setting apart of a field for a number of years in succession to the same crop, be it pasture, hay, oats, wheat, clover or corn, must of necessity be attended with serious loss from insect injury.

Good cultivation involves careful treatment of the soil, the crop, and its products. It means careful attention to the waste products and the waste places which are breeding places for many insects injurious to farm crops. It means the adoption of deep late fall plowing under certain conditions, which practice is one of the best methods of dealing with wire worms, white grubs, cut worms and grass-hoppers. It means high fertility of soil, and good drainage of the land, so that vigorous, healthy plants, capable of resisting the drains of insect attacks are grown instead of poorly nourished ones, which are much more liable to succumb.

The effect of high culture is to make the plants recover quickly from insect attacks. Dr. Forbes says correctly, "The effect of nearly every form of insect injury is virtually a *starvation* effect. If the roots of a plant are eaten away or otherwise injured, the surface for the absorption of food is thus reduced and the plant suffers from starvation as a consequence. If the elaborated sap is withdrawn from its cells and vessels by the beaks of sucking insects, the effect is essentially the same—the plant is starved. If the substance of the leaf is injured or destroyed the process of assimilation is interfered with, and less assimilated food becomes available for maintenance and growth,—again a starvation effect."

The effect of timely plowing and planting in the control of insects is not well enough known by our farmers. Much valuable information on these points is now available. Two or three late fall plowings are efficacious against wire worms and white grubs; early plowing of grass land in August will prevent severe cutworm attacks the following year; late sowing of fall wheat will prevent Hessian Fly injury; and early cutting of the first crop of clover will destroy the first brood of the clover-seed midge, and thus save the clover-seed of the later crop.

5. *Every Farmer and Fruit Grower should know the value of Co-operative measures in dealing with injurious pests.*

The importance of co-operation has been brought vividly to our attention in several cases; *viz.*, the Hessian Fly outbreak a few years ago, the Pea-weevil scourge, the Codling Moth and the San Jose Scale ravages; and the apple maggot injuries in some sections. As a matter of fact, many of our economic problems in Entomology will remain unsolved until a widespread public co-operative sentiment arises in our midst, "Many difficulties which would yield at once to community action are beyond the power of individual remedy."

I have stated briefly five of the main points which I believe every Farmer and Fruit Grower should know. While we realize that but few persons possess this knowledge, are we doing much to hasten the day when all shall have this knowledge? I believe this Society has done much good through its individual members and through the Reports which are published every year. I believe, however, that the most effective work must be done

at the agricultural colleges with the young men who assemble there for instruction. Such knowledge as I have indicated cannot be imparted in a few popular lectures. Time is required to give the knowledge of, and and acquaintance with the insects that will be of much practical value to the young farmers when they return to put into actual operation the lessons they have learned in the class-room and laboratory.

I believe the agricultural colleges are giving courses in Entomology along the very lines I have indicated. The courses in Entomology at the O. A. C. and Macdonald College are so arranged that the important elementary economic topics are discussed and studied in the second year by all the students in that year. Practically, then, all students who attend the O. A. C. and Macdonald College are given instruction in this most important aspect of agricultural operation. Unfortunately all students are not missionaries; many fail to proclaim the important entomological tidings to their benighted neighbours, and so the great work of the evangelization of the whole land is delayed. The wide-spread interest in agricultural education for rural schools indicates that some of the seed, at least, that was planted by the older men among us fell on good ground; for the present, interest has, to some extent, developed by way of *Nature Study*.

To one who took an active part in this movement for agricultural education it is clear that the presentation of the various phases of insect life by many of the members of this Society throughout the Province made a deep impression, whereby it was possible to introduce Nature Study into many of our schools.

INJURIOUS INSECTS IN ONTARIO IN 1908.

By C. J. S. Bethune, Ontario Agricultural College, Guelph.

The season of insect activity, which has now come to a close, has not been marked by any unusual outbreak, such as that of the Variegated Cutworm last year, but several of our well known pests have been more than usually destructive to certain kinds of vegetation. The long hot summer, with plenty of rain in this part of the Province till the middle of August, and the subsequent protracted drouth which has lasted with but few slight breaks till the present time (November), has been favourable to the multiplication of many insects while detrimental to others.

Insects Affecting Farm Crops.

Plant-Lice. There have been more complaints this summer concerning the damage done to turnips and cabbages by Plant-lice (Aphids) Fig. 33, than regarding any other kind of insect. From every part of the Province letters have come asking what could be done to get rid of the pest and to save the crop. Usually the application has been too late—the plants have been injured beyond recovery, and no treatment could restore their lost vitality. The warm dry weather in September was very favourable to the increase of this most prolific insect, and they multiplied to enormous numbers before their attack was noticed. They usually congregate on the under side of the leaves and are out of sight to a casual observer, but many of them are on the upper surface as well and the dead and withering leaves should serve to draw attention to them. These plant-lice are dark green in colour, much the same shade as the leaf they are feeding upon, and are

covered with a mealy-looking powder of a bluish or ashen hue, which gives them a particularly disgusting appearance. Each of the myriad lice is engaged all day long in sucking the juices of the plant on which it is stationed and the combined effect of so many feeders is soon shewn by the impoverishment and destruction of the leaf.

These sucking insects can be destroyed by the application of any of the usual contact remedies, such as kerosene emulsion, tobacco wash or strong soap-suds; the last is probably the cheapest and easiest remedy to procure and has been found very effective. A difficulty, however, is experienced with all these applications in getting at the insects on the under side of the leaves which are often close to the ground. In order to ward off an attack next year all the refuse of the crop, such as cabbage stalks and turnip leaves, should be destroyed by forming them into a compost heap or some other method which will prevent any lice upon them from finding secure winter quarters, and also kill the eggs which are laid on stems and leaves. This should have been done as soon as the crop was taken off the field. Next year these vegetables should not be planted on the same piece of ground, and should be watched for the first appearance of any colonies of lice. If a sharp look-out is kept during hoeing and any affected plants cut out and crushed under foot, a very great deal will be done to reduce the number of colonies if not to entirely clear out the insect.

Wire-Worms and White Grubs. (Figs. 34 and 35). Next in order to the foregoing were enquiries respecting these two classes of insects, which attack the roots of various plants and destroy large numbers of them. Being underground feeders no method has yet been found of applying a poison for their destruction. A great many experiments have been made in various places and all sorts of things have been tried, but nothing has yet been found to answer the purpose. Salt is often suggested, but it would require so large a quantity to kill the worms that all vegetation would be destroyed as well. Apparently the only thing that can be done is to prevent their breeding and coming to maturity by a short rotation of crops. Both these insects increase and multiply in grass lands, especially old pastures, where the worms and grubs feed upon the roots. If left long undisturbed they become very numerous and destructive. When an infected field of this kind is broken up for the first time, not much damage is done to the crop that is put in as the worms have still plenty of food in the roots and leaves of the grass that has been ploughed under. The next year this supply of food is gone and the worms must attack the roots of the crop whatever it may be or perish of hunger. Hence it is that corn and many other things suffer severely the second season after the grass field has been broken up. The most effective method, so far as the writer knows, is to plough up the infested field in August to destroy the tender pupæ which have been formed by that time and again late in October to expose the newly formed beetles and also the young worms to the cold and frost of winter; this ploughing will also enable birds and other creatures to get at and devour them; poultry and pigs will feed upon them eagerly and should be allowed to range over the field immediately after it is broken up.

Wheat Insects. The Hessian Fly has been present in injurious numbers affecting winter wheat in the Counties of Norfolk, Brant and Essex and in the Niagara District; in other parts of the Province it does not seem to have inflicted any appreciable injury. The plan of sowing wheat after the middle of September in order that the plants may be too late for the egg-laying of the flies has proved satisfactory, though it is attended with the risk in an unfavourable season of having an imperfectly grown plant to

withstand the dangers of winter. A useful method is to sow a strip of wheat two or three weeks before the regular crop and thus provide the flies with a suitable place in which to deposit their eggs; later on this should be ploughed under and the insects destroyed, thus leaving the main crop free from injury.

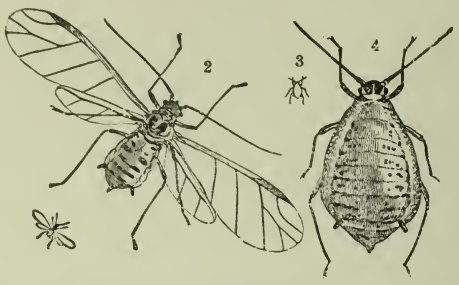


Fig. 33. Cabbage aphis: winged male, wingless female. Small figures are the natural size.

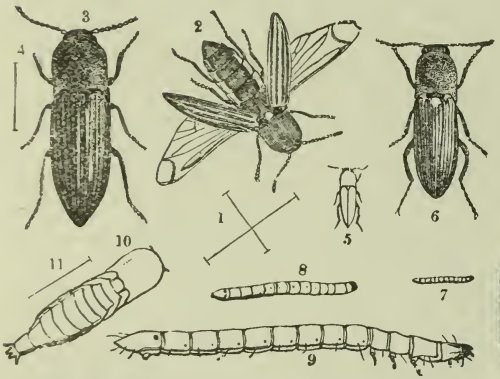


Fig. 34. Wire-worms: beetles and grubs.

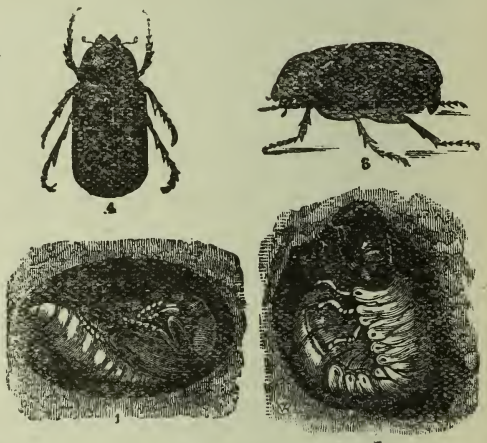


Fig. 35. White grubs; beetles, larva and pupa.

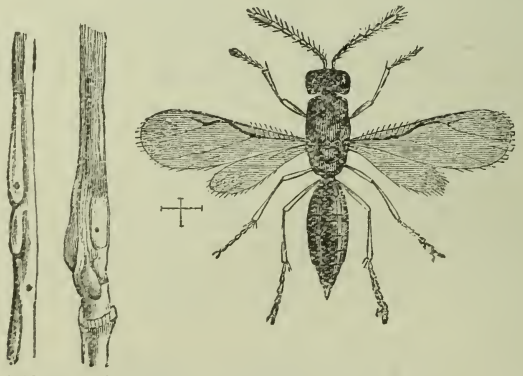


Fig. 36. Wheat joint-worm; affected joints; fly greatly magnified.

The Wheat Joint-worm (*Isosoma tritici*, Fitch), Fig. 36, is not of common occurrence in Ontario. Three years ago Dr. Fletcher reported a somewhat severe outbreak at Millbrook and complaints were made of it in some of the south-western counties. This year specimens of its work have been

sent to us from Petrolia only. The parent insect is a minute black four-winged fly, belonging to the same order as Wasps and Ichneumons and to a family most of the members of which are parasitic upon other insects. The eggs are laid at or near a joint of the growing wheat plant, and the larva burrows into the stem and causes a gall-like swelling to be produced inside which it lives and feeds. This swelling becomes hard and renders the straw so brittle above and below it that it is frequently broken off in a storm. The hardened portions which remain when the grain is cut are apt to be separated from the straw and to come through the threshing machine with the grain. When winnowed out these fragments with other refuse should be burnt. Most of the galls, however, are left in the stubble and contain the wintering larvæ; in order to destroy these the field should be burnt over in the fall if practicable, or the stubble deeply ploughed under. Usually a short rotation of crops with clean cultivation serves to keep this insect in check, and thus we do not often hear of any damage being done by it.

Indian Corn Insects. The Greasy Cutworm (*Agrotis ypsilon*) Fig. 37, has severely attacked some fields of corn, cutting off the young plant at the surface of the ground, and also attacking the roots; and the Glassy Cutworm (*Hadena devastatrix*) Fig. 38, caused much damage to several acres of corn near Listowel. Other species have seriously injured turnips and wheat in some localities. These night-feeding caterpillars are half grown in autumn and feed voraciously on almost any kind of vegetation that comes to hand in the spring. Fortunately there is a very satisfactory remedy which can easily be applied; it is called the poisoned Bran-mash. It is made by mixing half a pound of Paris green in fifty pounds of bran, stirring constantly and adding the poison little by little; this is sweetened by the addition of two quarts of cheap molasses previously diluted in about a gallon of warm water; the whole must be thoroughly mixed to such an extent that the bran will crumble through the fingers and not form hard lumps. The mash is distributed through the infested plot by means of a Planet Junior drill or by hand in the evening, taking care that poultry do not get at it. The worms come out at night and devour it in preference to the plants, and usually go off to die either under the surface of the ground or some other convenient hiding place, so that no dead ones are found lying about in the morning. One who tried this remedy with very much doubt as to its value, unearthed quarts of dead cutworms after a night's application and became thoroughly convinced of its effectiveness.

The Pea Moth. (*Semasia nigricana*) Fig. 39, has been troublesome in the neighbourhood of Lindsay. Eggs are laid by the parent moth on the young pods and from these hatch out small caterpillars which make their way inside and devour the peas; when full grown they leave the pods and form a cocoon beneath the surface of the ground and there remain all winter, the moth coming out the following summer. It has been found that early maturing varieties of peas are free from the attack as they are too far advanced when the eggs are laid, it is therefore advisable to sow as early as possible wherever it is known that there is danger of injury from this insect. In gardens the ground should be dug deeply in the fall to bury the cocoons so that the moths cannot reach the surface when they come out, and all immature pods should be burnt when the crop has been picked. In

field cultivation deep plowing and the removal of all refuse should be attended to; any infested plot should not be sown with peas again for two or three years. It is not likely that any poison can be successfully applied as the worm buries itself in the pod as soon as it is hatched.

The Pea Weevil. (*Bruchus pisorum*) Fig. 40, is to be found every year in many localities. If growers everywhere adopt the simple method of fumigating with bisulphide of carbon as soon as possible after harvesting there would soon be little injury to complain of; one ounce to one hundred pounds of seed has been found sufficient. All refuse after threshing should be cleaned up and burnt and no weevilly peas should ever be sown.

Fig. 37. Greasy Cutworm; (*b*) front of head; (*c*) moth.

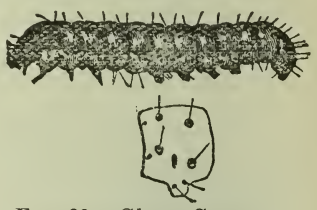


Fig. 38. Glassy Cutworm.

Fig 39. Pea moth, larva and infested peas.

Fig. 40. Pea Weevil.

Clover-Seed Midge. Many complaints have been received respecting loss caused by this insect. The adult is a two-winged fly which lays its eggs in the flower heads of clover; the maggots, when hatched, burrow into the ovaries and feed upon the developing seeds. They become mature at the end of June, descend into the ground and pupate there. A second brood of flies come out when the clover is again in flower and the same course is repeated; in this way both crops are prevented from maturing a large proportion of their seed. The winter is passed by the maggots in

the earth; they do not, like the Pea-weevils, remain in the seed or continue their work of destruction. These red larvæ may, howver, be found amongst the seed after threshing, but any that we have seen at that time were dead.

There is a simple remedy which has been found very effective, that is to cut, or feed off, the first crop of clover by the 15th of June, and thus destroy the maggots before they go into the ground to pupate. The result is that they fail to mature and there are no flies to lay eggs for another brood. The second crop will then produce good clean seed, having the further advantage of many more bumble bees in August than there were in June to assist in the process of fertilizing the bloom.

Insects Affecting Fruit-Trees.

In the earlier part of this report there is given an account of the discussion of many of the most serious insect pests of the orchard; it is, therefore, unnecessary to refer to them here, except very briefly. Of the scale insects we have as usual received complaints of the Oyster-shell Bark-louse from all over the province. The San Josè scale is reported from Dresden, a new locality; the Curtis and Scurfy scales have been sent in from Simcoe and from Vineland, and no doubt are to be found in many other places, but they are seldom numerous enough to do any serious damage.

The Pear and Cherry-Tree Slug (*Eriocampa cerasi*) has been very abundant in many places this year; the second brood continuing their injury to the foliage till quite late in the fall. The slimy black or greenish slug-like larvæ can be destroyed by dusting with Paris green or lime, or spraying with white hellebore mixed in water.

Apple-trees in unsprayed orchards in Sandwich, London, Simcoe, Guelph and other places suffered a good deal from the Cigar Case-bearer, the Apple-bud Moth and the Trumpet Leaf-miner. The fruit itself was attacked in many localities apparently by the Snowy Tree-cricket and the Plum Curculio, causing malformations of the apples and a serious impairment of their value; the Tussock Worms were also found attacking the fruit in a similar manner. Not much attention has been paid to injury from these sources; it is important therefore that careful observations should be made both as to the insect causing the injury and the time when it is done, in order that intelligent measures may be adopted for prevention.

Among the small fruits, Strawberry plants have been much damaged by Wire-worms and White-grubs at the roots, especially where they were planted in old pasture fields which had recently been broken up. It is impossible to apply any remedy for the destruction of these underground feeders; the only method of getting rid of them is by a short rotation of crops involving frequent cultivation of the soil and the consequent disturbance of the grubs and pupæ, as stated in the earlier part of this paper. The Strawberry Weevil has caused some damage by cutting off the pollen-bearing blossoms and preventing the setting of the fruit.

The Rose Chafer, which usually appears in swarms about the time that the Grapes are in blossom, has not been so abundant as usual this year, though bad at Cooksville, Niagara Falls, Simcoe and some other places.

Raspberry and Blackberry bushes have been attacked in some localities by the Cane-girdler—a slender beetle, less than half an inch in length, black in colour with an orange or yellow thorax on which are three black dots. The beetle bites a series of small holes close together all round a cane not very far from the tip, and then makes another series about the length of its own body from the first; between these two girdlings it excavates a hole and deposits an orange coloured egg. The grub lives on

the pith of the cane, which soon withers and dies above the girdling, and is checked in its growth. All affected canes should be cut off an inch or two below the place attacked and the prunings burnt in order to destroy the grubs within them.

A Leaf-miner (*Scholioneura capitalis*) has been very prevalent this year at St. Catharines, Oakville and in Prince Edward County, injuring the leaves of Blackberry bushes; in some cases a large proportion of the leaves were attacked and became prematurely withered.

Insects of the Vegetable and Flower Garden.

There has been no special outbreak during the past season, but many of our familiar pests have been more or less abundant and destructive. The Asparagus beetles, which came to us across the Niagara river and spread westerly and northerly, are now travelling eastward along the shore of Lake Ontario as well; the latest reports have come from Oshawa. Wherever they go they establish permanent colonies and will require to be dealt with every year.

Plant-lice (*Aphids*), as already mentioned, have been unusually abundant this year, and have not only attacked turnips and cabbage, but also lettuce, peas, potatoes, roses, and most other garden plants, a variety of species being present.

Tomatoes have in several places been attacked by the large caterpillars of the Sphinx moth; where these voracious feeders are numerous they devour a large amount of foliage and sometimes strip the plants of their leaves. Being so large and conspicuous they can easily be picked off by hand and crushed under foot. Owing probably to the very hot weather in September a number of moths emerged from the chrysalids that we had in a breeding cage, instead of remaining buried in the ground all winter.

Miscellaneous.

The Mediterranean Flour Moth (*Ephestia Kuhniella*) has made its unwelcome appearance in several mills in this part of Ontario. In one situated in Guelph, an annual fumigation with hydrocyanic acid gas is made with excellent results; it would probably be better, however, to repeat the operation at an interval of a few weeks when another brood may be developed, as it is doubtful whether the gas will kill the eggs of the insect. All sacks and packing material brought from other places should be steamed, or otherwise treated, as the insect is evidently in this way introduced into mills previously free from it.

The Indian-meal Moth (*Plodia interpunctella*) has been found in numbers infesting a mill, and the caterpillars in another place were discovered devouring seed wheat, of which they eat the germs and thus spoil a larger quantity than they actually consume. If a whole building should be infested by them it would be advisable to fumigate with hydrocyanic acid gas, but where they are confined to the grain bins they may be destroyed with bisulphide of carbon.

Grain Weevils (*Calandra granaria* and *oryzæ*) have also been found infesting stored grain. These small snout beetles will continue for years breeding and devouring the grain in the same receptacle if left undisturbed. Bisulphide of carbon may also be used as a remedy for these as well as any other granary insect. One great means of preventing injury from all these insects is cleanliness; all bins and other places where grain is stored should be thoroughly cleaned out at least once a year, and fresh grain should not

be brought in till the old has been cleared out. All corners and dark places where flour-dust and other refuse accumulate should be regularly swept out at short intervals and thus leave no undisturbed breeding places for these destructive creatures.

Another insect troublesome in the barn is the Clover-hay Worm (*Asopia costalis*), the caterpillar of a very pretty little moth, which has rich red wings adorned with yellow markings. The caterpillar feeds upon dry clover, both in the stack and the mow, and spoils it for fodder, as cattle will not eat it when badly infested. In this case also cleanliness is most important; no old clover or refuse should be left in the barn when fresh supplies are about to be brought in, and the remains of old clover stacks should be burnt or thoroughly cleaned up before a fresh one is built on the same spot.

During a summer trip to Fort William and Port Arthur it was disheartening to find that the Larch Saw-fly (*Nematus Erichsonii*) had extended its ravages along the north shore of Lake Superior. On the line of railway as far east as Nepigon the tamaracs were noticed to be every where dead or dying; on reaching this latter place an examination was made of a number of trees and all were found to be swarming with the caterpillars of this insect. This region of country was burnt over some twenty-five years ago, and the land is now covered with a vigorous growth of young trees of various kinds twenty and thirty feet in height. Scattered through these, as well as in clumps, are great numbers of larches, all of which seemed to be infested with these worms; in all probability in a year or two there will not be a living one left, thus repeating the devastation that was experienced some years ago in the Eastern Townships of the Province of Quebec. As the insect abounds over hundreds of miles of wild country it is evident that nothing can be done to check its devastating work.

Spruce trees in this part of Ontario continue to be attacked by the Spruce Gall-louse (*Chermes abietis*), which has several times been described in these reports. Young nursery trees and individuals grown for ornament may be treated when the young lice are exposed towards the end of May and of August with a soap and tobacco wash or kerosene emulsion. At Whitby some Spruce trees were defoliated this year by the caterpillars of the Spruce Saw-fly (*Lophyrus abietis*). Spraying with any of the arsenicals, applied as soon as any of the worms are seen, would soon get rid of them.

INJURIOUS INSECTS OF QUEBEC IN 1908.

By William Lochhead, Macdonald College, Que.

The damage done by insects in Quebec in 1908 has not been heavy. The season was exceptionally dry over a large area of the Province, which condition may have influenced the insect life in some way not yet ascertained. Dr. Forbes, of Illinois, says that "a wet season—if not too wet—is a favorable one, and a dry season an unfavorable one," inasmuch as the condition tends to the increase in growth and food-supply to the plant. Most serious insect injuries to growing crops diminish with wet weather and increase with dry. In very wet weather "the sap of the plant may become so dilute, through excessive absorption of water by the roots that it loses its nutritive value, and insects dependent on it are not so well nourished as by the denser sap of a plant growing in a drier soil. They consequently grow less thriftily and multiply less abundantly, and may

even diminish rapidly in numbers during a wet season, while if the weather were dry and their food nourishing they would increase steadily at a geometrical ratio. After a year or two or three of drouth the intelligent farmer will be more watchful for the first appearances of insect outbreak than after a series of unusually wet years." The Relation of Weather to Insect Life is still a baffling problem, but the economic importance of a satisfactory solution warrants the spending of much time, money, energy, and ability.

It is just as difficult to get reliable returns concerning insect pests from Quebec as it is from Ontario. Many of our common injurious forms are still known as *worms*, or *bugs*, *vers* or *pucerons*, and there are but few persons who can name even the most common injurious insects.

Insects Affecting Cereal Crops. No reports of the presence of the Hessian Fly or Wheat Midge have been received from any part of Quebec. The wheat grain aphis did considerably damage in certain localities. At Macdonald College the experimental plots were badly infested, but towards the end of the season it became very evident that the parasites were very numerous, and that they were controlling the aphis, but they did not appear soon enough to prevent serious damage.

Insects Affecting Vegetables. The cabbage and turnip aphis was a very common pest in late summer and autumn, but judging from reports which have reached me, no very serious damage has resulted. Mr. Chapais informs me that he has not found the *Cabbage aphis* in eastern Quebec. The *green cabbage worm* has been prevalent over a large part of Quebec, and considerable damage has been done. It is a very common pest in eastern Quebec, but not plentiful. The *Cabbage Root Maggot* can usually be found in most fields of vegetables where cabbage and rape are grown, but for the last two or three years, this pest has not made itself manifest to any extent. In some parts of the Province this insect is unknown, as it occurs only at intervals of many years. The *Squash Bug* (Anasa tristis) is not met with in Quebec. Mr. Chapais reports meeting with it now and again, but he says it never causes much damage. I have not seen any specimens of it at Macdonald College during the last two or three years. The cucumber beetles, however, are very abundant and injurious. In eastern Quebec they are not so abundant as in the western parts. The melon aphis, although present, is not at all injurious, and has not been found by Mr. Chapais east of Quebec. The Colorado potato beetle is keeping up its reputation as being the most abundant and persistent pest we have. In spite of all changes in temperature—hard winters and mild winters, wet summers and dry summers, this pest continues to hold its own. In fact, it seemed as if it required a stronger dose of Paris green to kill it than it did a few years ago.

Insects Affecting Large Fruits. The Codling Moth is reported as being very abundant at Cowansville and at Chateauguay, Covey Hill, Abbotsford, La Trappe and the lower St. Lawrence; in fact, all the reports received emphasize the abundance of this pest of the apple as doing a great deal of damage. The Apple Maggot was not observed at La Trappe, but was very abundant at Como, just across the Ottawa River, and according to Mr. Reid of Chateauguay, is prevalent at Covey Hill. It is evident that it is not prevalent throughout Quebec, else its presence would have been reported by more of my correspondents. The Plum Curculio, which injures both the apple and the plum was a very bad pest at Chateauguay. Mr. Reid states that it is the worst pest the fruit growers have in his district. Mr. Chapais reports it as abundant along the lower St. Lawrence. It does not seem to affect the apples much at La Trappe, but it is very severe on the plums. The green apple aphis is more or less prevalent in

some parts of Quebec, but is not troublesome at Cowansville or in the eastern part of the province. It is very abundant at Chateauguay and La Trappe. The Oyster-shell Bark-louse is also one of our most widespread insects in Quebec, and is reported as being very abundant at Cowansville, but at present it is not injurious at La Trappe to any extent. The Canker-worm is not troublesome. The Fall web-worm is very prevalent throughout the province this present autumn.

Insects Affecting Small Fruits. The Currant-worm is common everywhere, and is very injurious when left uncontrolled. At the Agricultural Institute, at La Trappe, the insect was successfully controlled by Nico Soap. The Raspberry Cane-borer was reported as doing little or no harm, but has been observed as being abundant on the wild canes.

Mites on Raspberries. In 1907 the raspberry plantation at Macdonald College was badly infested and injured by mites, which have the habit of clustering on the under surface of the leaves. They were again observed in June, 1908, and spraying operations were begun to determine the effect of various solutions in controlling the pests. These operations were in charge of Mr. J. M. Swaine. Ten plants were selected of about the same degree of infestation. The following substances were used:

Nico-soap	Fair results.
Lime-sulphur (5 oz. lime, 21-23 S, 2) ½ gal H_2O	Effective but killed leaves.
Lead Arsenate (1 to 10)	Not effective.
Bordeaux	Not effective.
V2 (1-10)	Effective.
Whale Oil Soap, 3 oz., 10 gals.	Fair results.
Tobacco decoction	Fair results.
Kerosene Emulsion (1 to 9)	Most effective.
Water	Effective.

Later, the whole patch, excepting three rows, was sprayed with whale oil soap, tobacco decoction and V2. They all killed the mites, where they were very carefully applied, but on the whole about half of the mites were killed. Tobacco was as effective as any of the substances tried. Probably these mites can be better controlled by winter sprays, and experiments will be conducted this coming winter to test the effectiveness of winter sprays.

The White Marked Tussock Moth. Mr. Swaine reports that the Tussock Moth was not nearly so abundant on the shade trees of Montreal as it was in 1907. Fully 90 per cent. of the larvæ that were collected at random from trees were found infested with parasites. Mr. Swaine bred 16 species of parasites.

Insects of the Eastern Townships. According to Mr. Douglas Weir *Grass-hoppers* were the cause of some damage to the grain crops in the Eastern Townships, and the *Potato Flea Beetle* was observed in somewhat greater numbers than usual, assisting the Colorado Beetle in the devastation of the potato crop.

In the orchards the *Tent Caterpillar* and plant lice were perhaps most evident, while in the forests and wood lots a species of *Saw-fly* (Nematus Sp.) defoliated many fine groves of birch (mostly *Betula papyrifera* and *B. populifolia*).

Insects Observed at the Port of Montreal. Mr. Merritt Baker, Fruit Division, Ottawa, who is in charge of the inspection of apples at the port of Montreal in connection with the inforcement of the Fruit Marks Act informs me that the three most important insects which he has observed in the course of his inspection are the Codling Moth, the Plum Maggot and the Lesser Apple-Worm. The apples which he examined came mostly from the Lake Ontario District, Ontario. The Lesser Apple Worm (*Enar-*

monia prunivora) is an insect which deserves more attention than it has usually received. It is probable that many of the injuries which have been done by this insect have been attributed to the young codling worms. This insect usually bores just below the skin at the blossom end of the apple, or at the point where two apples are in contact. The effect produced is a sunken area, somewhat irregular in outline, still covered by the dead skin of the apple. Observations show that it rarely bores into the fruit very far; never exceeding half an inch. Mr. Baker states that the injury to the apple may continue after the fruit has been packed in barrels. Dr. Felt, New York State Entomologist, states that it works also upon the domestic variety of plums. In appearance, the lesser Apple Worm resembles somewhat the Codling Worm. It is very probable—although direct experiments have not been conducted to test the effectiveness of the remedy—that this insect can be controlled by the same applications as those adopted against the Codling Moth.

The Apple Maggot or Railroad Worm (Rhagoletis pomonella) has become one of our most serious apple pests. It does not appear to be widely distributed as yet. It appears locally in several districts, and does not seem to have the faculty of spreading far from that locality. The insect winters over as a little brown oval puparium, either on the surface of the ground or at the bottom of barrels containing apples. The adults emerge very regularly throughout the season, from early July up into September, so that they affect both early and late-maturing apples. The adult is a blackish two-winged fly, a little smaller than a common house fly, and may be recognized by the narrow, white bands on its abdomen, and by the four black bands across its wings. The eggs are deposited under the skin of the apple, and the young maggots hatch within a week and begin burrowing and making channels in the developing apple. It seems as if the maggot does not emerge until the apple is matured; there is therefore great danger that many apples which appear quite free from injury when picked and packed in barrels will show serious injuries when the barrels are opened. There is but one brood each season. As spraying has little or no effect in controlling this insect the best methods of control are the gathering and destroying of the fallen apples, which contain the maggot, and the cultivation of the soil in the orchard, at intervals early in the summer, before 1st July, to destroy the pupæ in the soil.

THE FARMER'S WOOD LOT.

By Rev. Thomas W. Fyles, D.C.L., Levis, P. Que.

"How dear to this heart are the scenes of my childhood,
When fond recollection presents them to view:
The orchard, the meadow, *the deep tangled wild-wood*,
And ev'ry loved spot that my infancy knew."

Many a man who, in early life, left his father's homestead to try his fortune far away, has listened to the song of "The Old Oaken Bucket" with keen emotion.

It is the nature of man to

"look before and after,
And sigh for what is not."

And, in his leisure moments, when wearied with the turmoil of the busy world, the fancy of the exile from home will often revert to the scenes of his early life.

Among the cherished recollections of such a one will be the Wood Lot, with its stately trees, its pleasant glades, its cool retreats.

He will think of its hazel copses, its blackberry tangles, its furred and feathered denizens, its wealth of flowers.

He can call to mind its appearance in the early summer, when all the trees of the wood rejoice before the Lord, when the delicate green of the young foliage was relieved by the yellow catkins of the birches and the darker hues of the pines.

The glories of its autumnal tints will also present themselves to his fond remembrance—the splendid crimson and gold of its maples, the Indian yellow of its beeches, the rich rosy bronze of its oaks.

It will seem to him as if the woodland were wont to don its richest robes, to bid adieu to summer with befitting state.

Amid such scenes he received his first lessons in wood-craft, and learned to call the trees by their names, and to distinguish each kind by its peculiarities, and to know the timber of each by its grain, and to tell the uses for which it was adapted.

There he learned to admire the inexhaustible resources of the Divine Creator revealed on every hand, and the marvellous—to speak paradoxically—diversity in uniformity under which no two leaves of one tree exactly agree in all points of outline and venation.

Then, it may be his thought will revert to his early companions, and their frolics in the woods and sugar-house. He can recall the names, the features, the characteristics of his early friends; and he may wonder whither their several paths in life have led them.

But dearest to his fond recollection—dear and yet sorrowful—will be the remembrance of the home circle. He will think of his parents now laid to rest, it may be, in a selected spot of their own land; and he will perhaps view, with shame and regret, his conduct in leaving the old folk to carry on the farm, in their declining years, without the aid of his youthful energy and strong right arm.

"It is true," our friend may say to himself, "that the farm was less productive than it had been, that the prices of produce were low, and the general outlook somewhat gloomy; but observation has since taught me, that, as the population has increased, the prices of produce have risen, that new railways have given access to better markets, that such noble institutions as the Ontario Agricultural College at Guelph, and the Macdonald College at Ste. Anne de Bellevue, have made known that more can be done with, and made from, the land than our fathers were aware of. If I could have had the advantage of a training, such as these colleges afford, my ambition would have been aroused, and I would have staid by the land and made it profitable. And what nobler business can a man undertake! The cultivation of the soil was the work appointed for Adam by his Maker. The occupations of the farmer have not unfitted men for high endeavours. Stock-raising was the business of Abraham, the father of the faithful, the friend of God: the prophet Amos was a herdsman; it was from the sheep-fold that God took His servant David away, that he might feed Jacob His people, and Israel His inheritance. It was from the plough that Cincinnatus was called to the Dictatorship; and the poet, Horace, delighted in his Sabine farm."

But, leaving our city man to his cogitations, let us now make some observations on the wood lot for ourselves.

I do not in this article refer to the White Birch allotments that may be seen on the French Canadian farms around Montreal, nor to the Spruce growth on many of our northern farms; though these have their interesting features. I have in mind the mixed growth, remains of the old forest that

once covered the land: such as may be seen on the rougher portions of farms, in parts of the Eastern Townships and the New England States.

The *aristocracy*, so to speak, among the trees of such wood-lots are the lordly pine, the sturdy hemlock, the stately yellow birch, and the basswood beloved of bees. These rise, straight and tall, amid the numerous spruces, balsams, tamaracks, elms, maples, beeches, poplars and balm-of-Gileads.

Among all these fine and useful trees are others of smaller growth: thorns, hornbeams, amelanchiers, moosemissies, etc.

Stand with me in such a wood, and see the tall pines, with their spreading layers of foliage rising tier above tier; the graceful balsams, like church-spires pointing heavenward; the vase-like contour of the elms.

Time would fail us to consider the peculiarities and uses of many of the trees—let us observe those of *one* genus, that of *Fraxinus*, the Ash.

Of the six kinds of Ash accredited by Grey to North America, three are found commonly in Canada:

The White Ash, *Fraxinus Americana;*

The Red Ash, *Fraxinus pubescens;*

The Black Ash, *Fraxinus sambucifolia.*

The fruit of each of these is a Samara, or winged seed, and the leaves are compound leaves, and these afford distinguishing features for the three kinds I have mentioned.

In the *White Ash* the stalks of the leaflets are smooth and glabrous.

In the *Red*, they are softly pubescent.

In the *Black*, the leaflets have no stalks—they are sessile.

Again:—

The seed of the *White Ash* is winged from the apex only.

In the *Red*, the seed is edged on either side; and the edges gradually expand into the wing.

In the *Black*, the seed is winged all round.

These seeds hang in clusters. The children in England call them locks and keys.

The White Ash is a valuable shade tree. Its symmetrical stem, its graceful contour, and its elegant foliage render it a favorite for the lawn or park.

Then it is remarkably free from insects. In North America some 500 kinds of insects feed upon the oak; but about 50 only feed upon the ash; and of these very few can be said to be injurious or offensive.

The wood of the White Ash, on account of its toughness, its close grain, and its freedom from flaws, is valuable for the construction of carriages, farm vehicles and implements.

The wood of the Black Ash is useful for other purposes. Bars of it are well soaked, and pounded with mallets. They can then be rent into fine strips for basket work and bottoming of chairs.

Let us now turn our thoughts for a few moments to the sentient things around us.

I dare say you noticed when we entered the wood-lot that a sentinel-crow sounded an alarm—and now a dead silence seems to have fallen on the woodland. Let us sit on this log till the inhabitants of the wood have regained confidence. Meanwhile, I will say a few words about the crows.

The crows build frequently in spruce trees. The dense foliage of these trees hides their nest. I had the curiosity to climb to a nest some years ago; and I was rewarded for my pains, for a strange nest I found it. The

builders had stolen a whole length of clothes-line, and with great ingenuity had wound the cord round and round, and between the young branches of the tree, making a very firm basis for their nest.

You all know that the first egg of a pullet is sometimes very small: the mother crow, whose nest I invaded, must have been a yearling bird, for there was in the nest one very diminutive egg, with others of the usual size.

Ah, our patience is meeting with its reward—the birds and animals are no longer silent.

There is an oriole wending its way to its nest that we saw suspended from the extremity of an elm bough on the verge of the wood.

And yonder, near the top of that tall hemlock stump, a Golden-winged Wood-pecker (*Colaptes duratus*) is busy enlarging a hole in which to make its nest. What a litter he is making! "The carpenter is known by his chips." Now he flies away. Observe the graceful curves of his flight, and notice his peculiar call, which suggested the common name by which he is known—"Wake-up."

The stump he was operating upon must be fourteen feet high. Its top shews that *the axe* had severed it from the upper portion of the tree. How did the woodman find standing room for his work? The explanation is this:—the tree was blown down in some fierce gale. It tore from the ground, on all sides but one, a mass of roots, charged heavily with soil and stones, and leaving a deep hollow in the earth. The farmer came; peeled off the bark as far as the branches; cut off the limbs and top; then marked the trunk into lengths. He stept up on the tree, and standing with feet wide apart, chopped off standard logs—one—two—three. As the third log fell, he felt the butt, on which he was standing, beginning to move. He jumped, and so doing, escaped from being shot, as from a catapult, yards away. The counter weight being gone, the heavy mass of roots, with the stump in place, fell back into its matrix with a thud.

See yonder in the maples a pair of grey squirrels. What a frolic they are having! Chasing each other as if they were playing "tag," their long tails extended, or curved gracefully over their backs. Those tails serve them for Winter blankets. The little creatures, in their snug retreats, during the cold weather lie closely curled, and wrapped by their soft tails, heedless of wind and storm. They are sportive enough now—bye-and-bye, when Autumn is well advanced, they will be busy collecting beech nuts, acorns and butter nuts for their Winter supplies.

The butter nuts are truly to the squirrels *Juglans*—Jovis glans—Jupiter's nuts—the provision made by Providence for their Winter's need.

On the other side of us a red squirrel is scolding—"*chuck, chuck.*" I have lost my liking for this little animal ever since I saw one of its kind tearing to pieces the callow young from a young bird's nest that it had discovered.

Yonder runs the prettily striped ground squirrel or "chipmunk." One evening in the first year of my residence in Canada, I walked out from Montreal, where I was then living, to Cote des Neiges. There I encountered half a dozen boys who were greatly excited. Some of them had sticks in their hands; some large stones; all were eagerly searching the stone fences. "What are you hunting?" I asked. "A chipmunk! A chipmunk! !" they shouted. and away they ran. I had never before heard the name. I wondered what ferocious beast was known under the strange appellation.

I was as perplexed as the tourist who came to Quebec to view the Winter scenery. He was a man of more leisure and means than wit. He put up at the St. Louis Hotel, and in the afternoon walked out to the Plains.

He admired the pure unbroken expanse of snow and the fine view over the St. Lawrence and towards St. Jean Chrysostom. Next morning he arose early and took the same course to gain an appetite for breakfast. When lo, he saw some strange tracks in the snow. They were very large, and there was something like the imprint of a spur behind each of them. While he stood greatly puzzled, an old Scotchman drove along on a traineau. Our friend stopped him; and the following colloquy occurred:—

"Can you tell me, Sir, what made these tracks?"

"The snaw-shus."

"What huge tracks! They come from the woods" (pointing towards Wolfe's Field).

"O aye, that' awa."

"They came in the night?"

"Like as not."

"And they go towards the town. Ar'n't the people afraid "

"Na', na'. They're used to them."

And he drove on.

Out came the stranger's note book; and he wrote:—

"The Great Snortshius, a strange creature with huge feet, comes from the woods in the night, and passes into the town; and the people are not terrified. I must enquire further."

So I felt about the chipmunk. I must enquire further; and I did.

The chipmunks and field mice are very mischievious. Towards Spring when their Winter storm of provisions have run short, and when the snow next the earth has melted, leaving run-ways amidst the buried brush, the little animals follow these passages till they come to the young maples, that the farmer has been preserving to form a second growth sugary. They gnaw the bark of the trees near the ground. After a long Winter I have seen scores of young trees completely girdled and destroyed by them. If a young orchard is near the creatures are apt to serve the fruit trees in the same way. Lengths of stove pipe unhooked at the sides, and placed around the base of the trees, and then hooked together again, are a safeguard against the spoilers.

From our seat on the log we can observe many interesting things. Yonder runs a Ruffed Grouse or partridge. It probably has its nest at the foot of some neighbouring tree. The nest is but a slight hollow in a dry spot. The bird lays many eggs. She sits close; and her colour and markings so resemble her surroundings that she is seldom noticed by a passer-by. Her young can run as soon as they are hatched.

I have witnessed a strange device that the partridge has of escaping its foes in the Winter.

I was standing beside a church which was built near such a wood lot as we are considering. The snow lay deep on the ground, and was drifted against the edifice. Suddenly a pair of partridges whirled rapidly round the gable of the building. They were unaware of my presence till they came upon me. I could have touched them but they dived with startling rapidity into the drift beside me, scattering the light snow all around as they passed in, and so completely closing up their passage way that I could not tell the exact spot where they had entered, though it was not more than three yards from me.

Representatives of the insect world are on the wing, or sunning themselves on the foliage. There is *Polygonia faunus*, Edwards, the most beautiful of our Graptadæ. Notice the rich mottling of its under side. There, too, is *Basilarchia arthemis*, one of the finest of our butterflies. The dark

purple of its upper surface is banded with pure white and adorned with orange spots and blue crescents. The larvæ of these lovely butterflies feed upon the elm, willow, etc., and they do little, if any, harm.

But we must not dwell upon the inoffensive insects, however beautiful. Let me draw your attention for a moment to creatures that work in darkness, to the injury of the trees. Some of these belong to the HYMENOPTERA: *Tremex columba*, Drury (Fig. 41); *Uroceros albicornis*, Fabricius; *U. cyaneus*, Fabricius; *U. flavicornis*, Fabricius. They are large, handsome, but formidable looking flies. Their larvæ tunnel in various trees and do much damage. Fortunately their number are kept down by several species of even more dangerous-looking ichneumons: *Thalessa atrata*, Fab.; *T. lunator*, Fab.; *T. nortoni*, Cresson, &c. The larvæ of these follow up the larvæ of the others and devour them. Many a tragedy, that we know not of, is done in the darkness.

Fig. 41. Pigeon-tremex—the Horn-tail borer—(*Tremex Columba.*)

The larvæ of many beetles are borers. I dare say that this log on which we are sitting is bored through and through by the larvæ of *Orthosoma brunneum*, Forster.

We do not greatly wonder that larvæ of some of the four-winged flies, and of some of the beetles should bore in timber; but it does seem remarkable that larvæ of some of our moths should do the same.

Yet the larvæ of *Cossus centerensis*, Lintner, bore in the Balsam Poplar; the larvæ of *Prionoxystus robiniæ*, Peck, bore in the locust; the larvæ of *Prionoxystus Macmurtrei*, G.-M., bore in the oak; the larvæ of *Ægeria apiformis*, Clerck, bore in the willow; the larvæ of *Sesia acerni*, Clemens, bore in the maple; and there are others of like habits.

Turning our attention to the trees again. There is a White Cedar. Cedar is not plentiful on the Eastern Township farms. The man who owns a cedar swamp owns a mine of wealth for Cedar is of great value for shingles. There are, however, extensive tracts of cedar elsewhere. At Grand Metis, a company, called the "Grand Metis Lumber Company" is operating. This firm cuts, I am told, from 150,000 to 200,000 logs per year, out of which they manufacture from 50,000,000 to 65,000,000 shingles in the same period. They ship their output by rail to the New England States. One thousand feet, log measure, will yield about 8,000 shingles (32 bundles of 250 shingles each).

First quality shingles are worth from $4.00 to $4.35 per thousand, delivered at New England points. The duty at the border is 30 cents per thousand.

Cedar, to the lumber firms, is about twice as remunerative as spruce.

The White Birch is another valuable tree. The spools which are of use all over the world are made from its wood.

There are districts in which the White Birch (or "Bouleau," as the French call it) grows abundantly. Such a tract is that from Matane to Cap Chat, on the south coast of the St. Lawrence.

The firm operating in that part of the country is James Richardson & Co.

The timber is sawn into strips 1½ to 6 feet long, 2 inches broad, 2 inches deep. The white wood only is used; the heart wood is laid aside for fuel.

The strips of white wood are tied up in bundles, and shipped from Matane, in Norwegian sailing vessels, to Coats & Co., of Glasgow, who with some associated companies have the spool business entirely in their own hands.

The vessels that convey the spool wood to Scotland, when taking in cargo at Matane lie half a mile, or more, from the shore; and the lumber is carried out to them in scows, open boats and schooners. 3,000,000 feet of spool-wood board measure is exported from the Matane district every year.

Observe that small tree with blossoms resembling hops. It is the Hop Hornbeam or Iron Wood (*Ostrua virginica*). Young trees of this kind and young ash trees furnish the farmer with levers firm and good.

Speaking of levers, this incident came under my observation some years ago:—A farmer made a "Bee" for the purpose of drawing sawlogs to the mill. The neighbours came. On entering the wood, those who were not already supplied cut levers for themselves. An emigrant, who had been engaged by one of the men, observing this, cut a lever for himself. The work commenced. The emigrant made a great show of strenuous effort—it was but a show. The man beside him called out, "Lift man, lift!" Then he added, "Let me see your pry." Holding this up, he shouted, "A basswood! A basswood!" A roar of contemptuous laughter followed from the other men. The immigrant stood amazed. In his ignorance of the nature of the wood, he did not know that his pretentious ineffectiveness had been exposed.

Even the bushes around us are worthy of attention. There is the Moosewood, also called Wicopy (*Dirca palustris*). You cannot break a stick of it—the rind is too tough; but the wood, when peeled, is remarkably brittle. The farmers, when short of string, use strips of the bark, which is pliant as well as tough, for tying up the mouths of their sacks of grain, etc.

As we make for home, let us consider the condition of things in some parts of the country.

It is grievous to see the way in which farms are often mismanaged. Men with little means and less judgment, buy farms "on time" at more than their value. To meet their payments these men have to part with everything that will bring money. They have not wherewithal to purchase sufficient stock; and they sell the hay off their land year after year, impoverishing the farms more and more. They cut down their woods, and sell the maple for fuel, and the spruce for pulp wood. Where there are chemical works within reach the denudation of the land goes on rapidly, for hard wood is in demand for the distillation of wood alcohol, and other wood for feeding the furnaces in the work. By and bye the farm will be so unproductive that the owner will have to leave it.

According to the latest reports there are in Rhode Island 228 abandoned farms. In Massachusetts the abandoned and waste land amounts to one-tenth the total area of the state. But wealthy and intelligent men are now buying up the abandoned tracts and planting them with trees. One of them this year has planted 63 acres with white pine, and intends to plant 50 acres per year for the next ten years. See the "Richford Gazette" for October 9th, 1908.

Our own people should seize every suitable opportunity for tree-planting. They should put in trees for wind-breaks to their homesteads and orchards, shade trees for their roadsides, ornamental trees for their lawns and parks, young fruit trees to supply gaps in their orchards, young maples to keep up their sugar woods, useful trees in every waste spot.

In conclusion I would impress upon your minds the advice of an old North Countryman:

"Be aye stickin' in a tree.
'Twill be upwards creepin'
While ye are a-sleepin'.

LIFE HISTORY OF EUCHÆTIAS OREGONENSIS (Stretch).

By Henry H. Lyman, M.A., Montreal.

On 10th July, 1898, I had a day's collecting in High Park on the western outskirts of Toronto.

Neonympha Canthus was abundant in the moist hollows and *Satyrus Nephele* was also flying. *Thecla Edwardsii* and *Lycaena Scudderi* were common, the former on *Ceanothus Americanus* a low spreading shrub with white flowers, and the latter coquetting with the blue flowers of the harebell. *Thecla Acadica* was also flying with *Edwardsii* and *L. Neglecta, P. Troilus*, much worn, *P. Nycteis, Plusia Simplex*, brown form, were also taken while *L. Arthemis, P. Oleracea*, presumably of second brood, were seen, as well as *D. Archippus* from the south leisurely ovipositing.

While collecting the Theclas a white moth came flying around the same plant and was taken. I saw it was a species of Euchætias new to me and as it was a female I kept it alive to secure eggs if possible. I subsequently learned that it was *Oregonensis*, but it had lost all the pale drab tone of the primaries and was practically white.

Eggs, round, gum-drop shape, about as high as the diameter, which is .83 mm., shiny, but showing minute facets under a 2-inch power. Colour, honey-yellow when laid, turning dark lead colour just before hatching.

Began hatching 18th July, and all but one were out on 19th. Egg period about 8 days.

Young larva, length including forked tail 2.33 mm., the forked tail being .17 mm. This forked tail seemed marked under the microscope, but when larva was examined with ordinary pocket magnifier on 21st, after it had fed the forking seemed less conspicuous.

Head, rounded above, brown, darker on upper lobes, the lower part and median suture pale, with a few short hairs. Body after feeding green, yellowish-brown about warts which are dark brown or black. Setæ mostly long, black; cervical shield brown. Wart III. on abdominal segments has two setæ. The setæ on 4th segment are larger than on middle segments and project forward. On 5th segment the upper setæ are nearly twice as long as on middle segments. On 11th to 13th segments they are also longer than on the middle ones, those on 12th and 13th being longer than on the 11th. Feet, dark brown, claspers greenish.

For a wonder the specimen described kept quite still while its description was being taken. The larvæ on hatching were placed on *Asclepias*, but did not fancy it. Mr. Winn suggested Dogbane (*Apocynum Androsæmifolium*) which was then supplied and accepted by the larvæ as satisfactory.

On 22nd July they began passing first moult, the length after the moult being 4.7 mm.

As I was leaving town early in the morning of Saturday, the 23rd to spend Sunday at Lake Memphremagog, I merely took the length expecting to be able to take the rest of the description on my return, but on the 26th recorded in my note book that the second moult had already been passed and made the following description:

Stage III., after second moult. Length 8.6 mm. Head, rather small, rounded above, yellow, the ocelli, brown.

Body, rather plump, greenish yellow, with a green dorsal stripe, more conspicuous on the abdominal segments. Hairs spreading, a few longer than the others on some of the anterior and posterior segments, yellowish. The lateral warts seem to be placed in depressions. Feet and claspers, yellowish.

These larvæ matured very rapidly and on 28th the third moult was being passed.

Stage IV., after third moult. Length before feeding about the same as when last taken.

Head, yellow, mouth parts brownish. Body greenish yellow, the pulsating vessicle showing as a green line. Hairs, long and silky, overhanging the head and anal extremity, light yellowish. Anal claspers, rather small and spreading. Feet and claspers, pale yellowish.

The caterpillar under observation which had just passed the moult stood on its central abdominal claspers and raised both extremities, back to back, brushing them together to adjust the hairs. This it did repeatedly and with so much energy that it lost its hold and fell off the leaf.

On 31st July all but two had passed the fourth moult.

Stage V., after fourth moult. Length, 12.5 to 14 mm. Head, yellow, with tinge of orange, ocelli dark brown or black. Except when feeding or in motion the head is concealed by the hairs of the second and third segments which overhang it. Body, pale greenish, the spreading hairs greenish yellow. There are a number of long hairs on the segment projecting forward over the head, and a few on the third and fourth segments which stand straight up or project slightly forward. These hairs are from three to four times as long as the other hairs. There are also a number of similar long hairs on the 11th, 12th and 13th segments which slope towards the rear.

While I was describing these, at least about a half of them roused themselves and began running about, especially around the rim of the jar, stopping every few seconds and sounding with their feet, raising the thoracic segments and striking a number of times and then going on again. They sometimes crawled part way down the outside of the jar, but generally crawled up again, not showing any disposition to go far from home. Two, however, crawled down to the table, but one of these crawled upon the tin cover of the jar and rested there.

On 1st August two were found to have passed the fifth moult, but no change in size was apparent.

As I was leaving that evening for a brief trip to Tadousac on the lower St. Lawrence I had no time to make any detailed description of Stage VI.

On 5th August the larvæ were passing the sixth and last moult and changing their appearance considerably, but also showing a good deal of variation. Some were mouse-gray all but the head which was still honey-yellow, while others were gray as to the skin, but with yellowish hairs and some had yellowish hairs with a few mouse-gray ones mixed in.

These larvæ were perfectly healthy up to the time of my leaving Tadousac for home on the evening of 7th August. They had been perfectly

easy to rear, developed rapidly and none had been lost, but I doubtless made the mistake of not separating them sufficiently as they approached maturity for on my arrival home on the morning of 9th August I found that a choleraic disease had broken out among them and several were dead. I immediately separated them into a number of jars which I had washed with a disinfecting solution of permanganate of potash, putting those that seemed quite healthy by themselves and those under suspicion by themselves.

On 12th August one of those under suspicion spun a rather flimsy gray cocoon weaving in the hairs of its body, but by 21st August all the others had died in spite of all the care that was lavished upon them. Afterwards I found that the one which had spun its cocoon had not had sufficient vitality to pupate.

I thus succeeded in working out the life history of the species, though my cabinet was not enriched with any bred specimens.

Diameter of larval faces of the first six stages were .41, .58, .80, 1.12, 1.38, 1.67 mm.

DR. JAMES FLETCHER.

It is with the most profound regret that we record the death of our very dear friend, Dr. James Fletcher, which occurred on Sunday morning, November 8th. For the last two years his health had not been entirely satisfactory and for more than a twelve month he had been troubled more or less with an internal hemorrhage which caused him much inconvenience and discomfort at times, but which he did not regard as particularly serious. His cheery habit of mind caused him to treat lightly symptoms which would in most cases have excited much alarm. In the middle of September he went out to British Columbia on his annual visit and was absent from home for about six weeks. On his return his colleagues noticed that he had not benefited as much as usual by the trip, and that his appearance was by no means robust. But with characteristic energy he at once set to work to make the arrangements for the Annual Meeting of the Entomological Society of Canada, which he desired should be one of the most successful in its history. As President for the second year in succession, he expected to retire from office, but fully counted upon being present at Guelph and occupying the chair at the various sessions which were held on November the 5th and 6th. During the preceding week, however, he wrote saying that he was going to Montreal to consult a specialist, and might after all be unable to attend. He went down on Saturday the 31st of October, and was at once sent to the Royal Victoria Hospital, there to prepare for an operation. To the writer he sent a letter the following day expressing his great disappointment at being laid up and prevented from coming to Guelph, but full of confidence in the wonderful power of modern surgery and with apparently no fears as to the result. The operation took place on the following Saturday, but he failed, owing to his weak condition, to rally from it and the next morning he died. The operation revealed that he had been suffering for some time from a malignant tumour which had sapped his vitality and would very soon in any case have brought his life to a close. Up to the end he was cheerful and uncomplaining, free from despondency or anxiety about himself, and full of the happy optimism which had always been one of his charming characteristics.

Few men ever made so many loving friends in all walks of life; every one who came to know him could not fail to become warmly attached to him. There are many sad hearts grieving at his loss all over the Dominion of Canada and many, too, in widely scattered places in the United States. Old and young, rich and poor, learned or ignorant, children and their elders, it made no difference—he had a kindly word for each one and most can treasure in their memories a kindly deed as well. When he addressed a meeting he captivated his audience at once and when he joined an excursion of nature students all were eager to be with him, and learn from him some of the secrets of the woods and fields that he knew so well. We shall not see his like again, but we may all feel that it was good for us to have known him—his memory will long live in our hearts—his noble words and generous deeds will be happy recollections for many a year to come.

Dr. James Fletcher was born at Ashe in the County of Kent, England, on March 28th, 1852. He was educated at King's School, Rochester, and came to Canada in 1874 to fill the position of a clerk in the Bank of British North America. Finding the work uncongenial after two years, he gave it up and became an assistant in the Library of Parliament at Ottawa. All his spare time he devoted to Botany and Entomology and became as years went on a recognized authority in each of thse branches of natural science. This led to his appointment as honorary Dominion Entomologist and Botanist and a year or two later to his taking up the work of these departments at the newly established experimental farm. This was in 1887 and for twenty-one years he has been a highly valued assistant to Dr. Saunders, the director, and long since became known throughout North America as one of the ablest scientific men of the day in his special departments.

In 1878 he became a member of the Council of the Entomological Society of Ontario, and every year since he has been elected to hold some office in it, being four times Vice-President, and President for three years, from 1886 to 1888 and again from 1906 to the time of his death, when he had just been re-elected for another year. His first contribution to the Society's publications was an article on Canadian Buprestidæ, which was published in the Annual Report for 1878, and his first contribution to "The Canadian Entomologist" 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 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 energy and influence accomplished, the formation of the important Association of Economic Entomologists of North America, of which he was elected President in 1892. He was also one of the original Fellows of the recently formed Entomological Society of America, and was First Vice-President last year. In 1886 he became a Fellow of the Linnæan Society, of London, and in 1896 he received the degree of LL.D., *Honoris causa*, from Queen's University.

In 1885 he was elected a Fellow of the Royal Society of Canada; in 1895 he became President of Section IV., which is devoted to Geological and Biological Sciences. For many years he was Honorary Treasurer of the Society, and for the last two years Honorary Secretary. To the transactions of the Royal Society he contributed the following papers: Presidential Address, 1895, on Practical Entomology; Recent Additions to the list of Injurious Insects of Canada, 1899; The Value of Nature Study in Education, 1901; Descriptions of some new Species and Varieties of Canadian Butterflies, 1903; Notes on the Preparatory Stages of some Species of Canadian Lepidoptera, 1907.

A list of his contributions to scientific and agricultural journals would occupy many pages, if such a list could be completely carried out. His most valuable publications were his annual reports on the work of his department at the Central Experimental Farm and the Bulletins in connection with it, in which he gave accurate detailed descriptions of a large number of injurious insects, and also his papers in the Annual Reports to the Legislature of the Entomological Society of Ontario. Two years ago he completed an admirable work on the Farm Weeds of Canada, containing descriptions of all the most important weeds that are a trouble to agriculturists throughout the Dominion; a handsome quarto volume illustrated with 56 beautiful coloured plates.

Not only with his pen, however, did he perform useful work, but with his voice as well. He was in great demand as a public speaker at Agricultural, Horticultural, and Fruit-growers' conventions, meetings of Farmers' Institutes and other gatherings. On these occasions he at once secured the attention of his audience and charmed them with his graceful language and lively humour. No one else, indeed, has done so much for Canada in instructing the people in a practical knowledge of their worst insect foes and the best methods of dealing with them. His work has thus been of vast importance not only to those directly interested in the products of the soil, but indirectly to all the dwellers within the domains of this wide Dominion.

Though so fully occupied with scientific work he yet found time for other things. He was one of the most efficient members of St. Luke's Hospital board; for many years lay-reader and superintendent of the Sunday school in Holy Trinity Church, Archville, a suburb of Ottawa; and an active member of the St. Andrew's Brotherhood. His religious life as a devout son of the Church of England was known perhaps to but few amongst his intimate friends, though manifested in many ways through his goodness of heart; he lived and died an earnest, God-fearing man, devout and upright, filled with unobtrusive piety, a sincere Christian indeed "in whom was no guile."

While we deplore the loss that we all feel we have individually sustained, we desire to express to his sorrowing family, Mrs. Fletcher and her two daughters, the deepest sympathy with them in their sad bereavement. To them the loss is beyond all words, but it may afford them a ray of comfort to know that he whom now they mourn was so widely beloved, admired and respected and that so many friends share in their grief and are filled with sorrow for him who is gone.

C. J. S. Bethune.

Dr. L. O. Howard, Chief of the Bureau of Entomology in the Department of Agriculture at Washington, a friend of many years standing, writes as follows:

"Dr. Fletcher's services to his country were very great. He had a wonderful grasp of a very broad field in Entomology, and was one of the best-informed men of his time on the intricate and manifold aspects of economic Entomology. His reports were sound and practical, and as a public speaker before assemblages of agriculturists and horticulturists he was unexcelled. His address years ago before the National Geographic Society in Washington, on the Canadian Northwest, was one of the most perfect lectures I ever

heard. He was known, admired and loved all through the States. In fact, I have never known a man who had so many absolutely devoted friends as Dr. Fletcher. His energy, his enthusiasm, his absorbing interest in everything that lives and grows, his warm heart, his cheeriness, his perfect lack of even a suspicion of egotism, attracted every one who knew him, and bound them to him in friendship, and even love, forever. Here in Washington among the Entomologists and others there are many sad hearts to-day."

DR. WILLIAM H. ASHMEAD.

On the 17th of October Dr. William Ashmead died in Washington, D.C., aged 53 years. For more than a year he was in such an unsatisfactory state of health that his recovery appeared impossible and it was therefore no surprise to learn that the end had at last arrived. His break down in the midst of a career of scientific usefulness was evidently brought about by overwork; he devoted himself with such intensity to the study of the Hymenoptera and the publication of the results that he gave himself no rest and literally wore himself out, to the grief and distress of his family and many friends.

For close upon thirty years he was a constant contributor to the pages of "The Canadian Entomologist," his first articles on insects affecting the orange, having appeared in 1879. At that time he lived in Jacksonville, Florida, where he was engaged in the publishing business, which included the issue of a daily paper and a weekly agricultural journal. He was naturally much interested in the production of oranges and his attention thus became drawn to the insects injuring the trees and fruit and those parasitic forms that somewhat keep them in check. His work was so thorough that he was made a field Entomologist for the United States Department of Agriculture in 1887, and began his career as a professional Entomologist.

In 1890 he went to Germany and studied for some time in Berlin, thus becoming qualified for the performance of scientific work of a high character. In July, 1897, he was appointed a Curator of the Department of Insects in the United States National Museum at Washington, and continued to hold the position till incapacitated by illness.

In October, 1904, he was elected an "Honorary Member of the Entomological Society of Ontario in recognition of his eminence in the science and the valuable contributions that he so constantly made to the pages of the "Canadian Entomologist." His studies were devoted to the Hymenoptera, and he published many systematic papers on various super-families in the order and described a large number of genera and species. His work was of such a high character that it is regarded as authoritative and has attracted the attention of the leading Entomologist of both Europe and America. One of his completed works is his Monograph of the Proctotrypidæ, a volume of nearly 500 pages published in 1893. Most of his papers are to be found in the Transactions of the American Entomological Society of Philadelphia and in the Canadian Entomologist.

He received the honourary degree of Doctor of Science from the Western University of Pennsylvania and was the recipient of many distinctions from various Entomological Societies. Personally he was esteemed and beloved by all who knew him and there are many who now deplore his loss.

C. J. S. B.

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