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Ontario. Legislative Assembly

SESSIONAL PAPERS

VOL. XLVIII.—PART IX.

SECOND SESSION

OF THE

FOURTEENTH LEGISLATURE

OF THE

PROVINCE OF ONTARIO

SESSION 1916

145980 / 31.1.18

TORONTO:
Printed and Published by A. T. WILGRESS, Printer to the King's Most Excellent Majesty
1916

Printed by
WILLIAM BRIGGS
Corner Queen and John Streets
Toronto

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No. 51 Report of the Provincial Archivist for the year 1915. Presented to the Legislature, April 10th, 1916. *Printed.*

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No. 53 Provincial Auditor's Statements for the year 1915. Presented to the Legislature, March 15th, 1916. *Printed.*

No. 54 Report of the Workmen's Compensation Board to the 31st December, 1915. Presented to the Legislature, April 14th, 1916. *Printed.*

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No. 55 Report of the Commission on Unemployment. Presented to the Legislature, March 1st, 1916. *Printed.*

No. 56 Report on the British Red Cross Fund, Trafalgar Day. Presented to the Legislature, April 18th, 1916. *Printed.*

No. 57 Return to an Address, of the 5th March, 1915, to His Honour the Lieutenant-Governor praying that he will cause to be laid before this House a Return of: 1. Copies of all petitions or requests or communications received by the Government from Trades and Labour Councils, Municipal Authorities, Social and Philanthropic organizations, or other societies, organizations or individuals, in reference to the conditions of Unemployment in the Province, and in reference to governmental action to relieve conditions of unemployment. 2. All communications passing between the Government of Canada and the Government of Ontario, or any officer or official of the Governments respectively, in reference to conditions of unemployment, and as to governmental action in reference thereto. 3. A statement showing what action has been taken by the Government to relieve conditions of unemployment in the Province. 4. Copy of the Orders-in-Council appointing the Commission to investigate the conditions of Unemployment, and defining the scope of the work of the Commission. Mr. *Rowell.* Presented to the Legislature, March 1st, 1916. *Not printed.*

No. 58 Return to an Order of the House of the 1st April, 1915, for a Return showing: 1. All correspondence between the Government or any officer or official thereof and all Councils of Women and all other persons, societies or associations, in reference to the establishment of Houses of Refuge in municipalities and in regard to legislation for the purpose of requiring municipalities to establish Houses of Refuge for the care of feeble-minded and unfortunate persons. 2. All correspondence or communications between the Government or any officer or official thereof and the Councils of municipalities or any officer or official thereof.

with reference to the compulsory establishment by municipalities of Houses of Refuge for feeble-minded and unfortunate persons. Mr. *Hurdman*. Presented to the Legislature, March 1st, 1916. *Not printed.*

No. 59 Return to an Order of the House of the 1st April, 1915, for a Return showing: 1. A copy of all the proceedings in the Police Court in the City of Toronto in the charge made against Herbert Capewell for demanding commission on certain Government Military contracts for the supply of boots for the Canadian Expeditionary Force, including therein the evidence and the Police Magistrate's judgment and commitment. 2. A copy of the record of the proceedings on the trial of the said Herbert Capewell before His Honour Judge Coatsworth in the County Judge's Criminal Court of the County of York, including the evidence, statements of Counsel and statement of acquittal. Mr. *Atkinson*. Presented to the Legislature, March 1st, 1916. *Not printed.*

No. 60 Return to an Order of the House of the 1st April, 1915, for a Return showing: 1. What Fishermen received fishing licenses in Manitoulin Island for the fishing season, 1914, and upon what dates were these licenses granted respectively. 2. What Fishermen received fishing licenses for the year 1915, and upon what dates were these licenses granted respectively. Mr. *Parliament*. Presented to the Legislature, March 1st, 1916. *Not printed.*

No. 61 Copies of Orders-in-Council and Regulations made under the authority of the Department of Education. Presented to the Legislature, March 2nd. 1916. *Printed for distribution.*

No. 62 Report of the Monteith Demonstration Farm, 1915. Presented to the Legislature, April 14th, 1916. *Printed.*

No. 63 Report of the Northern Development Branch of the Department of Lands, Forests and Mines for the year 1915. Presented to the Legislature, March 13th, 1916. *Printed.*

No. 64 Copies of Orders-in-Council under Subsection 6 of Section 78, Chapter 62, R.S.O., 1914, relating to Surrogate Courts. Presented to the Legislature, March 7th, 1916. *Not printed.*

No. 65 Return to an Order of the House of the 25th March, 1915, for a Return showing: 1. How many Dining or Buffet Cars have the T. & N. O. Railway purchased, and what was the date of purchase, and the price paid for the said cars respectively. 2. How many of such cars are in actual use upon the railway. Mr. *Ferguson (Kent)*. Presented to the Legislature, March 7th, 1916. *Not printed.*

No. 66 Return to an Order of the House of the 25th March, 1915, for a Return showing: 1. With what Fire Insurance Companies did the T. & N. O. Railway place its Fire Insurance for the fiscal year ending 31st October, 1914, and through what agents was the Insurance placed. 2. With what Fire Insurance Companies has the T. & N. O. Railway Company placed its Fire Insurance for the current year, and through what agents has the Insurance been placed. Mr. *Davidson*. Presented to the Legislature, March 7th, 1916. *Not printed.*

No. 67 Return to an Order of the House, of the 1st April, 1915, for a Return showing: 1. If any requests have been made by the Lieutenant-Governor in Council to the Hydro-Electric Power Commission under section 3 of the Hydro-Electric Railway Act, 1914, to inquire into and report upon the proposed electric railways in Ontario. 2. If requests have been made, what are the dates upon which such requests were made and with respect to what railways or territories were such requests made. 3. What reports, if any, have been received by the Lieutenant-Governor in Council on the proposed Hydro-Electric Railways in Ontario. 4. Has the Lieutenant-Governor in Council approved the construction of any such railways; if so, which ones. Mr. *Richardson*. Presented to the Legislature, March 7th, 1916. *Not printed.*

No. 68 Return to an Order of the House of the 13th March, 1916, for a Return showing: 1. Copies of all correspondence between the Government of the Province of Ontario, or any officer or official thereof, and the Government of the Dominion of Canada, or any officer or official thereof, with reference to the care of or provision for returned soldiers, and particularly assisting returned soldiers to secure employment. 2. Copies of all resolutions passed at a conference between representatives of the Government of Canada and of the Provinces, in reference to the care of and provision for returned soldiers. 3. Copy of the document setting out the understanding arrived at between the Government of Canada and the Governments of the different Provinces in reference to the care of the said soldiers. Mr. *Rowell*. Presented to the House March 15th, 1916. *Not printed.*

No. 69 Return to an Order of the House of the 13th March, 1916, for a Return showing: 1. The names and addresses respectively of the persons who attended the short course of Instructions for Judges at Fall Fairs given at the Ontario Agricultural College at Guelph in June, 1915. 2. The names and addresses respectively of the persons who attended the Course of Instruction for Judges at Fall Fairs at the Experimental Farm, Ottawa, in 1915. 3. The names and addresses of the persons who were appointed by the Government as Judges at Fall Fairs in 1915, and what departments or classes did each judge respectively. Mr. *Ham*. Presented to the Legislature, March 17th, 1916. *Not printed.*

No. 70 Return to an Order of the House of the 6th March, 1916, for a Return showing how much of the sum received by the Government on account of the War Tax, 1915, has been expended and for what purposes has the money been expended and the amount of the expenditure for such purposes respectively. Mr. *Bowman.* Presented to the Legislature, March 20th, 1916. *Not printed.*

No. 71 Return to an Order of the House of the 24th March, 1915, for a Return showing: 1. What is the total number of employers of labour coming under Schedule 1 of The Workmen's Compensation Act, as reported to the Workmen's Compensation Board. 2. What is the total number of employees so reported. 3. What is the total amount of the assessment for the year 1915 for such employers. 4. How much has been received to date in respect of such assessment. 5. How much is on deposit to the credit of this fund to date. 6. Where and to whose credit are the moneys on deposit. Mr. *Hurdman.* Presented to the Legislature, March 21st, 1916. *Not printed.*

No. 72 Return to an Order of the House of the 25th March, 1915, for a Return showing: 1. If the Workmen's Compensation Board levied its assessment upon employers upon the basis of current cost, or the capitalized value. 2. If not on the basis of current cost, what amount or percentage has been added to the assessment over and above current cost. 3. If the Workmen's Compensation Board established a Reserve Fund under section 92 of The Workmen's Compensation Act. 4. If so, what amount or percentage has been included in the sum assessed upon employers to provide this Reserve Fund. Mr. *Elliott.* Presented to the Legislature, March 21st, 1916. *Not printed.*

No. 73 Return to an Order of the House of the 24th March, 1915, for a Return showing: 1. What is the total number of employers of labour coming under Schedule 2 of The Workmen's Compensation Act, so far as ascertained by the Workmen's Compensation Board. 2. What is the total number of employees under section 2. 3. What is the total number of employers coming under section 3, so far as the Workmen's Compensation Board has been able to ascertain. 4. What is the total number of employees coming under section 3, so far as the Workmen's Compensation Board has been able to ascertain. Mr. *Davidson.* Presented to the Legislature, March 21st, 1916. *Not printed.*

No. 74 Return to an Order of the House of the 21st March, 1916, for a Return showing: 1. Copies of all correspondence which passed between the Government, or any officer or official thereof, in reference to the granting of bail in the case of Rex *vs.* Friedman, heard at Sault Ste. Marie, Ontario. 2. Copies of all correspondence received by the Government from any source in reference to the granting, or refusal, of bail in said case. Mr. *Proudfoot.* Presented to the Legislature, March 22nd, 1916. *Not printed.*

No. 75 Return to an Order of the House of the 22nd March, 1916, for a Return showing what were the dates and amounts of the several payments made by the Province to aid Recruiting, and to whom were such payments made. Mr. *Ham.* Presented to the Legislature, March 22nd, 1916. *Not printed.*

No. 76 Return to an Order of the House of the 22nd March, 1916, for a Return showing what were the dates and the amounts of the several payments made by the Government of Ontario in respect of the Ontario Military Hospital, and to whom were such payments respectively made. Mr. *Richardson.* Presented to the Legislature, March 22nd, 1916. *Not printed.*

No. 77 Return to an Order of the House of the 29th March, 1915. for a Return showing: All correspondence received by the Government or any member or official thereof with reference to the appointment of present members to the Workmen's Compensation Board, or in support of the applications of the said members to be so appointed. Mr. *Carter.* Presented to the Legislature, March 28th, 1916. *Not printed.*

No. 78 Return to an Order of the House of the 1st April, 1915, for a Return showing: 1. How many persons in the employ of the Province or the Government are now serving with the Canadian or Allies' armies. 2. What are the names of the persons so serving, and what salaries do they respectively receive from the Government. Mr. *Racine.* Presented to the Legislature, March 28th, 1916. *Not printed.*

No. 79 Return to an Order of the House of the 24th March, 1916, for a Return giving the names of all persons employed in the Civil Service of the Province who have enlisted for overseas service with the Canadian Expeditionary Forces since the commencement of the War to date. Mr. *McCrae.* Presented to the Legislature, March 28th, 1916. *Not printed.*

No. 80 Return to an Order of the House of the 31st March, 1916, for a Return showing: 1. All correspondence between the Government of Ontario, or any member or official thereof, and the Canada Copper Company or the International Nickel Company, or any officer or official of either of the said Companies, in reference to the tax to be paid to the Province of Ontario in respect of the profits made on the nickel mining operations carried on within the Province of Ontario by or on behalf of the said Companies, or either of them. Mr. *Carter.* Presented to the Legislature, April 4th, 1916. *Not printed.*

No. 81 Return to an Order of the House of the 22nd March, 1915, for a Return showing: 1. Who is the Police Magistrate for the City of Windsor. 2. When was he appointed. 3. Whom did he succeed. 4. What salary does he receive from the City of Windsor. 5. How much from fees for convictions in County cases. 6. What amount in fees and costs in County cases has he collected from the 1st day of December, 1908, to the 1st day of January, 1915. 7. What amount for convictions in County cases has the Police Magistrate paid to the County Treasurer from the 1st December, 1908, to the 1st January, 1915. 8. What convictions has he reported to the Clerk of the Peace for Essex County from September 1st, 1914, to date. Mr. *Ducharme.* Presented to the Legislature, April 5th, 1916. *Not printed.*

No. 82 Return to an Order of the House of the 22nd March, 1915, for a Return showing: 1. Who is the Police Magistrate for Amherstburg. 2. When was he appointed. 3. Whom did he succeed. 4. What convictions has he reported. 5. What amount of fees and fines has he collected during his term of office. 6. What disposition was made by him of these fees and fines. Mr. *Tolmie.* Presented to the Legislature, April 5th, 1916. *Not printed.*

No. 83 Return to an Order of the House of the 3rd April, 1916, for a Return of copies of all correspondence or other papers and documents which passed between J. H. Carrique, of the City of Toronto, or any other person or persons and the Attorney-General or any official of his Department or of any Department of the Government in connection with, or arising out of, a request made by the said J. H. Carrique to have Robert M. Catts and Edward C. Hill extradited from the United States of America on a charge that they had defrauded him out of the sum of $5,000. Mr. *Proudfoot.* Presented to the Legislature, April 6th, 1916. *Not printed.*

No. 84 Report of the Decisions in cases arising under "The Municipal Drainage Act," together with other cases analagous thereto and The General Rules relating to practice and procedure under the said Act. Presented to the Legislature, April 7th, 1916. *Printed.*

No. 85 Return to an Order of the House of the 24th March, 1916, for a Return showing: 1. The names of the officials connected with the Ontario Reformatory or Guelph Prison Farm, giving their positions and salaries respectively. Mr. *Marshall.* Presented to the Legislature, April 11th, 1916. *Not printed.*

No. 86 Return to an Order of the House of the 9th March, 1916, for a Return showing: 1. What is the total capital expenditure on the Guelph Prison Farm to the close of the fiscal year. 2. If any further capital expenditures are contemplated; and showing the estimated amount thereof. 3. And how many prisoners are now confined at the Guelph Prison Farm. Mr. *Ferguson (Kent).* Presented to the Legislature, April 11th, 1916. *Not printed.*

No. 87 Return to an Order of the House of the 9th March, 1916, for a Return showing: 1. What is the total capital expenditure on the Whitby Asylum to the close of the fiscal year. 2. And if any further capital expenditures are contemplated; and if so, showing the estimated amount thereof. 3. And the number of inmates now confined in the Whitby Asylum. Mr. *Wigle*. Presented to the Legislature, April 12th, 1916. *Not printed.*

No. 88 Statement of the distribution of the Revised and Sessional Statutes for the year 1915. Presented to the Legislature, April 13th, 1916. *Not printed.*

No. 89 Report of the Sub-Committee on Bill (No. 53), Respecting the Ancient Order of United Workmen of the Province of Ontario. Presented to the Legislature, April 18th, 1916. *Printed by order of the House.*

No. 90 Return to an Order of the House of the 3rd March, 1915, for a Return showing: 1. How many permanent officials and employees of all classes were engaged in the inside Civil Service on the 1st days of January, 1905 and 1915 respectively. 2. How many permanent officials and employees of all classes were engaged on the outside service on the 1st days of January, 1905 and 1915 respectively. Mr. *Gillespie*. Presented to the Legislature, April 19th, 1916. *Not printed.*

No. 91 Return to an Order of the House of the 30th day of March, 1916, for a Return showing: 1. Copies of all correspondence between the Government of Ontario and any member or official and the Government of the Dominion of Canada or any member or official thereof, with reference to the Report of the Dominion Government Commission on Technical Education and as to any action to be taken upon the basis of the said report or otherwise in connection with Technical Education. Mr. *Ducharme*. Presented to the Legislature, April 19th, 1916. *Not printed.*

No. 92 Return to an Order of the House of the 11th April, 1916, for a Return showing: 1. If the T. & N. O. Railway was, within the past twelve months, asked to quote rates on the shipment of 6,000 tons of fabricated steel, or some quantity of fabricated steel, from Sarnia to Regina. 2. If the T. & N. O. Railway was asked to quote rates, who were the shippers or parties requesting the rates; and what was the amount of steel involved; and what were the rates quoted. 3. If rates were quoted, how did these rates compare with the tariff rates in the tariff approved by the Board of Railway Commissioners for the quantities of steel and the haul in question. Mr. *Munro*. Presented to the Legislature, April 19th, 1916. *Not printed.*

No. 93 Return to an Order of the House of the 17th day of April, 1916, for a Return showing if the Government received any statement from the Government of Great Britain, or from any other source, with reference to the use made of the flour contributed by the Province of Ontario to the Mother Country, of the value of $780,468.70. 2. If so, how was the flour used or disposed of. Mr. *Lowe.* Presented to the Legislature, April 19th, 1916. *Not printed.*

REPORT

OF THE

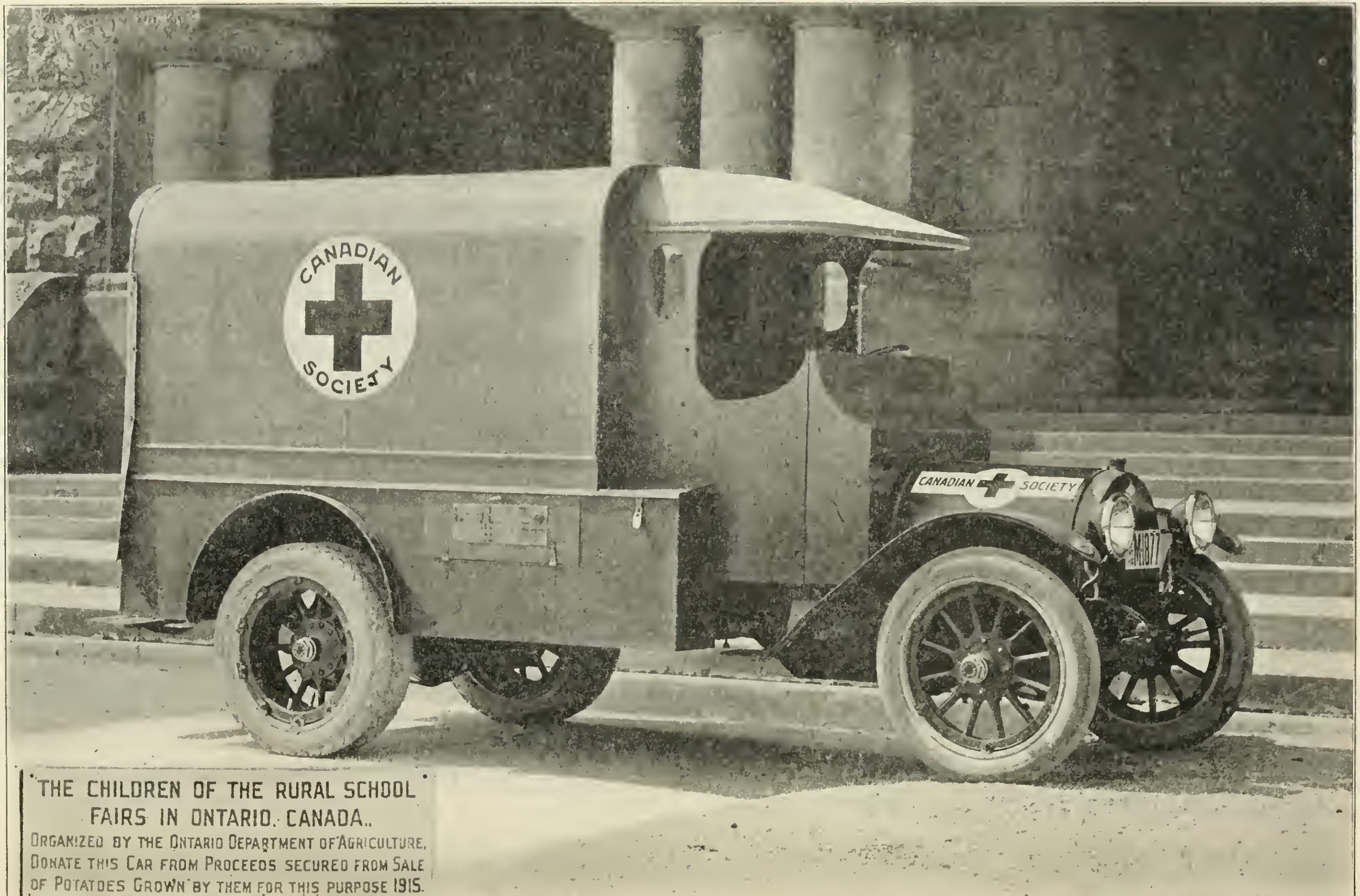
Minister of Agriculture

PROVINCE OF ONTARIO

FOR THE YEAR ENDING
OCTOBER 31, 1915

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed and Published by A. T. WILGRESS, Printer to the King's Most Excellent Majesty
1916



THE CHILDREN OF THE RURAL SCHOOL FAIRS IN ONTARIO, CANADA.,
ORGANIZED BY THE ONTARIO DEPARTMENT OF AGRICULTURE,
DONATE THIS CAR FROM PROCEEDS SECURED FROM SALE
OF POTATOES GROWN BY THEM FOR THIS PURPOSE 1915.

REPORT

OF THE

Minister of Agriculture

1915

To His Honour Sir John Strathearn Hendrie, C.V.O., *a Lieutenant-Colonel in the Militia of Canada, etc., etc., etc.*

Lieutenant-Governor of the Province of Ontario.

May it Please Your Honour:

I have the honour to submit the annual report of this Department for the year ending October 31st, 1915.

Always important, agriculture is especially so in war time, for an adequate food supply is of primary consequence. Hence throughout the year this Department has endeavored on every occasion to keep prominently before the farmers and public generally the conditions, agriculturally speaking, brought about by the war. The need of the largest possible production from the land was emphasized at every opportunity, including co-operation with the Federal Department of Agriculture in a special campaign along this line. Much information was disseminated and a splendid general sentiment created, with the result that farmers everywhere put forth their very best efforts, not only in utilizing more land but also in adopting better methods. But after the farmer has done his best much depends on nature and during the past year nature was only partially kind. Ideal weather conditions prevailed in the early part of the season, but in the early part of the harvest, at the beginning of August, many of the older counties in the Province were deluged with unprecedented rains, with the result that a great deal of the wheat and oat crops was ruined in the field. In spite of this loss, however, aggregating many million dollars over the Province, the crop was still a record one and the Province has great reason for gratitude. In the matter of wheat alone, for which a special appeal was made, the results were striking. Although this crop has been decreasing each year, the returns last year of fall wheat were greater than in any year in the last thirty, with one exception. The increase represents practically seventy per cent. over the previous year. It was also a record year for the dairy industry, both as to production and prices, and a good year for live stock. The following comparisons may be of interest, showing substantial increases in all the leading crops with the one important exception of potatoes. It should be noted the comparisons are with 1914, which was in itself a good year and would show still greater increases if compared with the average:

	1914	1915
	Bush.	Bush.
Fall Wheat	14,333,548	24,737,011
Spring Wheat	2,169,425	3,439,949
Barley	18,096,745	19,893,129
Oats	103,564,322	120,564,322
Rye	2,315,532	3,210,512
Buckwheat	4,251,421	4,278,366
Corn (for Husking)	23,232,360	21,760,496
Corn (for Silo) ... tons	4,751,223	4,874,377
Mixed Grains	16,854,550	19,461,609
Hay, Clover and Alfalfa ... tons	3,842,520	4,253,763
Mangels	25,439,520	25,302,323
Turnips	46,336,708	46,598,851
Potatoes	26,717,587	13,267,023

I have noted that even these splendid returns would have been greater with more favorable harvest weather. It should also be noted that they were also very detrimentally affected by a very general outbreak of fungus and insect diseases. Of these smut in wheat and oats was the most disastrous, resulting in a loss which has been estimated at $5,000,000. Smut is a disease which can be very effectively controlled my immersing seed in a formalin solution and those who adopted this treatment prior to seeding had fields practically free from loss. In order to bring this prominently to the attention of farmers generally the Department, among other methods, adopted an advertising campaign this fall just before the time to sow fall wheat. Advertisements outlining the remedy were inserted by District Representatives in local papers all over the Province. A similar plan will be adopted in the spring before seeding time.

Operating a binder by motor because of wet field.

Free from both the horrors and privations of war it was fitting that this Province should extend a helping hand to those less fortunately situated, though struggling in the common cause. This Department was called upon to look after the purchase and transportation of foodstuffs and a summary is given below of the amounts forwarded to date.

First, of course, there was the donation of 250,000 bags of flour to the Motherland. Part of this was used in relieving distress in various parts of England following the outbreak of war. The balance with the consent of the donors was forwarded to Belgium, where the need was even greater. Throughout the winter months contributions of evaporated apples to the British Navy, and evaporated apples and canned goods to stricken Belgium, were sent forward.

With another harvest steps were taken to secure a supply of fresh fruit for our soldiers and sailors. Arrangements were made to purchase 10,000 boxes of splendid Ontario apples of the standard varieties. These were picked and packed under the direction of the Department and placed in cold storage awaiting shipment. As it was impossible to ship fresh peaches, it was decided to do the next best thing and preserve a quantity. The canning plant at the Vineland Fruit Experimental Farm was utilized and the entire crop on the farm was used for this purpose. Sufficient were purchased in addition from neighboring farms to make a total of 20,000 gallon cans. These will be shipped from time to time during the winter months and will convey Ontario's greetings in practical form to Canadians in the hospitals and to the British Navy, whose vigilance makes possible our safety and prosperity. The following is a summary of the amounts forwarded and the cost of the same:

250,000 bags of flour distributed in England and Belgium	$780,468 70
100,000 lbs. of evaporated apples for the British Navy	6,381 85
100,000 lbs. of evaporated apples for the Belgians	5,500 00
1,378 bags raw Ontario grown beans and 48,000 tins baked beans for the Belgians	10,900 20

60,000 3 lb. tins baked beans; 27,000 2 lb. tins canned corn; 28,000 2 lb. tins canned peas, for the Belgians	8,910 44
10,000 boxes of No. 1 Ontario apples; 20,000 gallon tins of preserved peaches for Canadian Hospitals and British Navy	26,916 43
	$839,077 62

The work of the Department was maintained in all its branches. The Federal grant, which has made possible so much splendid work in the interest of agriculture, was received as usual and is being expended under an agreement which includes the following appropriations:

District Representatives	$114,000 00
Agricultural College:	
(*a*) Capital expenditure	81,413 64
(*b*) Salaries and expenses of additions to staff and maintenance	12,400 00
O. A. C. Short Courses, travelling and living expenses of winners of acre profit and live stock competitions	1,500 00
To encourage agriculture and domestic science in High, Public, Separate and Continuation schools, to be available for grants and for travelling and living expenses of teachers and others in attendance at Short Courses or other educational gatherings, in addition to services, expenses and equipment, and to be paid on the recommendation of the Department of Education	20,000 00
Educational work in connection with marketing of farm products, including organization of co-operative societies, collection, printing and distribution of information on current prices and systems of marketing	6,000 00
Stock and seed judging Short Courses and Institute Lecture work	6,500 00
Women's Institute Work, including courses in cooking, sewing, etc.	2,000 00
Short Courses for Fall Fairs and Field Crop Judges, including travelling and living expenses	3,000 00
Drainage work	6,200 00
Demonstrations and instruction in vegetable growing	3,000 00
Demonstration work on soils	2,000 00
Demonstration work in spraying, pruning and packing of fruits	4,000 00
Work in Beekeeping	1,500 00
Equipment of laboratory and services of Assistant, Horticultural Experiment Station, Vineland Station	2,500 00
	$266,013 64

This work as well as the general work of the Department is reviewed in more detail under the different branches.

ONTARIO AGRICULTURAL COLLEGE.

This institution, as was to be expected, reflected the strain of the war in a slightly decreased attendance in the general course, but nevertheless showed increases in some of the short courses. Hence the following figures showing another year of great usefulness must be recorded. (Figures for general course include students of winter term and new students for fall term.)

General Course		559	
Specialists in General Course Work		13	
Manual Training (One Year Normal Course)		7	
Dairy Courses		121	
Stock and Seed Judging		190	
Poultry Raising		34	
Fruit Growing		55	
Agriculture		39	
			1,018
Domestic Science (at Macdonald Institute)		390	
Summer Courses—High School	28		
Public School teachers, first year	54		
Public School teachers, second year	23		
Rural School Inspectors	78		
School for Rural Leadership	61		
		244	
			634
Total			1,652

Analysis of College Roll (General Course), 1915.

From Ontario.

Algoma	8	Huron	9	Perth	12
Brant	11	Kent	5	Peterboro	8
Bruce	8	Lambton	17	Prescott	4
Carleton	19	Lanark	5	Prince Edward	2
Dufferin	4	Leeds	1	Renfrew	4
Dundas	6	Lennox	6	Russell	3
Durham	7	Lincoln	10	Simcoe	10
Elgin	10	Middlesex	16	Stormont	2
Essex	11	Nipissing	3	Thunder Bay	3
Frontenac	6	Muskoka	3	Victoria	5
Glengarry	4	Norfolk	15	Waterloo	13
Grenville	12	Northumberland	5	Welland	7
Grey	4	Ontario	8	Wellington	34
Haldimand	6	Oxford	15	Wentworth	20
Halton	9	Parry Sound	4	York	61
Hastings	6	Peel	11		
				Total from Ontario..	452

From Other Provinces of the Dominion.

Alberta	11	New Brunswick	1	Quebec	1
British Columbia	27	Nova Scotia	11	Saskatchewan	5
Manitoba	1	Prince Edward Island	4		
				Total from other Provinces	61

From Other Countries.

Argentine Republic	1	Japan	1	Spain	1
B. W. I.	3	Panama	1	U. S. A.	19
England	12	Scotland	3		
India	1	South Africa	4	Total from other countries	46

O.A.C. Students Training Corps, with Officers from the Faculty.

Ages and Religious Denominations.

The limits of age in the General Course, 1915, ranged from 17 to 36 years. The average age was 22.

Anglican	118	Evan. Association	1	Methodist	172
Baptist	35	Friends	8	No Religion	8
Christian Scientist	1	Greek Orthodox	1	Presbyterian	185
Congregational	6	Latter Day Saints	1	Roman Catholic	16
Disciples of Christ	1	Lutheran	1	Unitarian	1
Dutch Reform	3	Mennonite	1		

STUDENTS' DRILL INAUGURATED

A most important change in College life and work was made at the opening of the college term in the fall of 1914 by the inauguration of military drill. Years ago military drill formed part of the College activities but this had long since been discontinued. When the students assembled under the first shadow of war the subject was at once taken up. It was gratifying to find the boys eager and anxious to undergo training and the movement was given every encouragement by myself and others in authority. A committee comprising both students and members of the faculty was organized to handle the matter and ample time was allowed in the curriculum. An Officers' Training Corps, similar to that at Toronto University, was formed and before the end of the term many had qualified and offered for Overseas Service. With the opening of the new term in September the work was resumed with even greater enthusiasm and it was no uncommon sight to see two hundred young men, including several of the younger members of the faculty, out drilling on the campus. I am convinced that this work must have a beneficial and far-reaching effect both during the war and after. In the first place it gives the students an opportunity, while continuing their studies, to fit themselves for the more immediate duty of serving their country and I have no doubt they will respond in large numbers. It will also qualify them for positions of leadership in their home communities in whatever capacity the conditions following the present conflict may demand. As far as can be seen at present it should become a permanent part of the training of the College.

TWO NEW BUILDINGS

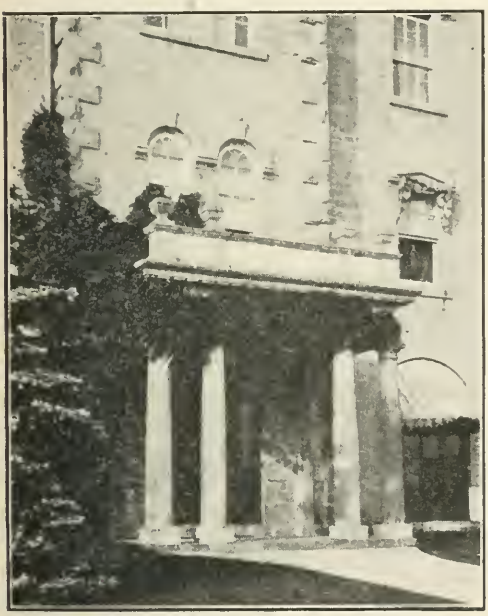
Building operations during the year included two new buildings—a maids' dormitory, located back of the new dining hall and providing accommodation for some fifty maids, and a new Physics building.

The latter is a very valuable addition to the equipment of the College, both from the standpoint of class rooms and laboratories. It was financed from the Federal grant and is now being fully utilized. It is a four-story, steel-framed building, having a frontage of 101 feet 9 inches, with a depth of 70 feet, with lower storey of stone and upper storeys of red pressed brick, relieved with stone dressings. The roof is of slate with platform of asphalt roofing. Internal partition walls are of tile. The floors of halls and stores are of reinforced concrete slabs, the former finished with 6 by 6 inch red flooring tile. The stairs are of steel with treads of mastic, giving a fireproof and at the same time noiseless stair. The whole of the trim throughout is of oak, including all furnishings and fittings; all table tops are of birch; all floors, where not fireproof, are of maple, carried on wood joists; all lavatories are tiled 5 feet high and all walls and ceilings are plastered, except in amphitheatre class rooms, where the lower walls are lined with oak to five feet high.

The building throughout is heated both by direct and indirect method, with thermostatic control. Fresh air is drawn in at the basement by fan and screened and passed over steam heaters and lead to each room in metal ducts, and the vitiated air is exhausted by similar ducts and drawn off by fan and discharged at the roof. A freight elevator communicating with the outside and capable of carrying a load of 2,000 pounds connects up all floors, passing up inside of store rooms. There is a store room on each floor fitted with racks for spare apparatus.

The basement is to be used for the testing of various soils and for firing clays and the carrying out of experiments on field drain pipes, etc.

The ground floor consists of two laboratory class rooms, one 37 by 64 feet and one 37 by 42 feet; a private laboratory 21 by 21 feet; students' toilet room 15 by 16 feet and store room 20 by 14 feet. The larger laboratory is fitted with nine tables, each to accommodate eight students. Each table is fitted with porcelain sinks with separate water tap and gas jet for each student. The lower part of the table is formed into individual cupboards fitted with galvanized iron drawers for experimental clays and space for test tubs and other apparatus. The smaller laboratory is fitted with a reinforced concrete bench carried on piers from basement to carry the centrifugal machine without vibration.



An important spot in the lives of many young men—Entrance to the O.A.C.

The first floor consists of two class rooms each 37 by 43 feet, with administrative office and rooms for the professors and lecturers, dark room and store room. One of the class rooms on this floor is fitted up as an amphitheatre, with rising seats to accommodate 150 students, and is fitted with individual chairs with folding seats and folding book rests. At one end is a raised platform with demonstration table in front and behind is a sliding slate blackboard 16 by 8 feet ruled off into inch squares. The other class room gives accommodation for fifty-four students working at twenty-seven drafting tables.

The second floors consists of two laboratories 37 by 42 feet, each giving accommodation for seventy-two students working at nine tables, as already described for the large laboratory on ground floor.

A steel wind gauge tower is carried up twenty feet above a platform on the roof.

The whole of the wood trim was prepared at the Central Reformatory, Guelph, and all the flooring tiles and partition tiles and common bricks were manufactured at the Government Brick Works at Mimico.

With the completion of the Physics Building, and the consequent removal of the Physics department from its old quarters in the Biological Building, important changes have been made in the latter. These changes very greatly improve the accommodation of the Botany department, the entire second floor being devoted to this subject. Where before everything was very much cramped, there are now spacious class-rooms and well-equipped laboratories, which will, no doubt, make for still greater efficiency.

MACDONALD INSTITUTE HAS GOOD YEAR

Macdonald Institute, the girls' department of the College, has not been detrimentally affected by the war. In fact, the attendance has for some time past been limited only by the accommodation. Preference is of course given to farmers' daughters and the aim is to make it exert as large an influence as possible on the domestic side of rural life. In addition to the different courses much correspondence is carried on, requests for information being received as follows:

Home	90
House and housekeeping	66
Food and cookery	86
Dietetics	8
Health	47
Household Finance	25
Home Economic Education	67
Social Service, Clubs, Community Work, etc.	159
Gardening, etc.	16
Patriotic	23
Miscellaneous	22
	609

And requests were answered with:

2,130 folders containing pamphlets, articles or clippings.
50 books.
6 special letters.
32 letters regretting that material wanted was lacking or already out on loan.
23 were referred to other departments or to Mr. Putman for answer.

Furthermore a new plan is now being tried out with a view to carrying on a rural short course on a co-operative basis. The idea is to conduct in some village or rural centre a three months' short course equivalent to the three months' course conducted three times a year at the Institute. Instruction is given in cooking, sewing, laundry, foods, sanitation, home nursing, care of the house, English, millinery, or embroidery. The Women's Institute at Ayr was given the first opportunity to co-operate in this plan. The Institute provided the equipment and instruction. The students were required to pay a fee of $15 and conform to regulations in vogue at the regular Institute Courses, including the examination at the conclusion. Twenty-two students, seventeen of them farmers' daughters, took advantage of the course, which proved quite successful. This is designated as Macdonald Institute Branch No. 1.

LEADING VARIETIES ON PLOTS

In spite of the adverse weather the College farm plot experiments were carried on with much success, again emphasizing the pre-eminence of the varieties which the College has done so much to popularize, especially the following:

Oats.—O.A.C. No. 21 and Mandscheuri.

Wheat.—Dawson's Golden Chaff and Imperial amber winter wheat.

Rye.—Mammoth white winter, O.A.C. No. 61 spring.

Emner.—Common.

Buckwheat.—Rye.

Peas.—New Canadian Beauty and early Britain.

Corn.—White Cap Yellow Dent and Wisconsin No. 7, and Salzen's North Dakota flint. Golden Bantam Sweet.

Alfalfa.—Ontario Variegated and Grimm's.

Beans.—Pearce's Improved Tree.

Mangels.—Yellow Leviathan.

Potatoes.—Empire State, Davies' Warrior, Extra Early Eureka.

Hairy Vetches.—Early yellow soy beans, early amber vetches.

In regard to oats, it is interesting to note that the returns from the plots showed a yield of 103.5 bushels per acre of O.A.C. 72 and 92.8 of Banner. Over a period of nine years the O.A.C. 72 has averaged 90.6 bushels per acre as against 72.5 per acre of Banner, taking a substantial lead each year. Not only has this variety taken first prize in the Field Crop Competitions but at the Winter Fair it showed four times as many entries as any other variety.

As to barley and potatoes I would like to quote the following from the report of the professor of Field Husbandry:

"In the barley experiments at the College and throughout Ontario the O.A.C. No. 21 still occupies highest place in yield of grain per acre. This variety has become exceedingly popular throughout the Province, and is supplanting all other varieties, even the Mandscheuri which the College introduced about twenty-five years ago, and which has done so much in the improvement of barley growing in Ontario. It is now estimated that about ninety-six per cent. of all the barley which is grown in Ontario belongs to the Mandscheuri or the O.A.C. No. 21 varieties. Of the forty entries of barley at the Provincial Winter Fair held at Guelph this year not a single name occurs except the O.A.C. No. 21. According to the report of the Bureau of Industries for Ontario the yield of barley per acre for the past sixteen years as compared with the sixteen years previous has had an increase of about twenty-three per cent. This increase in yield per acre throughout Ontario for the last period as compared with the first period of sixteen years would amount to about thirty-five million dollars, or sufficient to maintain the Ontario Agricultural College at its present cost of maintenance for approximately one hundred and ninety (190) years."

"The season of 1915 was exceptionally unfavorable for potato growing in Ontario, the average yield per acre for the Province being only seventy-six bushels per acre. The results of the experiments at the College for the past year are very interesting and important in showing the great variation in different varieties. One variety, viz., The Snowball, gave a yield of only 13 bushels per acre, and another variety, viz., The Hustler, under similar conditions gave a yield of 366 bushels per acre. The Extra Early Eureka, a medium early variety, gave an average of 326 bushels per acre in 1915, and an average of 232 bushels per acre for the past five years. This variety is not only a large yielder but it is also one of the freest from rot of all the varieties of potatoes under experiment. In the average results for the past nine years the Davies' Warrior stands first with 235, and the Extra Early Eureka second with 230 bushels per acre per annum. In comparing the varieties tested for a longer period of time the Empire State occupies the highest place in productiveness. These three varieties are all of good table quality, the Empire State being particularly good in this respect.

In a season like the present it has been difficult to get full advantage from the spraying materials with potatoes owing to the fact that the rains were so incessant. Our experiments at the College show a very great difference in the susceptibility of the different varieties of potatoes to the rot. For instance, in 1915 two varieties had less than one per cent. each of rot and two varieties had upwards of fifty per cent. of rot under similar conditions. Taking the average of experiments for five years it has been ascertained that those varieties which were the freest from rot were the Davies' Warrior, the Extra Early Eureka, the Stray Beauty and the Holborn Abundance, and those most subject to rot were the Early Rose and the Beauty of Hebron."

SOME EXPERIMENTS IN FEEDING

In the Animal Husbandry Department some interesting work was done in testing different feeds for cattle and swine. First during the months of June, July, August and September, thirty-two cows were pastured, and fifteen cows were fed in the stable on rations identical with those used in the winter. The stabled cows were given exercise in a small lot adjoining the stables.

The conditions as to lactation were as follows:—

Pasture Group.—23 cows averaged 116 days from date of calving to commencement of test: 6 cows, or 18.7 per cent. of group, calved during test.

Stable Group.—12 cows averaged 111 days from date of calving to commencement of test: 3 cows, or 20 per cent. of group, calved during test.

Method of Determining Cost:

(1) *Pasture Group*: This group was charged $5.00 per acre for rent of land; also, it was charged with preparation of land for crop, cost of temporary fencing, proportion of cost of seed, and cost of all additional feed, but cost of attendance was omitted. The average charge amounted to $1.87 per cow per month.

(2) *Stable Group*: This group was charged with cost of feed alone, cost of attendance being omitted as in the pasture group.

The results were as follows:—

	Cost of 100 lbs. of milk.	Cost of 1 lb. Fat.
Pasture Group	45.1c.	11c.
Stable Group	86c.	22c.

From the standpoint of feed alone, pasturing proved much more economical than stable feeding.

This test must not be confused with a comparison of soiling with pasturing, because soiling was not practised with the stable fed cows.

STEER FEEDING

Alfalfa vs. Straw.

During the winter of 1914-15, alfalfa hay was compared with oat straw for steer feeding, the groups being given the same meal ration. Silage was also fed in the proportion of four pounds of silage to one pound of hay or straw. The steers were on feed for 118 days.

Valuation of Feeds.—Alfalfa hay was valued at $12.00 per ton, silage at $3.50 per ton, meal from a mixture of home grown grains, at $25.00 per ton, and straw at $6.00 per ton.

There is always room for argument when it comes to attaching values to feeds, but the values adopted here are probably fair for the quality of feed used.

Summary of Results.—The steers in the alfalfa group made more rapid gains in weight than those in the straw group. The alfalfa group made an average daily gain of 1.82 lbs. per steer, and the straw group, 1.54 lbs.

The gain is reckoned from the shrunk weight of the steers at the city scales on the day of delivery.

Though the alfalfa steers made more rapid gains than those getting straw, they consumed a great deal more feed, and when feeds are valued as stated above, the gains made by the straw group cost $11.37 per hundred and the gains made by the alfalfa group cost $11.51 per hundred.

Financially, therefore, the results were very similar, though the steers fed alfalfa showed a little better finish than those fed straw.

COTTONSEED MEAL WITH STRAW

The object of this test was to ascertain whether the addition of a high-protein feed, such as cottonseed meal, to the ration of steers receiving a low-protein bulky ration, would prove beneficial.

One group, therefore, was fed oat straw, corn silage, and meal from mixed home grown grains.

A second group was fed the same bulky food, and the same kind of mixed meal with the addition of a small allowance of cottonseed meal, the cottonseed meal constituting twenty per cent. of the mixture.

The amount of meal per steer per day was the same in each group.

Summary.—The steers in the group fed cottonseed meal made an average daily gain per steer of 1.58 lbs., while those in the other group made an average daily gain per steer of 1.54 lbs.

The cottonseed meal cost $30.00 per ton, and other feeds are valued as in the test previously described. On this basis of valuation, the steers receiving cottonseed meal cost $11.81 per 100 lbs. gain, and those in the other group cost $11.37 for 100 lbs. gain.

In this test, therefore, the feeding of cottonseed meal was not profitable, although the steers fed cottonseed meal made somewhat larger gains than the others.

PIG FEEDING

Two tests were made with young pigs to compare three kinds of packing-house by-products with skim milk.

The first test was made with pigs which had just been weaned, and in the second test the pigs were about three months old when the test commenced.

The packing-house by-products are very concentrated, and hence, where they were used, they constituted only about eleven per cent. of the meal ration.

Valuation of Feeds.—Following are the values placed upon the feeds used, which are the actual retail values of the ones purchased:—

Swift's Digester Tankage	$2 50	per cwt.
Harab Digester Tankage	2 40	"
Harab Beef Meal	4 00	"
Skin Milk	0 20	"
Barley (poor quality and unsalable)	1 10	"
Wheat middlings	1 30	"

Very little barley was used in either test.

Summary: The following table shows results of Test No. 1:—

Group	Average weight at beginning of test.	Average weight at close of test.	Average daily gain per pig.	Cost per 100 lbs. gain.
	lbs.	lbs.	lbs.	$ c.
Group I— Swift's tankage, meal & water.	33.6	157.0	1.01	4 33
Group II— Harab tankage, meal and water	31.4	160.4	1.06	4 10
Group III— Harab beef meal, meal & water	32.8	146.4	0.93	4 48
Group IV— Meal and water................	32.8	156.8	1.01	3 61
Group V— Skim milk and meal..........	32.4	165.8	1.09	5 00

It will be noted that all pigs made very satisfactory gains, and that the cost of feed per 100 lbs. was very reasonable indeed.

The pigs in the meal and water group did exceptionally well under the circumstances, which makes this group very much cheaper than the others.

The pigs on skim-milk made the best gains, but, in this test, skim-milk at 20c. per hundred was more expensive than the other feeds used.

TEST No. 2

Group.	Average weight at beginning of test.	Average weight at close of test.	Average daily gain per pig.	Cost per 100 lbs. gain.
	lbs.	lbs.	lbs.	$ c.
Group I— Swift's tankage, meal & water.	69.4	153.8	1.14	4 23
Group II— Harab tankage, meal and water	71.4	159.4	1.19	4 07
Group III— Harab beef meal, meal & water	73.8	155.2	1.1	4 76
Group IV— Meal and water	70.4	159.2	1.2	3 34
Group V—...................... Skim milk and meal	73.0	171.2	1.33	4 32

As in Test No. 1, the meal and water pigs in this test have done surprisingly well.

The skim-milk pigs made the largest gains, but the cost is higher than in other groups, except the group on beef meal.

All groups made their gains on a very reasonable feed cost.

In both tests, meal and water alone proved the most economical ration.

PASTURING HOGS

A test was made to compare rape and clover pasture, also to compare pasture feeding with pen feeding.

All groups were fed the same kind of meal ration, and each received an equal allowance of skim-milk, though the pigs on pasture were fed less meal than those in pens.

Values attached to feeds are the same as in previous tests, and, in valuing pasture, rent of land, cost of preparation, seed, etc., are all taken into account.

Summary.—The following table shows the results:—

Group.	Average weight at beginning of test.	Average weight at close of test.	Average daily gain per pig.	Cost per 100 lbs. gain.
	lbs.	lbs.	lbs.	$ c.
Group I— Rape pasture	97.1	163.1	1.01	4 40
Group II— Clover pasture	95.5	171.1	1.16	4 08
Group III— In pens	96.3	173.5	1.19	4 26

It will be noted that the clover pigs made the cheapest gains, while those in pens made the most rapid gains, and more economical gains than those on rape pasture.

The food cost per 100 lbs. gain is very reasonable in all cases.

To be pastured to advantage, hogs should not weigh much less than 100 lbs. when turned out.

DRAINAGE WORK PROGRESSES

In connection with the Government's policy to assist farmers in appreciating the value of drainage and the methods by which its advantages might be secured splendid progress was made. The number of acres surveyed under the Physics Department, aside from surveys made by district representatives, aggregated 15,336, being 1,950 more than the previous year and the second highest since the campaign was inaugurated. Fewer ditching demonstrations were held, as the work has now been introduced in most localities. The following table gives a statistical record of the work since its inception:—

TABLE No. 1—SUMMARY OF SURVEY

Year.	Appropriation.	Applications.	Surveys.	Held over.	Acres surveyed.	Miles of drain.	Demonstrations. No.	Demonstrations. Average attendance
1906	Nil	15	15	....	500	45	....	....
1907	Nil	126	70	56	3,500	350	....	....
1908	1,000	166	100	66	5,000	510	43	....
1909	1,000	302	179	121	5,157	613	48	18.0
1910	4,000	518	383	135	14,672	1,800	132	23.6
1911	4,000	414	327	87	15,211	1,864	142	17.4
1912	4,000	430	293	137	17,212	2,278	70	21.7
1913	4,000	290	247	43	13,705	1,713	56	20.3
1914	4,000	296	250	46	13,386	1,673	23	20.9
1915	4,000	291	263	28	15,336	1,917	8	12.8
			2,127	....	103,679	12,763	522	

Further work was done by way of practical field drainage demonstrations, by which a whole field was taken over and portion drained and the balance left undrained. Six more plots of this nature were started and a demonstration held on each with an average attendance of 76. This makes a total of 24 plots being handled in this way in different sections of the Province. The season was a peculiar one from the drainage standpoint, being dry during the seeding and growing periods and very wet in harvest. It was noticed that the drained lands stood up best under the binder. Returns have not been received from all the plots, but returns from fourteen plots show an average increase of $14.48 per acre in favor of drained land. This work is being carried over a period of years.

NO ARMY WORMS—BUT OTHERS

As every farmer is aware there was no invasion of Army Worms similar to that of the previous year. This was due both to the methods adopted to check the attack and to the beneficent efforts of birds, toads and parasitic insects. Notwithstanding this exemption it was an unusually bad year for bugs and insects of various sorts. Cut worms were perhaps the worst, complaints of these having

All interested in the Gospel of Drainage.

been received by the Entomological Department from twenty-three different places. The prevalent species appeared to be what is known as the Glassy Cut-worm, which works beneath the surface and therefore could not be combated by the usual method of poisoned bait. In some instances the poisoned mash was plowed in, but in others it was necessary to plow up the crop. Aphids and Tent Caterpillars were also numerous. Various other worms and insects were active in gardens and pasture fields.

Careful investigational work has been carried on with regard to Pear Blight, Peach Yellows and Little Peach, spraying for San José Scale, Leaf Rollers, Apple Capsids, Apple Maggot or Railroad Worm, imported Poplar and Willow Borer. In so far as definite results have been secured details will be published later in such form as will reach those interested.

POULTRY PROBLEMS

In connection with the breeding problems of poultry dealt with in the Poultry Department of the College, particular attention has been paid during the past year to the hatching power of eggs, the size of eggs and the living power of chicks. Good progress has been made and a slow but gradual improvement in the hatching power of the eggs and the general quality of the stock was noted. There was a notable decrease in the percentage of culls and the hatch of 1915 gives promise of being better egg producers on the average than previous generations.

Some important work was also done in reference to feeding methods. For some years past the general ration included but three grains—wheat, corn, rolled or crushed oats, in about equal quantities. Other food consisted of roots, cabbage, clover hay, sprouted oats and buttermilk. Owing to the excessive price of wheat in the early part of the year, a less expensive substitute appeared desirable. Hence the plan of feeding was changed to meet the new conditions in that a wet mash was fed daily consisting of one-third in bulk of cooked pulped roots, and these were dried to a crumbly state with equal part of shorts and ground barley: the shorts and barley meal tending to counteract the general tendency of roots as a laxative when fed in large quantities. By using this ration we did not materially decrease the egg production nor the hatching power of the eggs; in fact, eggs never hatched better, but this result may be, and is probably, due to a breeding problem. When wheat is selling at one dollar per bushel and corn at eight cents per bushel the extra labor entailed in following the above plan of feeding would not warrant this method of feeding under ordinary conditions. The year has certainly suggested that local circumstances may mean a change in feeding methods and that a knowledge of various foods both as to their compositions and physical action, will permit one to use many combinations of feeds.

Importance of Succulent Foods for Poultry. A study of the importance of succulent green foods for poultry is indicating that the average poultryman can well afford to put forth a special effort to supply such daily, and furthermore, that such require particular attention during the hot summer months if a normal egg production is expected.

Breeding Problems. For a number of years special attention has been paid to breeding problems with poultry. Outside of the general routine of business and class-room work one might say that nearly all effort was put forth in trying to produce a family of hens that would produce more eggs and were also fair meat producers. Just at the present time there are many people interested in increased egg production and many breeders have undertaken this line of breeding. It appears to the writer that as an essential factor to permanent success there are some characters other than increased egg production that must not be overlooked: such as the hatching power of eggs, the size of eggs, and the living power of the chicks. The work done in this Department would indicate that the consideration of such characters is of prime importance unless one expects failure: in fact, we have been forced to consider them whether we wished or not; otherwise some prominent lines would have ceased to reproduce, and moreover, some extra heavy laying families have been broken up in order to get away from a permanent production of small eggs. The more characters considered the slower the progress and each year brings more information as to why certain results are obtained. This work is worth while if for no other purpose than information obtained for the class-room.

It is gratifying to be able to report a slow but gradual improvement in hatching power of the eggs and the general quality of the stock. The birds hatched during the season of 1915 give promise of being better egg producers than previous generations: that is to say they are more uniform in their production.

perhaps none better than the best in other years but fewer poor ones. It is certainly hopeful when the percentage of culls decreases.

SOIL WORK

In connection with the effort to make a preliminary soil survey of the Province in two years, which has been undertaken by the Chemistry Department, good progress was made during the summer months. The survey and mapping of the following counties have been completed: York, Peel, Halton, Wentworth, Lincoln, Welland, Haldimand, Norfolk, Elgin, Middlesex, Oxford and parts of Lambton, Kent, Brant and Wellington.

Two demonstration plots on definite types of soil are being conducted in connection with this work but no final definite results have yet been obtained. In Norfolk County on light sandy soil a yield of 400 bushels per acre of Early Eureka potatoes was obtained from manured and limed soil as compared with a yield of only about one-sixth from land not so treated.

Experiments are also being carried on with different forms of lime materials on the acid peaty soil of Leamington Marsh and the heavy clay soils of Welland County.

Germany having previously been the chief source of potash, efforts have for some time past been made to secure a substitute supply. At present the Chemistry Department is testing two possible substitutes, seaweed, prepared experimentally in Clark's Harbor, Nova Scotia, under the Dominion Government, and felspar fused with a mixture of limestone and iron oxide cooled and finely ground. This treatment was invented by C. W. Drury, of Queen's University, and is covered by patents in Canada and United States. According to our analysis the material contains about eight per cent. of potash, over ninety per cent. of which is soluble in a one per cent. citric acid solution. We included these materials in our field tests with fertilizers and also carried out several series of tests in pots. No conclusive results have been arrived at as yet.

GETTING RID OF WEEDS

The Botany Department has had a very busy year. There has been a big increase in the demand for information about weeds, weed seeds and fungous diseases, many specimens of which were sent in for examination. Owing to the wet season fungus diseases were especially prevalent throughout the Province. The most serious of these were: Loose Smut of Oats, Bunt or Stinking Smut of Wheat, late blight and rot of potatoes, late blight of celery, anthracnose of beans, apple scab.

For the fourth consecutive year co-operative experiments were conducted in weed eradication. The weeds experimented with are Perennial Sow Thistle, Twitch Grass, Mustard, Bladder Campion and Ox-eye Daisy. Five experiments in all have been tried, viz.: The use of rape in the destruction of Perennial Sow Thistle; the use of rape in the destruction of Twitch Grass; a method of cultivation for the eradication of Bladder Campion of Cow Bell; spraying with iron sulphate to destroy mustard in cereal crops: a method of cultivation for the destruction of Ox-eye Daisy. Some fifty-eight farmers have co-operated in this work during the past four years. These experiments have not been so successful this past year as in former years, but this is due to the exceedingly wet weather of the past summer preventing the carrying out of the experiments according to directions. Those experimenters, however, who in spite of the bad weather were able to give the experiments a fair trial report results which confirm those of the past three years. The results of the four years' co-operative weed experiments show:—

1. That good cultivation, followed by rape sown in drills, provides a means of eradicating both Perennial Sow Thistle and Twitch Grass.

2. That rape is a more satisfactory crop to use in the destruction of Twitch Grass than buckwheat.

3. That rape gives much better results in the eradication of Twitch Grass and Perennial Sow Thistle when sown in drills and cultivated than it does when sown broadcast.

Wood carving done by students in Manual Training class.

4. That thorough deep cultivation in fall and spring, followed by a well cared for hoed crop, will destroy Bladder Campion.

5. That Mustard may be prevented from seeding in oats, wheat and barley by spraying with a twenty per cent. solution of iron sulphate without any serious injury to the standing crop or to the fresh seedings of clover.

SEED INOCULATION

From the Bacteriology Department a total of 2,918 cultures of legume bacteria for seed inoculation were sent out, made up as follows:—

Alfalfa, 2,267; Red Clover, 401; Alsike, Vetch, Sweet Peas, Peas, Beans, White Clover, Sweet Clover, Crimson Clover, Mammoth Clover, 250.

Distribution by provinces is as follows:—

Ontario, 1,312; British Columbia, 733; Saskatchewan, 120; Alberta, 61; other provinces, 41.

Five hundred and fifty cultures were sent to the British Columbia Department of Agriculture on request, for distribution.

This Department, among other things, has made some experiments in connection with the canning of fruit and vegetables which will form the basis of a bulletin. A study has also been made of the quality of milk secured by the use of milking machines and a bulletin will probably also be issued on this subject.

FRUIT IN NEW ONTARIO

One branch of the investigational work carried on by the Horticultural Department was an enquiry as to the fruit possibilities of our newer Ontario, including Parry Sound, Algoma, Temiskaming, Thunder Bay, Rainy River and Kenora. As a result of these enquiries the following opinions are expressed:—

1. Strawberries, currants and gooseberries can be grown with excellent success in any of these districts, provided due consideration is given the choice of varieties, soils and locations.

2. Red raspberries can be successfully grown in any of the districts mentioned, but special care is necessary in order to screen the canes from the sun on bright days in winter and early spring. This is best accomplished by choosing locations protected *on the south* by belts of trees, windbreaks and the like.

3. Apples, plums, and cherries are being successfully produced in Parry Sound, on Manitoulin Island and in the southern part of Algoma District.

4. For trees and bush fruits in cold districts, lighter soils are preferred, and if these can be had on northern slopes, so much the better. Special attention should be given to windbreak protection on the west and north, and to sun protection on the south.

With a view to developing strains of sufficient hardiness, the Department secured a considerable quantity of seed of the hardiest desirable Russian apples and pears. From these about 5,000 seedlings have been grown and many will be distributed for further test. Hybridization is also being adopted to secure better varieties of hardy plums and cherries.

As to the investigation of winter injury of fruit trees in older Ontario the following conclusions have been arrived at:—

1. Lack of adequate drainage is the direct cause of many cases of severe winter injury.

2. Root killing is common (even in the southern portion of the Province) on exposed situations or in sections when snowfall is light. For exposed situations, windbreaks on the west are recommended, and cover crops should also be made use of in order to retain all the snow possible.

3. Late growth of trees is especially to be guarded against, and fruit growers are particularly warned against late cultivation. Apples, pears, cherries and plums *should not be cultivated later than July 1st in any season, in any part of Ontario.*

A cover crop should be sown at the last cultivation in order to check the growth of trees and cause the wood to ripen thoroughly. Peaches may be cultivated three or four weeks later than other fruits.

INVESTIGATIONS AS TO RENNET

One of the branches of investigational work carried on by the Dairy Department was with reference to rennet. Without this ingredient it would be impossible to make cheese, and yet practically no rennet is made in this country. It is all imported from the United States and indirectly from Europe. The war, therefore, has created a great scarcity and consequent big advance in the price. This should constitute an opportunity for Ontario manufacturers to get established, and early in the year two samples were submitted by a Toronto firm. One of these samples was found satisfactory in every way, but the makers claimed the cost of production was too high to enable them to sell at the prices then prevailing. The other sample was not satisfactory and so no local source of supply has yet materialized, although the outlook is that Ontario cheesemakers will be able to get an adequate supply again next year at the advanced price. It is unfortunate that the Province should have to depend on foreign sources of supply, and it is to be hoped the Canadian manufacturers will yet succeed in placing on the market a rennet of the desired quality on a sound commercial basis.

APIARY INSPECTION

In addition to the instruction in beekeeping given at the College, the work of inspection to stamp out Foul Brood was also organized and supervised. In order that the maximum amount of information might be disseminated on this and other important phases of beekeeping some 60 demonstrations were held throughout the Province with an attendance of 1,910. Foul Brood, however, continues to be the big problem, and last year the Government offered on the basis of a charge sufficient to cover expenses to have the inspections remain long enough at an apiary to thoroughly clean out the disease. Unfortunately this was not very generally taken advantage of. The following figures showing the distribution of the disease may be of interest:—

EUROPEAN FOUL BROOD.

County.	No. of apiaries inspected.	Total No. of colonies in apiaries.	No. of apiaries diseased.	No of colonies diseased.
Carleton	106	1,054	50	283
Durham	24	167	12	55
Frontenac	14	461	8	152
Hastings	10	96	3	27
Lennox and Addington	40	493	26	164
Northumberland	30	409	20	69
Peterboro'	14	93	8	39
Prescott	40	661	14	181
Prince Edward	12	241	5	118
Renfrew	4	300	2	14
Russell	22	396	4	67
Victoria	25	579	13	98
Welland	50	417	29	120
Total	391	5,367	194	1,387

AMERICAN FOUL BROOD.

County.	No. of apiaries inspected.	Total No. of colonies in apiaries.	No. of apiaries diseased.	No. of colonies diseased.
Algoma	3	41	....	....
Bruce	25	504	10	41
Dufferin	19	227	3	9
Dundas	7	34	2	7
Elgin	27	685	2	16
Essex	35	339	5	12
Glengarry	2	105	....	....
Grenville	12	212	3	9
Grey	31	242	15	51
Halton	31	1,036	4	5
Huron	2	7	....	....
Kent	26	309	1	2
Lambton	41	632	17	202
Lanark	23	250	6	16
Leeds	1	22	....	....
Lincoln	7	95	5	19
Middlesex	21	680	5	13
Norfolk	2	41	1	17
Ontario	16	321	8	45
Oxford	26	269	7	14
Peel	35	1,148	9	62
Perth	20	469	8	18
Peterboro'	14	93	2	12
Simcoe	2	175	1	....
Stormont	2	96	1	2
Victoria	25	579	5	16
Waterloo	28	502	11	15
Wellington	29	268	12	81
Wentworth	26	443	5	13
York	73	1,001	31	224
Total	611	10,825	179	921

WHITE PINE BLISTER RUST

Early in the year an outbreak of what is known as White Pine Blister Rust in the Province was reported to the Department and a conference of the experts on the subject was at once called to consider measures for combating it. The Professor of Botany thus reports on the work done in this connection:—

"The fungus which causes this disease attacks both five-needled pines and various species of currants and gooseberries. It is capable of being exceedingly destructive to white pines. In some parts of Europe it has destroyed many thousands of trees. On the leaves of currants and gooseberries it produces a rust known as the European Currant Rust, which is not generally considered a very serious disease but does to some extent injure the bushes."

"As a result of the recommendations made at the conference, the following steps were taken in regard to the control of the disease: An Order-in-Council was passed by the Dominion Government prohibiting the importation of white pines and other five-needled pines into Canada from Europe; the disease was included in the Ontario Fruit Pest Act and a circular letter sent to the nurserymen prohibiting for the present the sale of white pines and other five-needle pines; a survey was commenced to ascertain to what extent the disease had spread over the Province." This survey showed evidences of the disease in the following counties: Brant, Durham, Halton, Kent, Lincoln, Wellington, Wentworth.

ONTARIO VETERINARY COLLEGE

As in other departments of activity, the Veterinary College showed the effects of the war in its work throughout the year. In the first place the attendance was slightly reduced, although the first year class was a little larger than in 1914. The total attendance for the year was 290. In the spring of 1915, students to the number of 86 were granted the degree of V.S. upon successfully passing their examinations, while 11 of these afterwards qualified for the higher degree of Bachelor of Veterinary Science from Toronto University.

A word should be added as to the contribution of the college to the prosecution of the war. In the first place arrangements were made with Toronto University by which the students might take military drill with the training corps of that institution. The College Calendar was re-arranged so that this would interfere to the minimum with the work, and a large number of the students took advantage of the opportunity for training. Many have already enlisted, while others are likely to do so. Further, 20 members of the year's graduating class were recommended for positions in answer to the call for veterinary surgeons at the front, and they have rendered excellent service in that capacity. Some six or seven members of the faculty are also on active service; temporary arrangements have had to be made for carrying on the work.

The new college building is now in splendid working order and is giving every satisfaction. The improved conditions seem to have had a most salutary effect upon the health and general comfort of the students, while the increased laboratory space and equipment has enabled the faculty to give more attention to the individual student.

Twenty thousand cans of Ontario peaches like these were put up and forwarded to Canadian hospitals.

BUREAU OF INDUSTRIES

The value of the publications, especially of Bulletins, has been further attested by the continued requests for information. To meet this demand a large supply of most timely Bulletins, in simple, concrete form, have been issued. The following figures show the work in that connection:

*184 Uses of Vegetables, Fruits and Honey	50,000
*213 Bee Diseases	10,000
*225 Swine	25,000
226 Plum Culture in Ontario	15,000
227 Cherry Fruit-Flies	11,000
228 Farm Crops: Experiments at O.A.C., 1914	50,000
229 Smuts and Rusts of Grain Crops	25,000
230 The Cherry in Ontario	15,000
231 Vegetable Growing	50,000
232 Field Beans	20,000
233 Natural Swarming of Bees	15,000
234 Co-operative Marketing Associations	8,000
	294,000

The following Crop and Statistical Bulletins have been distributed:

Crop Bulletin 121, November, 1914	19,000
Crop Bulletin 122, April, 1915	6,000
Crop Bulletin 123, May, 1915	7,000
Crop Bulletin 124, August, 1915	7,000
Municipal Bulletin, No. 9	7,500

The distribution of the Annual Reports has been continued and the following are the figures of the numbers distributed:

Minister's Report	25,000
The Ontario Agricultural College	30,000
The Experimental Union	27,000
The Ontario Veterinary College	4,000
Agricultural Societies and Field Crop Competitions	20,000
Horticultural Societies	15,000
Vegetable Growers' Associations	8,000
Stallion Enrolment Board	6,000
Farmers' Institutes, Part 2	4,000
Women's Institutes, 1 and 2	37,500
Dairymen's Associations	26,000
Entomological Society	3,500
Fruit Growers' Association	4,500
Beekeepers' Association	4,500
Bureau of Industries (Agricultural Statistics)	7,000
	222,000

*Revised editions.

AGRICULTURAL SOCIETIES' BRANCH

In spite of war's distractions the Fall Fairs were unusually successful in 1915. Notwithstanding some doubts earlier in the year, the Government grants were paid in full, and every effort was made to give every possible stimulus to agriculture in this way. Weather conditions were, on the whole, favorable, and only $3,408 were required of the $10,000 grant available to meet bad weather conditions. The exhibits of live stock in every department were the best ever exhibited in this banner Province of the Dominion. Ladies' Work, Domestic Science and Fine Arts were all of a high class.

Several hundred judges attended the Short Courses for Departmental Judges at Guelph and Ottawa, and the result of these classes has proved of inestimable value, not only to the judges themselves, but to the Agricultural Societies which employ them, and, as the years go by, a more uniform system of judging is being arrived at.

FIELD CROP COMPETITIONS

Judging the Dairy class.

A great step forward was made last year in the Standing Field Crop Competitions, particularly in the number of societies taking part, the varieties of crops entered, and the increase in individual competitors. A better idea of what is being accomplished through the agency of this most important educational work may be gleaned from the fact that no less than 6,500 farmers, located in nearly every district of Ontario took part, with fields ranging from five to twenty acres, for which seed had been carefully selected, the soil particularly well cultivated, and, where a noxious weed reared its unwelcome head, it was promptly uprooted, in the endeavor of the competitors to win first place in their Agricultural Society's Competition.

In 1915 each society was allowed to select three crops. One hundred and one societies entered in one, forty-eight in two and thirty-seven in three, a total of 308 crops. Of these, oats were the choice of 152 societies, potatoes of 47, corn of 44, spring wheat of 8, fall wheat of 17, barley of 17, turnips of 11, mangels of 4, peas of 4, clover of 2, beans and beets of one apiece. As compared with 1914, fifty more crops were entered.

From a financial point of view, these Competitions have surpassed all expectations, and the reports from the prize-winners are that in nearly every case largely increased prices have been obtained from the sale of their prize-winning grain. These Competitions have resulted in an increase of from 15 to 30 bushels per acre, which means much to the Province when spread over upwards of 6,000 farms.

The exhibits of the prize-winning grain at the Provincial Winter Fairs and other exhibitions received nothing but favorable comment, and at the auction sales held at the close of the fairs the grain was bought up chiefly by the farmers, a change from the earlier years of the competitions when nearly all the grain was purchased by seed dealers.

The Appendix to the Agricultural Societies' Report containing the names and addresses of the competitors in the Standing Field Crop Competitions and the varieties of grain has been greatly in demand by seed dealers and farmers, not only in Ontario, but in other parts of the Dominion. In some sections of this Province, where these Competitions have been specially successful, car lots of seed grain have been shipped to farmers in the United States at remunerative prices.

HORTICULTURAL SOCIETIES

The Horticultural Societies of Ontario have also had a progressive year. The membership has largely increased, one society having added upwards of 400 members to its roll. Where these organizations have been established in the different towns, cities and villages of this Province, the spirit of Horticulture has been implanted in the breasts of the workers, and many millions of plants, shrubs, flowers and bulbs have added to the beauty of homes and public buildings. The paid membership of these societies is not far from 15,000.

ONTARIO VEGETABLE GROWERS' ASSOCIATION

This Association has also had an excellent year, in spite of somewhat unfavorable weather conditions. Increasing interest is shown in every line of work conducted by the members. The Field Crop Competitions are becoming more popular as the years go by, and the splendid exhibits from the prize-winning fields were the best in the history of the Association Some of the members have undertaken the growing of their own seed, and the results have proved successful beyond their expectations. Co-operative purchasing by the Branches is showing marked expansion.

ONTARIO PLOWMEN'S ASSOCIATION

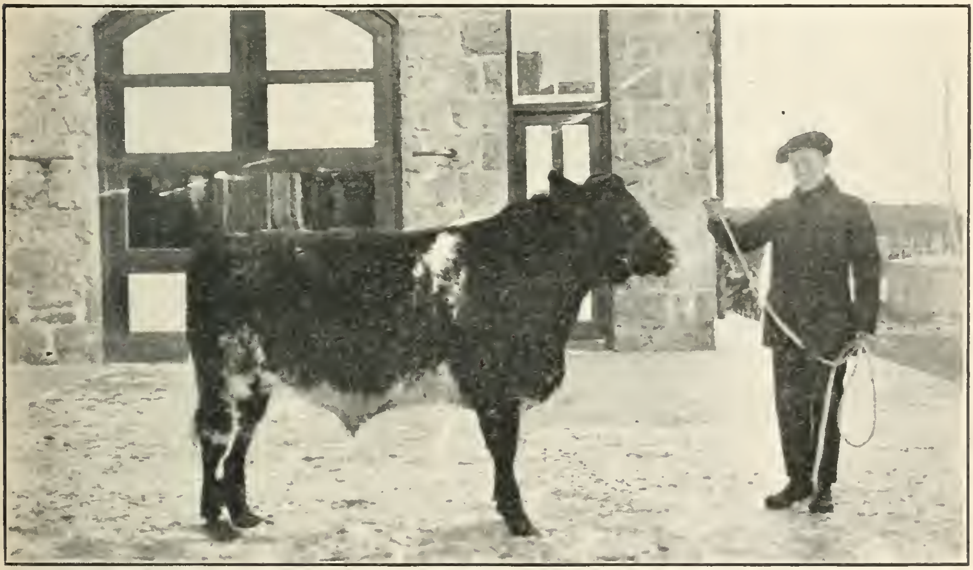
The branches of the Ontario Plowmen's Association held successful competitions in 1915, and the Provincial Match, where the prize-winning plowmen from all over Ontario foregathered, was said to be the largest ever held on this Continent. This match was held on the farm of the Guelph Agricultural College, and the 4.000 farmers in attendance were interested from the time the first furrow was turned till each ridge was completed. Valuable, indeed, were the prizes offered, and the sweepstakes trophy was won by a plowman from the County of York. Besides the walking plows, a number of riding plows were in operation. A prominent feature of this Provincial Match was the splendid demonstration made by light and heavy tractors. Some of these implements turning over as many as 10 furrows in a sweep. Some of the light tractors dragged a three-furrowed plow, a seeder and harrow at the same time.

One of the most important matters handled by this branch has been that of stallion enrolment. The total number of stallions enrolled for the year was 3,177, of which 2,155 were pure-bred and 1,022 were enrolled as grades, though a small number of these latter are said to be pure-bred horses, for which the applicants for enrolment have been unable to produce proofs of breeding and ownership as required by the Act.

Improvement in the proportion of grade stallions enrolled is being made, there being in 1913, 36 per cent., in 1914, 34½ per cent., as compared with 32 per cent. in 1915.

All cases of violation of the Act that came to the attention of the Board were investigated by special inspectors appointed for the purpose, and, where circumstances warranted it, prosecutions followed.

There were, during the year, 49 prosecutions under the Act, resulting in 36 convictions, and in some instances, where the offence was not wilful, sentence was suspended.



Winners in baby beef contest in county and also at winter fair.

The amendment to the Act, which was in force for the first time in 1915, making inspection compulsory, has worked out well, though some stallion owners, by not taking advantage of the regular inspections, have made the work of the Board more difficult and more expensive than necessary.

The records, the reports of inspectors and the general observation of conditions in the Province, lead to the conclusion that the aims and object of the Act are gradually being attained, and that in a very few years the good results will be very marked indeed.

It seems reasonably certain that with stimulation of horse-breeding, which must inevitably follow the close of the present war, this Province ought, largely as a result of the elimination of the grade as a sire, to be in a position to supply in a large measure high class horses and become the breeding ground of the horse industry not only of America, but of a large part of Europe.

SUCCESSFUL STOCK SHOWS

The number of shows assisted through the Live Stock Branch was 56 for the year 1915. They consisted of two winter fairs, at Guelph and Ottawa; 11 spring horse shows and 43 poultry shows. The fair at Guelph held in December, 1914, was very successful, the quality of the exhibits rather surpassing that of former years. $15,000 was paid in prize money. The Ottawa Winter Fair of 1915 was also very successful, the exhibits being of high order. These two winter fairs are becoming increasingly important as centres of agricultural education.

POULTRY ASSOCIATIONS

Provision has been made by an Order-in-Council for the organization of one recognized Poultry Association.

(*a*) In each electoral district in the Province, except that not more than one association may be recognized in any incorporated city.

(*b*) In any incorporated city, whether or not it is an electoral district.

A recognized Poultry Association is one that is entitled to receive a Government grant of fifty dollars and to have a lecturer supplied by the Department at a meeting which is held in most cases at the time of the Annual Poultry Show of the Association. Each Association is required to hold a show each year. The meetings for 1915 were well attended and the work being done by these associations is adding greatly to the interest taken in the improvement of poultry conditions.

CO-OPERATIVE SHIPMENTS OF PURE-BRED STOCK TO WESTERN CANADA.

During the past year a shipment was made from Ontario to the West each month from January to June and October.

NUMBER IN EACH SHIPMENT

——	January	Feb.	March	April	May	June	October	Total
Horses—								
Clydesdales	....	2	9	7	1	1	....	20
Shire	....	....	....	....	1	....	....	1
Percheron	....	1	3	....	....	....	....	4
Standard-Bred	....	....	....	....	....	....	....	....
Thoroughbred	....	....	....	1	....	....	....	1
Hackney	....	....	....	1	....	....	1	2
Cattle—								
Shorthorn	11	8	16	9	7	6	1	58
Aberdeen-Angus	1	1	1	6	....	4	5	18
Galloway	....	....	....	....	....	....	....	....
Ayrshire	....	....	....	....	....	....	1	1
Holstein	....	....	....	1	1	4	1	7
Jersey	....	....	1	....	....	1	....	2
Hereford	5	....	....	....	3	8	2	18
Sheep—								
Cotswold	....	....	....	....	....	....	1	1
Leicester	....	....	....	....	....	....	....	....
Shropshire	....	....	15	8	....	8	3	34
Southdown	....	....	....	....	....	....	1	1
Hampshire	....	....	....	....	....	....	4	4
Suffolk	....	....	8	1	....	....	4	13
Cheviot	....	....	....	....	....	....	....	....
Dorset Horn	....	....	....	....	....	....	....	....
Oxford Down	....	....	20	3	....	....	....	23
Swine—								
Yorkshire	....	....	2	....	1	2	....	5
Berkshire	....	....	....	....	1	1	1	3
Tamworth	....	....	....	....	....	....	....	....
Chester White	....	....	....	....	....	....	....	....
Duroc Jersey	....	....	....	....	....	....	....	....
By Shipments	17	12	75	37	15	35	25	216

INSTITUTES BRANCH

On account of the unsettled conditions during the winter of 1914-15 and the number of other meetings being held, the number of Regular Farmers' Institute meetings was considerably reduced as compared to former years, the total number held being 351. There was a keen interest shown in these meetings, as well as in the Short Courses and other special meetings. The attendance during the twelve months ending with October, 1914, was as follows:—

Regular and Supplementary Meetings.

Farmers' Institutes	48,182
Women's Institutes	224,210
Special Institutes.	
Women's Institute Demonstration Lectures	8,859
Farmers' and Women's Institute Conventions	14,500
Seed and Live Stock Judging Classes	16,883
Cheese Factory and Creamery Meetings	11,506
Better Farming Coaches	15,340
Total	339,480

FARMERS' CLUBS

These organizations are increasing in some sections of the Province, while there is a lack of interest in other localities. It would appear that the farmers will not continue to hold meetings regularly from month to month and year after year simply for the purpose of discussing agricultural problems and practices. The permanent club, and we have a number of these, in nearly all cases has introduced co-operation of one kind or another. The purchase of seed, farm implements, fertilizers, live stock, and, in some cases, salt, sugar, etc., has been an important feature of their operations. Where monetary benefit is coupled with the discussion of farm problems there seems to be more permanent organizations.

BETTER FARMING SPECIAL

During the fall of 1915 the Department of Agriculture, co-operating with the Canadian Pacific Railway, ran two demonstration cars over a considerable portion of the railway company's Ontario system, visiting thirty-eight places. Such widespread interest had been taken in a similar train run two years previous that the Department considered that in the interest of much-needed increased production on the Ontario farms it would be advisable to again give a considerable number of the farmers of the Province an opportunity of visiting the highly instructive exhibits found in these coaches. Although many farmers found it difficult to complete their fall work owing to the previous unfavorable harvest weather, the attendance, 15,340 during the itinerary, was very encouraging.

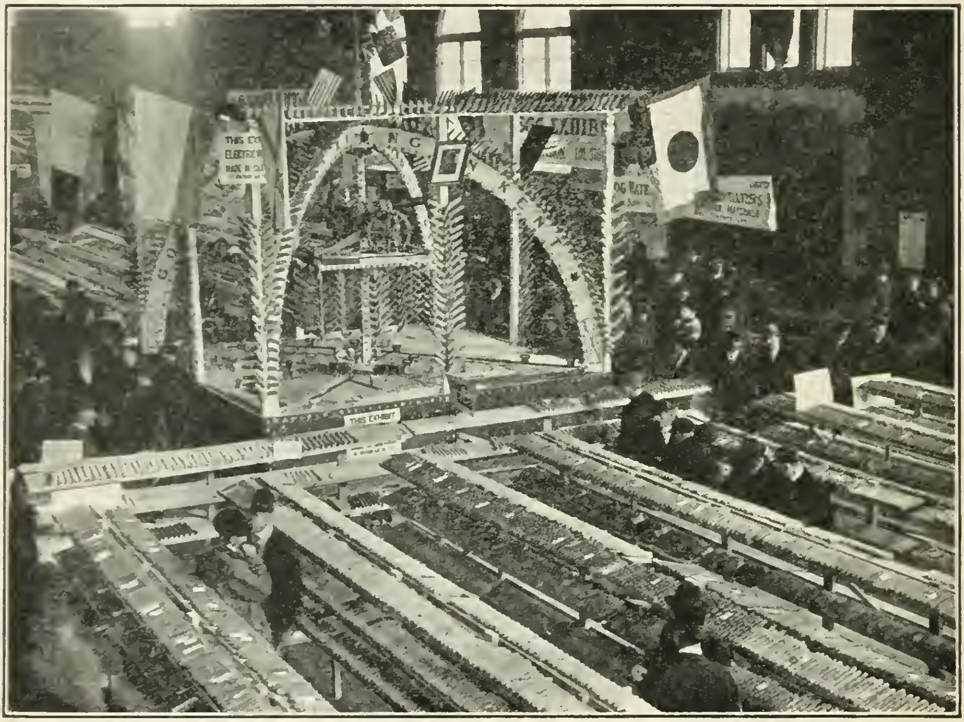
One coach contained the following educative exhibits:—

1. A display of the most productive varieties of grains growing in Ontario, as well as illustrations of the advisability of early seeding, sowing plump grain, free from smut, etc.
2. A drainage and lightning rod exhibit.
3. Appliances used by the up-to-date dairymen.
4. Miniature modern poultry houses, feeding troughs, etc., as well as samples of the most approved poultry foods. This Department also carried specimens of the most desirable and undesirable types of poultry.
5. Specimens of the noxious weeds and weed seeds most commonly found on Ontario farms.

Each exhibit was in charge of an expert, capable of giving valuable instruction to all who visited the car. The Department also distributed through these experts up-to-date literature containing information on all branches of agriculture.

The Live Stock Car contained animals exhibiting desirable characteristics of our heavy horses, beef and dairy cattle, swine and sheep. A Clydesdale filly and a Percheron mare, both Canadian-bred and both winners in our best show rings, were specially valuable in showing to what excellence our stock can reach, when special care had been taken in both breeding and feeding. A Holstein, an Ayrshire and a dual-purpose Shorthorn were also carried, as well as pens of Cotswold and Shropshire ewes and Yorkshire and bacon Berkshire hogs. Live stock specialists accompanied this car and gave live stock lectures and judging demonstrations at each stop.

Not only were the farmers invited to visit the train, but special invitations were sent to the school children through the school boards and teachers, and the



Where corn is king—This is just a section of the Ontario Corn Show.

instructors took special pains to make their exhibits as instructive as possible to the great number of children who visited the coaches.

Arrangements were made through the local Women's Institutes to hold afternoon meetings for ladies, these meetings being addressed on subjects of special interest to women by members of the regular staff of Women's Institute lecturers. These meetings were largely attended. Joint meetings were held in the evening, when addresses were given by the lady speaker and some of the specialists accompanying the train. A leading feature of these evening meetings was moving pictures illustrating modern agricultural operations. These pictures, secured at considerable expense by the Department of Agriculture, proved to be not only entertaining but highly instructive.

The Department wishes to take this opportunity of thanking the officers of the various agricultural organizations and Women's Institutes who so willingly and efficiently co-operated with the Department in advertising the visit of this train to the various places where it called. The farmers of the Province appreciate to the full the liberality of the Canadian Pacific Railway in placing the necessary cars at the disposal of the Department of Agriculture and transporting them over their lines free of cost.

BOARDS OF AGRICULTURE

Since the Department has representatives located in nearly every County and is undertaking to hold special meetings of various kinds, such as stock judging classes, instruction trains, etc., there has not been the same field for the Institutes, and their relative importance is not so marked as formerly, when they were practically the only means by which agricultural information was given direct to every rural district. It has been recognized for some time that a reorganization of the work would be beneficial. Accordingly a plan was submitted to all interested parties in the spring of 1915. This plan has met with general approval, and the Department has decided to provide for the formation of Boards of Agriculture, made up of representatives from all agricultural interests in the territory concerned. It is hoped in this way to prevent overlapping in the work and to have definite assurance from interested responsible parties in each locality where meetings are to be held that the meetings will be liberally supported and well attended. By the new plan the special needs of the different districts will be more nearly met. These Boards will co-operate with the District Representative in the various lines of work under his direction.

WOMEN'S INSTITUTES

The statistical report for the year ending May, 1915, shows that the regular work of the Institutes has been well maintained. There were 29,046 members and 8,902 regular monthly meetings were held with a total attendance of 224,210. There are 870 Institutes in the Province at the end of October, with a prospect of organization at a number of places during the winter season.

Red Cross Work. At the outbreak of the war the Women's Institutes were among the first to respond to patriotic appeals. It would have been impossible to have reached, effectively, the rural districts if it had not been for the existing Women's Institutes where women were only too ready to drop most of their regular work and devote their attentions to collecting money and making supplies for the Red Cross Society, Belgian Relief, etc. It is difficult to estimate their contributions, but practically all of the 860 branches did their share. $200,000.00 is a conservative estimate of the contributions in cash and goods.

The Girls in the Institute. There is an increased interest in Institute work on the part of the girls in the rural districts, with the result that many of the Institutes have introduced work of special interest to the girls who take full charge of some of the meetings, and in a few centres, have formed Girls' Clubs which conduct their meetings separately but usually with the advice and co-operation of some of the members of the regular Women's Institute. This promises to develop into an important feature of the Institute work.

Demonstration Lecture Courses. That the women and girls of rural Ontario are anxious to have systematic instruction from trained workers, is evidenced by the number of courses that have been given during the year in "Home Nursing and First Aid," "Sewing" and "Food Values and Cooking." Because of added responsibility on account of the war many Institutes which had planned to take advantage of the courses offered, have decided to wait until conditions are more settled and there is not such a pressing need in patriotic work. In view of the fact, however, that the holding of a course increases efficiency and attracts new members to the Institute, with the result that patriotic work is taken up with all the more enthusiasm at the conclusion of the courses, a number of branches have held courses with most satisfactory results.

At a few centres, short courses in Agriculture, under the direction of the District Representatives of the Department of Agriculture, and demonstration-Lecture Courses to the Women's Institutes are being held concurrently. Instruction of special interest to the girls is given in the forenoon at the Domestic Science Classes, and both the grown-ups and the girls take advantage of the afternoon lessons. It is not only that the young people are getting valuable instruction, but they are being won over to intelligent thinking in these classes. It is a beginning of what promises to develop into a very important feature of up-to-date instruction for the women and girls in the rural district.

CONVENTIONS. It was found necessary in 1915 to again hold three provincial conventions to serve all the Institutes—one at Ottawa, one at London, and one in Toronto. The programme for each was similar and such subjects as "Rural Leadership," "School Gardens," "School Fairs," "The Healthy Child," "Girl's Possibilities," "A Woman's Life, Her Possibilities," "Canadian Literature," etc. Patriotic work and the regular work of the Institutes were also fully discussed. A number of county conventions have also been held and have been of advantage to the work generally.

DAIRY WORK

The past year saw the dairy industry reach the high level mark both as to quantity and prices received for dairy products. Pastures were unprecedentedly good, herds have been enlarged, improved, and have received an increased amount of care during the past year. The dairy cow is now considered one of the Ontario farmers' most esteemed assets and has done her share in supplying much needed food products during this year of national conflict.

During the season of 1915 there were 998 cheese factories in operation in Ontario, an increase of 6, and 163 creameries, an increase of 2. The output of cheese was 115,500,000 pounds. Of this amount Eastern Ontario produced 90,000,000 lbs. and Western Ontario 25,500,000 lbs. Eastern Ontario produced 3,000,000 lbs. of butter during the year, while western Ontario produced 18,320,000 lbs., making a total of 21,320,000 lbs. for the Province. (These figures are based upon accurate returns for nearly the whole year and reliable estimates for the balance of the year.)

Unprecedentedly high prices prevailed during the year for cheese in spite of the fact that there was a large increase in the amount of cheese manufactured in the Province. Owing to the fact that a considerable quantity of American cheese was placed on the British market during the early part of the season, cheese prices dropped somewhat for a time, but the price for the year was slightly above 15 cents, an increase of 1½ cents over the previous year.

In Western Ontario the powdered milk industry has been looked on with favor in a few sections where formerly cheese had been the chief dairy product, two cheese factories having sold out to a powdered milk company. A much larger quantity of condensed milk is also being manufactured in the Province, while increasingly large quantities of milk and cream are being shipped to the larger commercial centres. The manufacture of ice cream has created a satisfactory market for a considerable quantity of cream.

Seeing the advisability of keeping a record of the dairy herd many farmers have, during the past year, begun this practice, and no doubt the averages of our herds will increase as a result.

In Eastern Ontario alone 1,258 new silos were built in 1915, showing the value placed on ensilage for the production of milk. Dairymen have also learned the advisability of supplementing the feeds produced on the farm with a few of the highly concentrated feeding stuffs now so common on the market.

During the year there were 37,351 patrons of creameries and 50,719 farmers who supplied milk to cheese factories. The staff of thirty dairy instructors paid 516 visits to creameries and 7,315 visits to cheese factories and reported an improvement in the quality of the milk and cream delivered, an improvement which is largely due to more cleanly methods of handling and to the fact that many producers are particular to cool their milk and to hold it at the temperatures advised by the instructors. The use of Sediment Test has also done much to impress upon patrons of cheese and butter factories the necessity of taking special pains in order to produce clean milk. The result of this improvement in the quality of milk and cream supplied has made it possible for the makers to raise the standard of their output and to decrease the amount of milk required to make a pound of cheese. However, there is yet much room for improvement in the quality of the milk and cream delivered at our factories and creameries and many of the men most prominent in the dairy industry have now reached the conclusion that the day has arrived when these raw materials should cease to be "pooled" and that they should be paid for on a "quality basis."

The Dairy School at Kingston and the Dairy Department of the Ontario Agricultural College continue to render the dairy industry valuable service both through the scientific information imparted to students in attendance and by carrying on experimental work along practical lines.

Scene at a plowing match in Oxford County.

FRUIT BRANCH

The season of 1915 was marked by a very short crop of apples and an average crop of most other kinds of fruit.

During the year two more orchards were taken over by the Fruit Branch for demonstration and experimental purposes. These were located at Thedford in Lambton County and at Collingwood in the Georgian Bay District. Both sections are noted apple producing districts with large orchard plantings. In both, however, there are many orchards neglected for want of pruning and spraying, some of it due to carelessness, but much due to ignorance on the part of the owners. It is hoped that as soon as the five orchards comprising some twelve hundred full-grown trees now leased by the Department have been brought back into shape by careful management, that they will be models for the surrounding districts.

Learning how to prune a tree properly.

The season of 1915 was remarkable for the continuous wet weather in harvest season. As a result the apple orchards were exposed to late infections of scab on a scale hitherto unparalleled. Orchards well sprayed during the usual periods of attack were badly spotted at picking time much to the disappointment of the owners. The Provincial Entomologist issued a warning that growers should put on a late spray and where this was heeded little scab or sooty fungus was found.

SPRAYING RESULTS

At three of the points where the Department of Agriculture has leased orchards, the crop in 1915 was heavy enough to show up the comparative results of the spraying operations. After three years' experiments, the other sprays have been abandoned for commercial work in favor of the lime sulphur mixture combined with arsenate of lead either in paste or dry form. The past season showed the necessity for later sprays than the three usually recommended. The results given below are from the experiments on this point.

GREENINGS.
At Whitby.

3 Sprays.	%
Ink Spot	58.3
Scab	1.4
Clean	40.3
4 Sprays. July 15th.	
Ink Spot	16.2
Scab	0.
Clean	83.8
5 Sprays. Sept. 8th.	
Ink Spot	7.3
Scab	0.3
Clean	92.4

SPYS.
At Paris.

3 Sprays.	%
Ink Spot	6.
Scab	1.2
Clean	92.8
4 Sprays. July 15th.	
Ink Spot	5.5
Scab	2.2
Clean	92.3
5 Sprays. Aug. 15th.	
Ink Spot	0.
Scab	0.
Clean	100.

SPYS.
At Wellington.

3 Sprays.	%
Ink Spot	2.8
Scab	10.8
Clean	86.4
4 Sprays. July 15th.	
Ink Spot	0.4
Scab	1.1
Clean	98.5
5 Sprays. Aug. 15th.	
Ink Spot	0.4
Scab	0.7
Clean	98.9

The fifth spray, applied at Whitby on September 8th, was too late, as the cost of wiping the fruit more than offset any gain in the quality. If this had been put on the middle of August, as was done at Paris and Wellington, the results would have been much better from a commercial standpoint.

Under ordinary weather conditions three thorough sprayings with lime sulphur as usually recommended will produce good fruit. These are (1) the dormant spray, (2) when blossoms show pink and (3) when petals have all fallen. Where, however, weather conditions are such as was found in 1915, with continuous rain, at least one more spraying about the middle of July is strongly advised. No poison is required under ordinary conditions, so that the cost of material is very light, about three cents per tree.

MARKETING PEACHES

Conditions in the peach districts were the very opposite to those in the apple orchards. No crop in 1915 meant, with ordinary weather, a heavy crop the year following. Special arrangements were made in time by growers and dealers to push the sales of this fruit so that while prices were never high, the immense volume produced was moved out steadily at fair figures. Advertising campaigns were carried on jointly by the Dominion Government and the Niagara Peninsula Fruit Growers' Association, funds for the latter being obtained by direct contribution from the growers. There is still room for a great deal of work to be done in perfecting the profitable distribution of our perishable fruits.

MONTHLY CIRCULARS

During the year the Fruit Branch has published monthly circulars dealing with subjects of interest to growers at the time of issue. These proved to be acceptable and will be continued during the coming year, the range of subjects being widened and the staff of the Experimental Farm at Vineland Station contributing valuable data on the work there. Some seven thousand growers are now receiving the circular, and many of the articles are being reproduced by the agricultural press. In addition the work of completing the series of bulletins on fruits was continued, all kinds except pears now being in print or under revision. It is expected that the information on pears will be in shape for publication during the present winter.

HORTICULTURAL EXPERIMENT STATION

A marked increase in the number of visitors from a distance to the Farm at Vineland has been noted during the past summer and also a marked increase in the interest taken by leading fruit growers of the immediate vicinity. An example of the increased interest may be gained from the attendance at a pruning demonstration held at the Farm during the year. Without advertising and without a special notice other than an announcement at the Farmers' Institute at Jordan on Wednesday evening and an announcement at the Vegetable Growers' Association's meeting in the Reading Room at the Farm on Thursday, forty-two growers attended on the following day, Friday, in a driving snowstorm and carefully followed and discussed the work in the orchard.

The work in plant breeding has been carried on as efficiently as formerly, as has also the vegetable improvement and seed selection work.

The work in Pomology, including varieties and experiments with sprays, experiments in cultivation, in fertilizers, in pruning, etc., has been well maintained.

A branch of work has been undertaken in the study of utilizing by-products. This branch of the work is of extreme importance. A special expert has been placed in charge and the old museum has been reconstructed and partly equipped and it is hoped that good results will be secured from this line of experiment.

Well cultivated cherry orchard.

During the fall outside work has been so continuous that all bulletins and reports are not yet completed. The bulletin on "Grape Culture" has been rewritten and is now in the hands of the publishers. The "Peach" bulletin has been prepared and is now in process of reconstruction and correction. A bulletin on the study of "Fruiting Habits in Relation to Pruning" has been completed and will be submitted to the Department immediately for publication. The study of the pear industry and the preparation of a bulletin on this fruit has been started, but it is not felt that the material available is sufficient to warrant publication at once. This must, of necessity, be delayed a few months. A complete report of the work of the Station is now in process of completion, and it is hoped will be published before spring. In addition to these bulletins and reports, all of the branches mentioned have prepared special reports on their work for publication in the Fruit Branch Circular issued monthly.

DISTRICT REPRESENTATIVES

The past year has been one of endless activity for the District Representative. With the insistent call for increased production he has found the farmers more eager than ever before to enlist his services. As might naturally be expected a number of District Representatives and assistants have felt it their duty to enlist for overseas service and serve their country in the field of action rather than assist in increased production. In all cases thus far these vacancies have been filled and the work continued without any serious interruption. During the past year permanent offices were opened in the County of Grenville and the Districts of Parry Sound and Muskoka and Sudbury, making in all a total of forty-four permanent offices in the Province. In some of the larger counties, especially those not well served by railways, District Representatives have experienced great difficulty in covering the territory assigned to them. To overcome this, assistants were located in towns some distance from the office. These men devoted their time entirely to field work and received their instructions directly from the District Representative's office. This plan proved most effective and will no doubt be generally adopted in future.

In order to give some idea of the extent of the correspondence and office work I give here a brief statement taken from the records of a District Representative's office, showing the comparison between the callers at the office and the correspondence for 1914 as compared with 1915:

—	1914	1915
Callers at Office	1,113	1,632
Communications received	1,264	1,709
Communications sent out	1,048	1,351
Circular letters	3,160	3,587

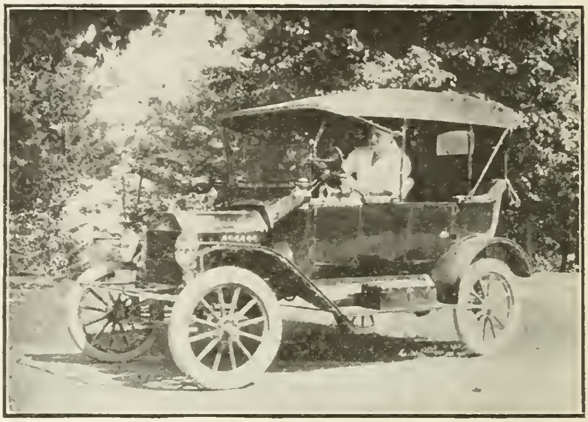
The following summary of the personal and telephone calls at the office in another county is of interest in this connection:

—	Personal calls.	Phone calls.
November	89	12
December	57	15
January	64	18
February	90	25
March	111	35
April	149	43
May	96	39
June	53	17
July	71	19
August	80	19
September	76	44
October	47	16
Total	983	302

These figures represent average conditions and it must be borne in mind that the calls at the office do not include meetings of any kind. They are merely calls made by farmers with individual problems.

Apart from the office duties the field work of the District Representative demands a very large share of his attention. The extent of his work in this direction is best shown by the following list of activities which are receiving attention from the hands of one District Representative and is typical in many others:

1. Farmers' Clubs.
2. Stock and Seed Judging Courses.
3. Fruit Institutes.
4. Farmers' Institutes.
5. Apiary Demonstrations.
6. Drainage Surveys.
7. Ploughing Matches.
8. Egg Circles.
9. Six Weeks' Courses in Agriculture.
10. Junior Farmers' Improvement Associations.
11. Acre Profit Competitions.
12. Feeding Hogs for Profit Competitions.
13. Baby Beef Competitions.
14. Inter-County Live Stock Judging Competitions.
15. Potato Variety Tests.
16. Corn Variety Tests.
17. Alfalfa Variety Tests.
18. Sweet Clover Variety Tests.
19. Potato Spraying Experiments.
20. Fruit Growers' Associations.
21. Fall Fairs.
22. Cow Testing.
23. Prize Grain Distribution.
24. Publicity Associations.



The effectiveness of district work is greatly increased by the use of a car, with which most of the offices are now equipped.

25. Patriotism and Production Campaign.
26. Pure Seed Centres.
27. Live Stock Census.
28. Rural School Fairs.

The nature and extent of the activities of the District Representative will vary somewhat in each county due mainly to agricultural conditions. The above list, however, fairly represents the average county in the Province. It would be impossible in this report to give a detailed account of all the work covered by the District Representative. I wish to deal briefly, however, with some of the more outstanding features of the work.

SCHOOL FAIRS

The history and methods of organization of the school fair movement have been outlined in my previous reports; hence it is not necessary here to do more than refer briefly to the past year's work and to some of the newer features which have proven effective. I think it is only fair to say that the School Fair movement has met with the hearty approval of all those who have had the opportunity of coming in contact with the children who are taking part in this work. The rapid growth of this movement can readily be seen from the fact that in 1912 only 25 School Fairs were held and in 1915

School Fair girl in her flower garden.

Midsummer Working Conference of the District Representatives at the O.A.C.

the number had increased to 234. These fairs were held in 41 counties or districts and included 2,291 schools representing 48,386 children. Seed was supplied and instructions given to children for the planting and caring for 51,243 plots; they were also supplied with 6,868 settings of eggs of a bred-to-lay strain; total number of entries at the School Fairs amounted to 116,236 and the total attendance including children and adults was approximately 157,000.

The giving of reasons for the placing of awards was introduced at a number of fairs and will undoubtedly be generally adopted next year. It enables the children to appreciate the importance of more careful selection and preparation of their exhibits and is also of interest to the parents. The public speaking contest has again proved to be a very popular feature of the fairs and there was no difficulty in securing entries for the contest. Generally speaking the children acquitted themselves well, in many instances the subject was patriotic. The following speeches are very typical of those given in the contests and give an idea of the many-sided influence on the young mind:

President and directors of a Rural School Fair Association.

THE RED CROSS.

My speech for to-day is on the "Red Cross," the organization of which we have heard so much since the beginning of the present war. Some thinkers tell us that the advancement of mankind has been marked by wars, yet up to the time of the Crimean struggle, history records no instance of women nursing the wounded on the field. To Florence Nightingale humanity is indebted, for she was influential in the founding of the Red Cross Society.

In passing it might be of interest to give a brief sketch of her life. She was born in Italy, May 12th, 1820, near the city of Florence, from which circumstance she derived her name. Her childhood was passed at Lea Hurst, Derbyshire, her father's estate, and there she received the education suitable for a gentle woman. Even as a child she showed the sympathy for the suffering which in after years led her to undertake the nursing of the wounded in the Crimea. In opposition to the wishes of her friends, she devoted nine years of her life to the study of the nursing methods of the various great European hospitals. Stories of terrible conditions in the Crimea reaching England, she set out in October with thirty-four efficient nurses. In one and a half years they reduced the death rate from sixty per cent. to a little over one per cent. and when Miss Nightingale returned to England she was welcomed as a national heroine. Until her death on the 14th of August, 1910, she laboured unceasingly at hospital work and thus by her labours at home and abroad earned for herself the title of "Britain's Best Beloved."

Each country has its own Red Cross Society, but they all work for the same end—to relieve the sufferings of the wounded and to provide for them necessities and comforts.

As soon as this war broke out the call for Red Cross workers was sent out. Many nurses and doctors responded and before the war was well begun, hospitals had been prepared for the reception of the wounded and every possible means of alleviating the sufferings resorted to. Nearer the field of battle temporary hospitals were prepared, very often in churches and other public buildings.

When the Germans were driven from Rheims, the famous cathedral of that city was used as a hospital, until the enemy violating the Hague Treaty, fired upon it in spite of the fact that many of their own men were being nursed there.

In the motor ambulance first aid is given the soldiers, for sometimes several hours elapse before they can be taken to the hospital.

While this war has caused much suffering, yet it has some good results. People of all classes are united in their efforts to aid Red Cross work and they forget themselves and their own petty troubles in this great calamity.

The crowd is interested in a real "boy orator" at the School Fair.

THE UNION JACK.

King Richard is said to have won a great victory over the Turks with the aid of St. George, a Christian knight, who had killed a dragon that was just ready to devour a beautiful princess. He was afterwards put to death for his belief in Christ, and King Richard chose him for the special or patron saint of England, and changed the white cross of the Crusaders to the red one of St. George.

As the patron saint of England, the banner of St. George ever ranked highly. It was a white flag with a plain red cross (the Plantagenet colors, white and red). It appears to have been early adopted as a national ensign. Coins and seals at the time of Edward Third and Henry Fifth are impressed with the figures of a ship bearing the flag at the bow and stern.

In these days the Scotch nation was separate from England, and had another patron saint, Andrew, one of the apostles. The story goes that a vessel bearing his bones was wrecked on the coast of Scotland, but the Saint's bones were carried safely to shore. Some time after that, a great host of Englishmen invaded Scotland, and the Scotch spent the night before the battle in prayer to God and St. Andrew. At last there appeared in the blue sky a cross formed of white clouds. The Scotch, sure now of victory, flung themselves upon the enemy and defeated them, and after that they carried into battle a blue flag, bearing from corner to corner a white cross shaped like this—X.

In the reign of Queen Anne, on the union with England, these flags were combined, the red cross of St. George with a white border to it, being laid upon St. Andrew's banner, and thus it appears in the portrait of a warship of that period.

Still there were only two crosses in the Union Jack, till in George Third's reign there was added the cross of St. Patrick, the patron saint of Ireland. The story of St. Patrick, whose name means noble, is a beautiful one. It is said that he was born in Scotland, but was taken away by pirates, and was sold as a slave in Ireland. Presently he made his escape, but becoming a Christian returned to Ireland. After preaching the gospel to the people, he was crucified upon a cross like that shown on his flag.

For the last hundred years there has been no change in the Union Jack.

It is the emblem of British rule. It recalls the great deeds done in war and peace to make our country strong and free.

It is the flag that stirs the world. It is red with the blood of heroes, it is blue with blueness of the seas, it is white with the stainless soul of Justice. It is the flag of the brave, it is the flag of the free, it is the king of all the flags that fly beneath the sun.

Far out into the world it has gone, far and wide to the ends of the earth, so that there is not a free land anywhere, nor a free mind under the sun, that would not suffer if our flag should fall. No enemy has ever pulled it down.

There are girl orators, too, equally popular.

It flies for the open door, a fair field and equal rights for all nations. It flies for the honour of the written and the spoken word. It flies for the peace of the world.

We give our hands, and our heads, and our hearts, to God and to our country. One King, One Flag, One Empire.

PATRIOTISM.

We were given a choice of any patriotic subject for the three minute address this year, so I thought I would speak about what "Patriotic" means and how we school boys and girls can show that we know what it means.

Now that this great war has been going on for over a year we surely have heard the word "Patriotic" enough to know what it means, but I would like to know how many of us have ever thought just what it does mean.

Last fall they had what was called a Patriotic Concert here, in the Town Hall. Almost all the numbers on the programme were patriotic songs, such as "Rule Britannia," "We Must Fight for our Country," "Why Can't a Girl be a Soldier?" etc. Then the boys in their cadet uniforms gave an exhibition of marching and drilling. Another number showed Britannia, who was presented in turn by each of her colonies with some gift from the home colony.

Now if this is what is called a Patriotic Concert, it takes quite a number of things to be patriotic. We would have to do more than clap our hands, wave our hats, cheer once in a while, and sing "God Save the King" as loud as we can. It was very nice to sit and watch Canada and India, Australia, and all the rest bringing wheat and precious stones and wool and laying them at Britannia's feet; but now when Britannia really needs them, I wonder how many of us feel the meaning of patriotic enough to give them to her in real earnest. There was very loud and long clapping after the songs were sung at that concert, but from what the papers say and from what I know about the people around here, the men don't seem to take so kindly to really going to fight for their King and Country. Of course, I am not a man with a gun, so I don't know what it feels like to be really scared of another man with a gun. And I don't suppose if they went to fight for their King and Country that they would get roast-beef and plum pudding every day for dinner, and that seems to make an awful difference to a man.

Now, seeing I am not a man and can't act like one, there surely is some way that we boys and girls can be patriotic. If we can't fight we can do another thing, and that is help feed the ones that are fighting and the ones that are left behind. Someone has to keep the farms going to get wheat for flour, and oats for the horses, and potatoes and vegetables and fruit, and that is where we boys and girls come in. The Department of Agriculture gave us one chance this year by giving seed potatoes to any boy or girl who would take them with the understanding that all the potatoes from that plot had to be given to the War Fund, so that is one thing to our credit. Then, if we boys help look after the cattle and horses it would help keep up the supply of beef and horses that are needed in the war. The girls have any amount of things that they can do. They can pick berries to make jam, and if they can't knit stockings or make bandages they can wash the dishes or mind the baby while mother does it. One of the speakers who was at the meeting in the Town Hall here last week said that in Northumberland and Durham Counties, on an average, the men, women and boys and girls and babies had only given 16 cents each. Now it seemes to me that the boys and girls alone could make up that 16 cents apiece and leave the men and women to bring up the average a little. I am sure there are a good many thousands going to public school, and that would amount to quite a sum.

Now, I would like to say in closing that while the calves and colts are out to pasture, and the grain and vegetables are growing, there will be enough spare time so that if they will give we boys a rifle and a man to train us we will drill and drill until if the Kaiser ever dares stick his nose in Canada he will be that badly scared that he won't last long enough to reach Berlin again.

Thank you, ladies and gentlemen, for your kind attention.

A Girl's Speech.

On this, the day of our first school fair it would not be out of place to make a few brief remarks on the benefits derived from the same.

While a student from each section will uphold his own respective school, I must stand up for S.S. No. 2. Were I to give you the different reasons it would take too long, so I will only say it is situated in the best part of the township, that which included Black-Pool, Kerry-Line and Pigeon Creek, and its advantages are so numerous that in learning or raising produce for the Fair it cannot be surpassed.

The value of a school fair is not found simply in the awarding of prizes for the best exhibits of this or that so much as in the long and careful planning and systematic training of the pupils according to definite requirements. The Ontario Department of Agriculture is giving invaluable assistance in developing this idea and through its District Representatives in various sections, for the contribution of seeds and prizes is stimulating the interest of many rural schools such as those of Ennismore Township, hitherto uninterested in home garden work.

Last April, Mr. McRae visited our school and told us the school board had consented to take up this new work. He explained fully what this meant and said we would reap the financial profits of our work in carrying off several of the prizes at the school fair, which would be held sometime in October. Now this seemed a long way off, but we at once began making preparations. The first event was to appoint a president and a secretary. This being done, it was the duty of the secretary to report to the Ontario Department of Agriculture at Norwood, what part each pupil intended taking in the Home Garden work. All went nicely for about a week till one evening, just a few minutes before four o'clock, our busy school was disturbed by a sound of a car at the gate. In a minute in walked a gentleman with a pack on his back. There was a happy

How they get to the fair sometimes.

A few of the many school teachers who help greatly in school fair work.

smile passed over the whole school when we learned this sack contained the seed for our garden. I received my package, which was flower seeds, and I really thought I could not reach home quickly enough in order to get them planted. I spent some time measuring out my plot, then filled the bed in with rich soil and lastly sowed the seed, paying strict attention to the arrangement. How I watched to see these flowers come above the ground. I visited them every evening and sometimes stole a glance at them in the morning. All passed smoothly for a month or more till one morning before I was up, my brother's flock of chickens, which he was raising for the fair, took a walk out into my garden and, believe me, I think those chicks knew I was raising these flowers for the fair and were rather jealous of them. They did not leave one inch of the bed but they tore to pieces. Now, although I have no flowers to bring here to-day, still I assure you that next year I will have.

"Her brother's chickens"—See Speech.

We are all very well pleased to see our parents here to-day as it is a proof to us that they are interested in our new work and I take this opportunity of inviting them to visit our school from time to time and see how our work there is progressing.

I thank you for your kind attention and on behalf of our school, I thank Mr. McRae and Mr. McDowell for the keen interest they have taken in our work during the past year, and I hope that we shall have the pleasure of meeting again next year under the same conditions.

SCHOOL PARADES

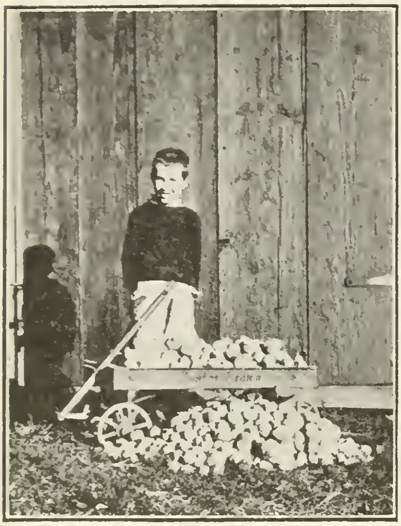
In a number of School Fairs, inter-school parades were conducted and proved to be spectacular and appreciated by all. Schools were required to parade before judges who scored them on marching, singing and originality of design showing identity of school. After the schools were judged and placed in order of merit, they marched around the fair ground singing patriotic songs.

It has been the practice in a number of counties to pay the prize money by cheques and arrange with a local bank to cash them for the children. While this has been very satisfactory in a number of cases, children some distance from a bank have experienced some difficulty in getting cheques cashed. In order to overcome this difficulty and at the same time give the children the benefit of a little banking experience, cheques are being issued to the children and an amount of money equal to the total winnings of the school is handed over to the teacher, who becomes the banker.

In addition to the usual exhibition of calves and colts a judging contest for boys was conducted at a School Fair in Oxford County by way of an experiment. Teams were selected from each school in the School Fair Association, to compete with one another. This competition created a great deal of interest among the live stock breeders and the children showed by their placings and reasons given that they were quite capable of appreciating the good and bad points in the various classes of live stock. Driving contests were also introduced at a number of fairs.

Refreshment booths have not only proven a source of revenue but have also rendered a great service to those who find it necessary to remain a whole day at the fair. In many instances hot lunches were served in addition to the usual ice cream, bananas, etc. The children assisted to some extent in this work but in the majority of cases it was under the direction of the local Women's Institute. Four hundred dollars was secured in the County of Lennox and Addington in this way and devoted to patriotic purposes. When the war is over it is proposed to use these funds to defray part of the expenses of the fair.

POTATO WAR PLOTS



This boy grew these potatoes on his "war plot," giving the proceeds to help buy a Red Cross motor ambulance.

Feeling that the children connected with the School Fairs of the Province would appreciate some practical way of assisting the Empire, the Department offered to supply seed to all children who would agree to grow a plot of potatoes with the understanding that the crop be sold and the funds devoted to some patriotic purpose. A large number of children responded to the call and there was every indication that their contribution would amount to several thousand dollars. Unfortunately, however, the season proved unfavorable, so much so that many plots were not harvested. However, I am pleased to report that the Department has collected nearly $1,700 with a few counties yet to be heard from. It is proposed to donate an ambulance to the Red Cross as the contribution from the rural school children of Ontario.

COURSES IN AGRICULTURE

It is gratifying to note the increasing popularity of the 4-6 weeks' Courses in Agriculture for farmers' sons conducted by District Representatives in their respective counties, the nature of which has been fully outlined in previous reports. The attendance for 1914 was 555, whereas our records for 1915 show that courses were conducted in counties, with a total attendance of 1,114. It will, therefore,

County class meeting together for six weeks for agricultural instruction.

be seen that there was an increase in attendance of 100 per cent. over the previous year. It might be well to add that the increased attendance was not secured by any special advertising campaign, but it is due mainly to the fact that these courses have been made as practical as possible and are supplying a need, that is being more appreciated each year by the young farmers of the Province.

During the past year the District Representatives have had the assistance of outside speakers (prominent farmers and specialists of the Department) which gave variety to the courses and served to relieve the District Representative so that he had time to devote to other pressing work under his direction.

In counties near Toronto where courses were held the District Representative arranged for one and sometimes two days visits to the city, inspecting the Union Stock yards, abattoirs, fertilizer factories, stock breeders' stables, and other points of interest. In all cases where these visits have been made I have had the pleasure

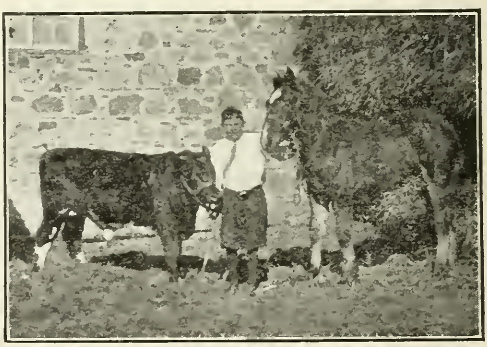
Types of young farmers who meet together in the agricultural class and afterwards in the J.F.I.A.

of receiving these young men in my office. Similarly, the counties in the vicinity of Ottawa arranged annually for a visit to the Parliament Buildings and the Experimental Farm. At the Farm they are given a splendid opportunity of seeing and judging stock of a very high order as well as learning a great deal in regard to modern farm buildings.

Another feature of the course which is very popular with the students and one which deserves every encouragement is a class banquet at which prominent farmers and business men are guests as well as men connected with the Department of Agriculture. These banquets are conducted by the class and almost invariably the boys take a very prominent part in the speech making.

JUNIOR FARMERS' IMPROVEMENT ASSOCIATION

In every district where a successful course in Agriculture is held, an effort is made to organize these young farmers for future work. For this purpose an Association known as the Junior Farmers' Improvement Association has been formed. The constitution of this Association will be found in my report for 1914. Although it has been in existence for only a little over one year, yet there are already 32 local Associations with a total membership of 945, an average membership of 29.5. Judging from present indications, at least 1,000 young farmers will be added to the membership of the Association each year and an outlook for a young farmers' organization in Ontario is very bright. In order to stimulate an interest in yields of crops, cost of production and net profit, a number of competitions have been devised by the Department for members of these Associations who care to enter. The nature and extent of these competitions will be dealt with in detail under a separate heading. No hard and fast rules are laid down as to the nature and extent of work and the Association and often it is found that very interesting features are introduced. In a number of counties debates, hockey matches, baseball matches and picnics have been held. In Elgin County, the Junior Farmers' Association at Aylmer, organized and held a very successful "Junior Farmers' Winter Fair." The Town of Aylmer gave them a suitable building with heat and light free of charge and the township council and other bodies rendered valuable assistance in the way of grants, etc. The fair will no doubt become an annual event. In Dundas County, the Junior Farmers' Association have undertaken the marketing of eggs. The following statement of the work undertaken by the Junior Farmers' Association in Middlesex County is characteristic of the work in many other counties:—



Three winners.

"This is the most active organization in the county. Since their organization in December, 1914, they have held monthly meetings to discuss various work in connection with the farm, held debates, speeches, etc. In the spring each member decided to conduct experiments, the results to be made known at their annual meeting in the fall. The experiments have been carried on through the summer and the boys have splendid information which will be of value to themselves, and will help the whole organization. They have entered in the Feeding Hogs for Profit Competition, Acre Profit Competition in Oats and Potatoes. The results which have been secured have opened their eyes regarding the cost of doing the work on the farm, and it will be the means of starting some of them at keeping books in order to know what line of farming pays. They succeeded in having one of their members placed on the Strathroy Agricultural Society Fair Board. They were also successful in having the live stock judging competition put on at the Strathroy Fair. The Fair Board paid $10 in prizes. $20 in prizes was also given by the Fair Board to an exhibit put up by the Junior Farmers."

Early in November the District Representative in one county began issuing to the Junior Farmers periodical leaflets on seasonable farm topics. The leaflets which are termed "Short Notes for Increased Farm Revenues," are issued twice monthly, and deal with such topics as the preparation of sprays for various farm crops, sources of seed grain and other seasonable suggestions. As an example the first number issued in November recommended the keeping of herd records, and advised what outfit was necessary and sources of supply, together with evidences of the value of herd testing. Recommendations with respect to the storing of machinery were also given as well as a number of poultry pointers, which recommended the cleaning and spraying of poultry houses. From reports received to date these leaflets are being very much appreciated by the young farmers and are serving a good purpose in guiding them in their farming operations.

ACRE PROFIT COMPETITIONS

The Acre Profit Competitions are proving to be very popular among the members of the Junior Farmers Improvement Associations and form the basis of many interesting discussions at their meetings. During the year 59 competitions were held in 43 counties and districts as follows:—

20 contests in	potatoes.	2 contests in	turnips.
14 "	oats.	1 contest in	barley.
11 "	silage corn.	1 "	wheat.
5 "	mangels.	1 "	beans.
4 "	seed corn.		

A winner in the Acre Profit contest and the corn he grew.

Three hundred and thirty young farmers took part in this competition and of this number the 67 winners were sent to the Ontario Agricultural College at Guelph where they were given a two weeks' course in live stock and seed judging. All expenses were paid by the Department.

Rules and Regulations of the Competition.

1. Open to all young men who have taken the Course in Agriculture conducted by the District Representative, except winners in previous Acre Profit Competitions.

2. The prize is a two-weeks' Course in Live Stock and Seed Judging at the Agricultural College, January, 1916, railway fare to Guelph and return and two weeks' board.

3. The prize is awarded to the young men showing the largest net profit from an acre of land.

4. Accurate account is to be kept of all labor, cost of seed, fertilizer, etc. Any contestant who fails to fill out accurately the form supplied by the District Representative will be disqualified.

5. There must be six entries before a Competition can be held. Unless at least four complete the contest, no prize will be awarded. If twelve or more entries are secured in a Competition and at least eight complete the contest, two men will be sent to Guelph.

6. Two Competitions (different crops) may be conducted in a county provided six entries are secured in each.

7. The crop should be decided by a vote of the competitors.

8. The Competition will be confined to a measured acre. The district Representative will inspect the field and see that it is correctly measured.

9. If possible, the District Representative will be on hand when the crop is measured or weighed.

10. A uniform price will be made throughout the Province for the value of the various crops grown when estimating the net profit per acre.

11. The Representative will certify to the correctness of each report. All reports must reach this Department before November 15th.

12. Where the Competition is conducted in a grain crop, in order to keep the grain separate and avoid delay in forwarding reports waiting for it to be threshed, select a square rod at three or four places in the field, cut by hand, and thresh with a flail.

13. At the conclusion of the Course at Guelph, a competition will be held in judging of live stock and seed, and a gold watch will be presented to the man showing greatest efficiency.

Giving a slight idea of the interest taken in rural school fairs.

ACRE PROFIT WINNERS.

The following is a list of the winners in the various counties with the figures as to cost of production and profits in each instance:—

POTATOES

(Marketable 75c. per bush.; unmarketable 37½c. per bush.)

County.	Winner	Yield. Bush.	Yield. Lbs.	Cost Prod. $ c.	Profit. $ c.
Muskoka	Milton H. Goltz, Bardsville. Clay loam, following oats, farmed 10 years, 5 loads manure, Paris green, Davies Warrior.	514		42 02	336 72
Renfrew	Percy Wright, R. R. 2, Westmeath. Loam, following barley, farmed 60 years, 12 loads manure, Paris green and Bordeaux, Green Mountain.	421	30	42 09	269 81
Parry Sound	C. W. Campbell, Powassan. Clay loam, following peas, farmed 20 years, 4 loads manure, Paris green, Early Rose and Comet.	405		39 30	253 20
Port Arthur	Edwin Payton, Dorion Station. Sandy loam, following timothy, farmed 8 years, 19 loads manure, Carmen No. 1.	402		49 55	245 20
Lambton	H. V. Kember, R.R. 1, Sarnia. Rich sandy loam, following potatoes, farmed 50 years, 15 loads manure, Irish Cobbler.	394	30	40 29	240 67
Grenville	J. Gordon Davidson, R.R. 1, Kemptville. Clay, following corn, farmed 50 years, 12 loads manure, Bordeaux and Paris green and arsenate of lead, White Star.	401	30	47 90	237 85
Grey	R. S. Mundle, R.R. 3, Owen Sound. Clay loam, following oats, farmed 52 years, 12 loads manure, Paris green, bluestone and Lime, Vulcan.	363		53 15	196 22
Rainy River	Harry McCool, Burriss. Rich clay, following oats, farmed 2 years, Bordeaux and Paris green, Delaware.	313		41 05	186 20
Sudbury	Frank McDonald, Warren. Clay loam, following oats, farmed 15 years, 6 loads manure, Paris green, Rapid Transit.	330	30	44 86	176 39
Kenora	Wm. Alcock, Kenora. Sandy loam, following potatoes, farmed 10 years, 8 loads manure, 300 lbs. land plaster, Delaware.	294	30	42 25	170 93
Peterborough	John Young, Ennismore. Sandy loam, following clover, farmed 35 years, Paris green, variety unknown.	256	12	39 95	148 37
Prince Edward	Joseph Jackson, Picton. Clay loam, following oats, farmed 95 years, 9 loads manure, 700 lbs., 2-8-10 arsenate of lead, Carmen No. 1.	225		48 78	115 84
Dufferin	W. T. Dean, Shelburne. Sandy loam, following potatoes, farmed 30 years, 12 loads manure, Paris green and Bordeaux, Comet.	161	2	34 59	84 37
Durham	Irwin R. Bragg, R.R. 4, Bowmanville. Loam, following oats, farmed 75 years, 10 loads manure, Bordeaux mixture, Eureka and Empire State.	180		44 60	71 65
Welland	Carl Woolnough, R.R. 1, Niagara Falls. Rich loam, following pasture, farmed 60 years, New Ontario Reds.	140		29 90	60 10

POTATOES—Continued

County.	Winner.	Yield. Bush.	Yield. Lbs.	Cost Prod. $ c.	Profit. $ c.
Middlesex	Archie D. Limon, R.R. 2, Strathroy Sandy loam, following wheat, farmed 53 years, 10 loads manure, Bordeaux and arsenate of lead, Dooley.	117	20	32 86	53 14
Wentworth	Leslie J. Christie, R.R. 2, Ancaster Sandy loam, following clover, 10 loads manure, Delaware.	126		30 00	44 25
Northumberland.	Archie Ferguson, Warkworth Clay, following hay, farmed 30 years, 9 loads manure, Paris green, American Wonder.	90		31 50	30 00
Frontenac	Roy Ewing, Elginburg Clay loam, following oats, farmed 50 years, Churchill.	51	30	26 50	9 87

OATS

(40c. per bushel).

County.	Winner.	bush.	lbs.	$ c.	$ c.
Lanark	James J. Pennett, R.R. 2, Perth Clay loam, following potatoes, farmed 75 years, Improved Banner.	104	10	17 75	23 98
Brant	Osborne Rosebrugh, St. George Loam, following mangels, farmed 100 years, O.A.C. 72.	92	28	16 02	21 11
Frontenac	Roy Ewing, Edinburgh Loam, following hay, farmed 47 years, Banner,	90	17	16 42	19 78
Glengarry and East Stormont	Eddie McKillican, Moose Creek Loam, following corn, farmed 50 years, O.A.C. No. 72.	83	2	14 02	19 20
Wentworth	Albert Whitfield, R.R. 3 Dundas Sandy loam, following mangels, farmed 100 years, O.A.C. No. 72	87		15 86	18 94
Simcoe	J. W. Flynn, Alliston Loam, following potatoes, farmed 50 years, New White Derby	84	4	15 11	18 54
Dundas and West Stormont	Ford McMillan, Finch Clay, following pasture, farmed 12 years, O.A.C. No. 72.	82	20	14 56	18 48
York	W. A. Baldock, Thistletown Loam, following potatoes, farmed 8 years, O.A.C. No. 72.	84		15 65	17 95
Carleton	Percy J. Bradley, North Gower Rich clay loam, following potatoes, farmed 50 years, O.A.C. No. 72.	82	12	15 39	17 67
Middlesex	Archie Muxlow, R.R. 1, Kerwood Clay loam, following potatoes, farmed 55 years, Siberian.	85	30	16 91	17 44
Peel	Tindale Rutherford, R.R. 2, Bolton Clay, following fall wheat, farmed 75 years, O.A.C. No. 72.	81	6	15 97	16 50
Haldimand	A. J. Hunter, R.R. 3, Hagersville Loam, following potatoes, farmed 50 years, 4 loads manure, O.A,C. No. 72.	74	9	16 71	13 00
Renfrew	Norman Jamieson, R.R. 3, Renfrew Clay loam, following corn, farmed 30 years, O.A.C. No. 72.	61		13 43	10 97
Elgin	Elton H. Jackson, Straffordville Sandy loam, following corn, farmed 30 years, variety not known.	63	20	14 70	10 74

MANGELS.

12c. per bushel.

County.	Winner.	Yield. Bush.	Lbs.	Cost Prod. $ c.	Profit. $ c.
Halton	Jos Willmott, R.R. 1, Milton. Clay loam, following pasture, farmed 85 years, 4 loads manure, White Sugar Beet Mangels.	1,652		42 33	155 91
Durham	Wilfrid Elson, R.R. 1, Fraserville. Clay loam, following wheat, farmed 60 years, 18 loads manure, Sludstrup.	1,352		31 85	130 39
Manitoulin	Wm. Cooper, Mindemoya. Clay, following peas, 2 loads manure, Windsor	1,278	40	31 60	121 84
Bruce	John Hossfeld, R.R. 4, Walkerton. Clay loam, following wheat, farmed 40 years, 10 loads manure, Ideal.	1,135		28 88	107 32
Waterloo	Wesley Heipel, R.R. 1, Waterloo. Black loam, following wheat, farmed 50 years, Yellow Leviathan.	999		22 90	96 98

SILAGE CORN

($3.00 per ton)

County.	Winner.	tons.	lbs.	$ c.	$ c.
Oxford	Archie E. Gregg, R.R. 1, Salford. Clay loam, following pasture, farmed 60 years, 8 loads manure, 330 lbs. potash, Wisconsin No. 7.	39	1,400	18 15	100 95
Halton	J. F. Campbell, R.R. 4, Milton. Loam, following pasture, 6 loads manure, 3,000 lbs. ground limestone, Big Crop.	38	1,000	21 55	93 95
Victoria	George Suggitt, R.R. 1, Fenelon Falls. Clay loam, following oats, farmed 20 years. Big Crop.	32	240	14 73	81 63
York	Robert Watson, R.R. 2, Woodbridge. Clay, following oats, farmed 40 years, 10 loads manure, Improved Leeming.	32		17 56	78 44
Bruce	H. D. Thomson, Dobbinton. Clay, following hay, farmed 35 years, 10 loads manure, Bailey.	29	1,799	16 90	72 80
Grey	Elmer Warling, Vandeleur. Clay loam, following pasture, farmed 57 years, Ninety Day.	29	1,360	18 75	70 29
Simcoe	F. E. Weir, R.R. 1, Collingwood. Loam, following oats, farmed 25 years, 10 loads manure, Improved Leeming.	29	720	23 43	64 65
Peel	Eldridge Kellam, Nashville. Clay, following hay, farmed 40 years, Wisconsin No. 7.	27	400	17 05	64 55
Welland	Lloyd Snyder, R.R. 1, Welland. Clay loam, following potatoes, farmed 100 years, 5 loads manure, Bailey.	22	53	16 40	49 67
Algoma	James Nott, MacLennan. Clay, following potatoes, farmed 12 years, 5 loads manure, Compton's Early.	21	1,040	17 40	47 16
Ontario	Roy F. Lick, R.R. 3, Oshawa	17	60	29 77	21 32

CORN FOR SEED

($1.25 per ton)

County.	Winner.	Yield.		Cost Prod.	Profit.
		bush.	lbs.	$ c.	$ c.
Lambton	Graham Griffith, Mandaumin.................. Clay loam, following sugar beets, farmed 2 years, Whitecap.	154		12 32	180 18
Lennox and Addington..	John Breault, R.R. 1, Enterprise .... Clay loam, following timothy, farmed 35 years, 4 loads manure, Longfellow.	94	19	42 70	75 22
Essex	Gerald Smith, Ruthven .... Loam, following hay, farmed 60 years, 3 loads manure, White Cap.	72		18 24	71 76

TURNIPS

(12c. per bush.)

		bush.	lbs.	$ c.	$ c.
Fort William....	Roland Brown, Hymers .... Rich loam, following potatoes, farmed 9 years, Kangaroo Swede.	994	40	21 94	97 42
Timiskaming....	H. A. Parker, Uno Park .... Clay loam, following potatoes, farmed 15 years, 10 loads manure, Canadian Gem and Magnum Bonum.	942		42 76	70 28

SPRING WHEAT

(80c. per bush.)

		bush.	lbs.	$ c.	$ c.
Dundas and West Stormont..	Silas Farrell, R.R. 1, Finch .... Clay loam, following potatoes, farmed 40 years, Marquis.	46	45	15 18	22 22

BARLEY

(55c. per bush.)

		bush.	lbs.	$ c.	$ c.
Norfolk	C. B. Hazen, R.R. 2, Port Rowan .... Clay loam, following corn, farmed 75 years, 4 loads manure, O.A.C. No. 21.	51		17 28	10 77

BEANS

($3.50 per bush.)

		bush.	lbs.	$ c.	$ c.
Kent	Clifford Smith, R.R. 3, Ridgetown............. Clay loam, following wheat, farmed 60 years, 9 loads manure, 200 lbs. 16% phosphate, Yellow Eyes.	22	20	21 55	56 61

FEEDING HOGS FOR PROFIT

This year 16 Feeding Hogs for Profit Competitions were held in 16 different counties and districts with a total of 77 competitors, 17 of which were awarded the prize of the Short Course at Guelph at the expense of the Department.

Rules and Regulations of the Competition.

1. Open to all young men who have taken the Course in Agriculture conducted by the District Representative, except winners in previous Feeding Hogs for Profit Competitions.

2. The prize is a two-weeks' Course in Live Stock and Seed Judging at the Agricultural College, January, 1916, railway fare to Guelph and return and two weeks' board.

3. The winner will be selected on the following basis:—

(*a*) Fifty points for the highest net profit.

(*b*) Fifty points for type and finish, this being done with bacon hog score card.

Developing the farm boy's natural love for live stock.

4. There must be six entries before a competition can be conducted, and unless four complete the contest no prize will be awarded. If there are twelve entries and eight complete the contest, two men will be sent to Guelph. Entries close July 1st.

5. Each contestant must feed three hogs. A fourth hog may be fed and used as a spare in case of accident or disease.

6. At the time of entry, the Representative will inspect the hogs and mark with ear tag or in some equally suitable way.

7. Hogs are to be weaned six weeks and fed and cared for by the contestant. An accurate account must be kept of the kind and amount of food consumed. Any contestant who fails to fill out accurately the form supplied by the Representative will be disqualified.

8. When the hogs are twenty-two weeks old they will be inspected and weighed by the District Representative.

9. The Representative will certify to the correctness of each report. All reports must reach this Department by December 1st.

10. At the conclusion of the course at Guelph a competition will be held in the judging of live stock and seed, and a gold watch will be presented to the man showing the greatest efficiency.

11. Special prizes for the winners in these competitions will be awarded at the Winter Fair at Guelph, and at the Union Stock Yards Show. The Stock Yards will arrange for the sale of the hogs if the competitors so desire.

Value of feed consumed as follows:—

Ground oats	$24 00	per ton.
" barley	24 00	"
" peas	30 00	"
" rye	24 00	"
" wheat	30 00	"
Bran	20 00	"
Low-grade flour or red dog	28 00	"
Shorts or middlings	24 00	"
Tankage	40 00	"
Green feed (name kind)	2 00	"
Skim milk	4 00	"
Buttermilk	5 00	"
Whey	3 00	"

WINNERS IN HOG FEEDING

The following list gives the winners with cost of production and net profits:—

County.	Winner.	Breed.	Average cost production.	Average Value.	Average Profit.
Grey	Lawson Sewell, R.R. 2, Meaford	Yorkshire, Tamworth and Berkshire Cross	12 53	24 84	12 31
Oxford	J. S. Pollard, R.R. 1, Mt. Elgin	Tamworth	13 63	24 84	11 21
Renfrew	Calvin White, R.R. 2, Pembroke	Yorkshire	9 14	19 65	10 51
Frontenac	Owen Fitzgerald, R.R. 3, Harrowsmith	Tamworth and Berkshire	8 86	18 69	9 83
Middlesex	Archie Limon, R.R. 2, Strathroy	Yorkshire	9 33	18 72	9 39
Carleton	Willis McRostie, Vernon	Yorkshire	7 94	16 53	8 59
Victoria	Victor Knox, R.R., Fenelon Falls	Yorkshire and Tamworth	10 97	19 83	8 86
Rainy River	Hugh J. Hunter, Sleeman	Yorkshire	11 49	19 86	8 37
Manitoulin	Harold Lane, Barrie Island	Yorkshire	9 95	18 27	8 32
Elgin	F. E. Leeson, Aylmer	Tamworth and Berkshire Cross	8 60	16 86	8 26
Norfolk	C. Bing Hazen, Port Rowen	Chester White	8 77	16 41	7 64
Waterloo	Oscar Schierholtz, R.R. 2, Elmira	Yorkshire and Berkshire Cross	9 30	15 90	6 60
Durham	Laurie B. Cole, R.R. 4, Bowmanville	Yorkshire and Berkshire	9 00	15 39	6 39
Dundas and W. Stormont	Clayton Froats, Finch	Yorkshire	11 24	17 55	6 31
Haldimand	Thomas Laidlaw, Hagersville	Yorkshire and Chester White	13 46	19 45	5 99
Brant	Wm. Brooks, R.R. 3, Paris	Tamworth and Berkshire Cross	9 55	14 73	5 18

BABY BEEF COMPETITION

With a view to interesting the young men taking courses in Agriculture under District Representatives, in the production of Baby Beef, the Department announced in April, 1914, that they would be eligible to enter a Baby Beef Competition in September of the same year. Calves were to be selected at that time or later, if they chose and were to be fed by the contestants until December, 1915.

The following were the rules and regulations governing the competition:

1. This competition will be open to all farmers' sons under twenty-five years of age.
2. There must be at least five entries before the competition can be conducted.
3. Calves must be fed and cared for by contestant and an accurate account kept of the kind and amount of feed consumed.
4. Each contestant has the privilege of selecting one or more calves at the time of entering the competition and discarding the less promising ones as they develop.
5. At the time of entry the Representative will inspect the calves and make a note of markings of same.
6. Calves used for this competition must be born on or after September 1st, 1914, heifers will not be eligible.
7. This competition will close in November or December, 1915, the exact date to be decided later.
8. Each animal entered in the competition will be carefully judged, and the young man producing the best steer in each county will be sent to Guelph to take the Course in Live Stock and Seed Judging in January, 1916, all travelling and living expenses to be paid by the Department of Agriculture.
9. After the winners in each county have been selected, the first prize steer in each county, and the second prize, if thought advisable, will be sent to some central point and shown against similar winners in other counties. Liberal prizes will be awarded.

10. After the prize at the fair is awarded, the steers in the competition will be sold to the highest bidder, the cost of transportation, etc., deducted, and the balance returned to the exhibitor.

11. If the contestant wishes to retain his animal, he may do so by paying transportation charges to the show, and animal will be returned free of charge.

Both happy.

This competition did not attract so many competitors, only four counties were represented, namely: Bruce, Halton, Oxford and Waterloo. From the standpoint of interest, however, this contest was well worthy of the effort put forth by the Department. The competition within the counties was exceedingly keen and it required very careful judgment in several instances to declare the winner. One of the most pleasing features of this competition was the fact that eight of these steers were exhibited by the boys at the Guelph Winter Fair, where special prizes were offered. Not only did these steers do credit to the Fair from the standpoint of quality but they also won the distinction of taking 1st and 2nd prizes in the class open to all breeders. The first prize steer in this class, a pure bred shorthorn, was fed by Wm. Guthrie, of New Dundee. At a few days over 13 months of age, it weighed 1,100 lbs., and sold for 15c. a lb., after being shown at Guelph. Between 2½ and 2¾ lbs. gain daily from the time of birth was made by this steer. In brief this steer was fed as follows: On December 1st, 1914, he was started with a little ground oats, bran, oilcake and mangels. About February 1st, 1915, he was eating about 1 lb. each of these feeds per day with all the clover and alfalfa he could eat. This was gradually increased each month until he was up to nearly 3 lbs. of each of the foregoing feeds. The steer standing second in the class was fed by John Hossfeld, of Walkerton, Ont., the 3rd prize steer in the special Baby Beef contest was fed by Leslie W. Turnbull, of Galt, and fourth prize won by Ralph Fred, of New Dundee, and the fifth by J. G. Wilson, of Georgetown. To even the casual observer, the results of this competition should be sufficient to convince him that the production of Baby Beef is worthy of more serious attention than it is receiving at the present time. It is to be hoped that this competition will gain in popularity and will become a more important feature of the Winter Fair each year.

INTER-COUNTY LIVE STOCK JUDGING CONTEST

This year marked the inauguration of the Inter-County Live Stock Judging Contest. Two contests were held in the Province, nine of the eastern counties competing at the Ottawa Winter Fair and eighteen of the western counties at the Guelph Winter Fair. The following rules and regulations taken from the Guelph Winter Fair Prize List will serve to give some idea of the nature of this competition:—

Class 108.—Inter-County Live Stock Judging Competition.

In order to encourage a deeper interest in Live Stock on the part of the young men of the Province, the Winter Fair Board has inaugurated a special competition to be open to one judging team from each County. These teams must be selected by the District Representative from those who have attended a four to six weeks' course in Agriculture and who have never taken a regular course in an Agricultural College. The young men must be under twenty-five years of age and three will constitute a team.

Aside from the honour, the prizes are most substantial and should arouse the keenest competition.

Prizes are as Follows:

(1) To the team winning the greatest number of points, a handsome silver trophy has been donated by Hon. J. S. Duff, Minister of Agriculture for Ontario, and to each member of the winning team a silver medal. The trophy will be competed for annually, and must be won three years in succession before it becomes the property of any county. Headquarters for the trophy will be the District Representative's Office.

(2) The following individual prizes will be offered, but no competitor will be given more than two prizes:

Sec.	——	1st Prize.	2nd Prize.	3rd Prize.	4th Prize.	5th Prize.	6th Prize.
		$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
1	Horses	10 00	9 00	8 00	7 00	6 00	5 00
2	Beef Cattle	10 00	9 00	8 00	7 00	6 00	5 00
3	Dairy Cattle	10 00	9 00	8 00	7 00	6 00	5 00
4	Sheep	10 00	9 00	8 00	7 00	6 00	5 00
5	Swine	10 00	9 00	8 00	7 00	6 00	5 00

(3) Members of the team winning first prize, will not be eligible to compete in this competition in succeeding years.

(4) An entry fee of $1.00 will be charged each member of the team.

Some real country boys getting interested early in better farming.

The rules governing this contest and the prizes offered at Ottawa were the same as those at Guelph except that Peter White, K.C., of Pembroke, generously donated the silver trophy to the winning team of the eastern counties.

The teams taking part in the contest at Guelph were required to place and give written reasons for two classes of each kind of stock, making in all ten classes. Twenty-five minutes were allowed for placing the animals and writing reasons, and the judges allowed 60 per cent. for correct placing and 40 per cent. for correct reasons. In Ottawa, much the same procedure was followed except that only one class of stock was judged and each contestant was required to pass an oral examination in addition to handing in written reasons. The written reasons were used only in cases of a tie. The plan of having an oral examination was very satisfactory, indeed, and will probably be adopted at both fairs next year. The County of Oxford succeeded in winning the trophy in Western Ontario and Lanark County in Eastern Ontario. In each contest, the competition was exceedingly strong and all the teams represented made a splendid showing.

CORN VARIETY TESTS

As intimated in my report of last year's work arrangements were made to conduct a Corn Variety Test in all counties of the Province where District Representatives are established. The following is a copy of instructions of the experiment, which were supplied to each District Representative.

Result in a corn variety test.

1. Select eight reliable farmers with a view to including each section of your county, wherever possible get junior farmers to co-operate.

2. Give each experimenter definite type-written instructions *re* preparation of seed bed and method of planting and cultivation. Insist upon corn being planted 3½ feet apart each way.

3. You will be supplied with sufficient first-class seed of seven varieties. Divide your seed among the eight co-operators so that they may grow the seven varieties side by side devoting one-seventh of an acre to each.

4. During the growing season take every advantage to inspect the plots and take notes as to relative stand—special forms will be supplied later.

5. The Department is going to considerable expense in securing seed for this experiment and is anxious that this work be carefully carried out.

The following is a copy of the letter supplied to each farmer co-operating in the work, giving an outline and objects of the experiment:—

1. To demonstrate the advantages of well-matured and properly dried seed corn shipped on the cob, as shown by its high percentage of germination and vigor of growth, compared with ordinary crib dried corn shipped in sacks after shelling.

2. To suggest the hill system as the most practical method for the production of ensilage, as demonstrated by its equally large tonnage per acre, at the same time permitting of thorough cultivation both ways of the field, thus affording an excellent crop with which to eradicate weeds.

3. To test in several localities seven different varieties of corn on one acre, in order to find which is most suitable for the particular district by keeping records of each variety as to:

(*a*) Vigor of growth.
(*b*) Uniformity of crop.
(*c*) Weight per acre in green feed.
(*d*) State of maturity.
(*e*) General quality of the crop.

The following points must be kept in mind:

1. Before any definite conclusion can be drawn from the results, the experiment shall be carried on at least three years in succession.

2. The corn shall be secured in each case from a grower who is making a specialty of producing highly bred seed of the variety. The seed shall be secured from the same source for three years or more in order that no allowance need be made for difference

in strain beyond that which may result from a year's improvement by selection or a variation in quality of crop due to the season.

3. The varieties used in the experiment shall be those recommended by the Ontario Corn Growers' Association, which are:

DENTS—White Cap Yellow Dent, Bailey, Wisconsin No. 7, Golden Glow.

FLINTS—Longfellow, Salzer's North Dakota, Compton's Early.

4. All corn shall be shipped on the cob.

5. Remove the tips and the butts from each ear before planting so that only the most uniform and properly developed kernels may be used for planting, thus insuring regularity in planting, and high percentage of germination, and as strong and vigorous a growth as possible.

6. Plant as soon as possible after danger of frost is over in well-worked, well-drained and well-manured soil. The soil in which the corn is planted must be as uniform as possible over the acre.

7. The hills should be 42 inches apart each way. If it is not exactly practicable to do this, they should be not less than 36 inches apart and the distance should be regular for the various varieties.

School fair boy and his oats, both looking well.

8. In each and every case the corn shall be planted in hills in order that the same number of kernels may be planted on an acre, and at the same time admit of thorough cultivation both ways. As the corn to be used should be capable of germinating from 97% to 100%, it would seem unnecessary to do any thinning as four kernels to the hill should give an excellent stand of crop. With this high percentage of germination it should be as uniform as it is possible to secure even by thinning.

9. Cultivation should be carried out at regular intervals and at a fair depth at the commencement, becoming shallower as the season advances. The last cultivation should be quite light in order that no roots may be broken off during the operation. A good suggestion is that the person responsible for the cultivation before commencing should carefully examine the roots of the corn to ascertain the depth and width at which to adjust his cultivator in order that the roots may not be disturbed during the operation. This suggestion is quite important as there are instances where good fields of corn have been partially destroyed by too deep cultivation late in the season.

10. In autumn, the corn should be allowed to mature as much as possible. It is recognized by all successful ensilage growers and feeders of live stock that the quality of the seed improves on maturity as far as the glazing stage. In districts where the season is short and the crop does not usually reach a desired maturity, it is better

that the corn receive a light frost before being cut in order that it may have as many days as possible in which to mature. A light frost will not hurt, providing the corn is cut the following day or so.

11. During the summer and early fall fields will be carefully inspected by the District Representative and definite information secured. Special forms will be supplied for this purpose.

While last year was not the best of years for field crop experimental work, the Corn Variety experiment proved to be very interesting and so far seems to demonstrate the fact that no one variety can be recommended for all sections of the Province. It is not proposed to publish the results of this work until the results covering a period of at least three years have been secured. When definite information is available, it will be presented to the farmers in some practical way.

POTATO VARIETY TESTS

Probably one of the most serious handicaps to the potato industry in Ontario is the use of too many varieties. There are very few sections in Ontario where potatoes may be purchased in carload lots of one variety, and in too many instances the varieties used are not of the type and quality desired by the market, nor are they always profitable yielders. With the hope of overcoming this difficulty, arrangements were made to conduct a variety test by the District Representatives in their respective counties. Standard varieties generally recognized to be among the best were secured from reliable sources and planted side by side under ordinary field conditions. Unfortunately the season this year was decidedly unfavorable to potato growing and as a result many of the experiments were total failures. However, plans have been made to continue this work for at least 3 years, so that we may be able to recommend, with every assurance, that certain varieties are best suited to certain districts.

An alfalfa test looking well.

ALFALFA TEST

Alfalfa is to-day generally recognized as a valuable crop. There have been, however, many disappointments in getting a satisfactory catch and many farmers have given up the idea of growing it. In the majority of cases this is due to the use of seed secured from a warmer climate. There are two strains of alfalfa recognized to be very hardy and well suited to Ontario conditions. They are: *Canadian Variegated* and *Grimm's Alfalfa*. District Representatives have devoted considerable attention to demonstrating the value of these two varieties of alfalfa. A large number of successful farm demonstrations have been conducted and as a result a demand for seed of the above named varieties has greatly increased. The growing of alfalfa seed has also received attention. The following is a list of instructions supplied by District Representatives to farmers co-operating in this work:—

1. At least forty rods from any alfalfa field select land which has a good, natural underdrainage, and preferably soil of rather a heavy character, elevated and sloping, and which is comparatively free from weeds and from weed seeds.

2. Thoroughly cultivate the soil as early in the spring as the land is dry enough to work to good advantage.

3. Sow on the selected acre the three pounds of Grimm alfalfa seed, in rows thirty inches apart, as soon as possible after the land is cultivated, and while it has plenty of moisture.

4. Cultivate between the rows occasionally throughout the season to destroy the weeds, and to conserve moisture. Practise level cultivation.

5. In the spring of 1916, again cultivate the land thoroughly, and keep the crop free from weeds.

6. On one-half of the land allow the first crop in the season to remain for seed. Cut the crop when the pods have become brown.

7. On the other half of the acre use the first cutting for hay and allow the second crop in the season to produce seed. The crop for hay should be cut when it is starting to bloom or when the young shoots are starting to grow from the crowns of the roots. All crops should be cut from two to three inches above the crowns of the roots to prevent the killing of the plants.

NOTE.—For seed production the cultivated row system requires less seed, conserves soil moisture, tends to keep the land free of weeds and insect pests, and favors a large yield of seed of good quality. It is expected that seed can be produced from this acre for a number of years if the foregoing directions are followed. After 1916, the grower is at liberty to use such methods as he desires. The seed produced each year becomes the property of the grower, to be used for sowing on his own farm or to be sold to others for sowing on their farms.

POULTRY

As in previous years, the District Representatives have devoted a considerable amount of attention to poultry raising. Farmers have been induced to establish

Making room for the games which form part of the Fair programme.

flocks of well bred poultry, build modern hen houses or make their present buildings more suitable. Meetings have been arranged where poultry raising in all its phases has been discussed and demonstrations conducted to show the most up to date methods of killing and plucking poultry. Largely as a result of this work, poultry raising is now being recognized as an important department of the farm and will undoubtedly become more and more so from year to year. The marketing of eggs has also received considerable attention which has resulted in some sixty odd co-operative egg circles. These egg circles have done much to improve the quality of eggs on the market and to considerably increase the price to the farmer. There are, however, many difficulties to be overcome in connection with the marketing of eggs co-operatively but there is every reason to hope that these problems will be satisfactorily solved.

Another problem connected with the poultry industry, and one with which the District Representative is grappling, is the preparing of poultry for the market. Too often it so happens that poultry is taken off the range in a thin condition and put upon the market without any special feeding. The result is that the producer gets an indifferent price for his poultry and fails to satisfy the consumer. The value of crate fattening of poultry has long been recognized as a profitable method of feeding, but it is not generally practised. The District Representatives, in counties where poultry is extensively produced, have done much to encourage farmers to adopt this method. Crate fattening demonstrations were conducted last year where accurate records were kept of the weights of the birds at the beginning of the fattening period and at the completion of the test in addition to the kinds and amounts of feeds consumed. In this way it has been possible to demonstrate very conclusively that this method of fattening invariably pays. The following report of crate fattening work conducted in one county will serve to illustrate in this connection:—

During the past fall and the early part of the winter we had crate fattening experiments carried on on five farms in different parts of the County. The breeds used were Barred Rocks, Rhode Island Reds and White Wyandottes.

The following table is a summary of results obtained.

——	J. Kearney.	Homer White.	G.S. Taylor.	H. D. Leavens.	C. Metcalfe.	Totals.
No. of birds	9	29	15	15	12	80
Breed	W. Wyandottes and R. I. Reds.	Barred Rocks.	Barred Rocks.	R. I. Reds.	Barred Rocks.	....
No. days of experiment.	22	19	21	21	12	(av.)19]
Feed used	Oats, wheat and buckwheat.	Oats and corn.	Barley, oats and buckwheat.	Oats, corn, buckwheat.	Oats, corn, buckwheat.	....
Value of feed used	$1 17	$1.87	$1 18	$3 20	$1 15	$8 57
Total weight at beginning, in lbs	45	130	94.2	87.5	60	416.7
Total weight at conclusion, in lbs	63	163	105.5	116.25	72	519.75
Average gain per bird, in lbs	2	1.14	.74	1.9	1	1.35
Value of birds at beginning	$4 50	$13 00	$9 42	$8 75	$6 00	$41 67
Value of birds at conclusion	$11 34	$29 34	$18 99	$20 92	$11 52	$92.1
Increase in value per lb., due to fattening	8c.	8c.	8c.	8c.	6c.	....
Average net profit per bird	61.8c.	49.9c.	55.9c.	59c.	36.4c.	52.3c.

None of the experimenters made any charge for the milk used or for labor. Valuing milk at 20 cents per cwt. and labor at 20 cents per hour, the average net profit per bird would be reduced from 52.3 cents to about 40 cents.

DRAINAGE

As in former years the District Representatives have devoted a great deal of attention to drainage. In practically every county in the Province drainage demonstration meetings have been held and in many sections demonstration plots have been established, which have been very effective in proving the value of drainage. In many instances it has been possible to work the land from one week to ten days earlier in the spring and the crop yields have been greatly increased. To further encourage this work the District Representatives, in addition to a large staff from the Ontario Agricultural College, devoted considerable time to making drainage surveys for farmers and supplying them with plans of their fields they wished to drain showing the elevations, plans of the drains, outlets, etc., and also advising them as to the number and size of tile required and in many instances assisting

Growing of flowers is encouraged by the school fairs.

them in securing the tile necessary for the work. During the past season, the District Representatives alone made in all 536 surveys which included 14,598 acres. It is impossible to give any definite information as to the total number of acres drained throughout the Province; however, the following statement giving the number of ditching machines imported into Ontario since 1904 will give some idea of the increasing interest in drainage from year to year:

Year.	*No. machines.*	*Year.*	*No. machines.*	*Year.*	*No. machines.*
1904	1	1909	1	1914	31
1905	1	1910	9	1915	26
1906	1	1911	14		
1907	1	1912	18	Total	128
1908	1	1913	24		

The number of these machines in other provinces is as follows: British Columbia, 4; Alberta, 1; Saskatchewan, 2; Quebec, 3; New Brunswick, 1; Nova Scotia, 2.

FIELD DEMONSTRATION WORK

The conducting of demonstrations on the average farm under average field conditions is recognized as one of the important features of District Representative work. As might naturally be supposed, these demonstrations cover a wide field, and differ somewhat in each county, depending upon the kind of farming practised. There are, however, several kinds of demonstration work which are quite generally carried on to which I wish to refer. In the fruit districts of the Province where apple orcharding is generally practised, District Representatives have done much to improve orchard methods through the use of orchard demonstrations. During the past year the District Representatives held 163 orchard meetings with a total attendance of 2,583 farmers. At these meetings farmers were instructed in methods of pruning, spraying and packing of fruit. In addition thirty-seven orchards were used as demonstration orchards where the Department, in co-operation with the owners, put into practice the best known methods in order to demonstrate that clean fruit of high quality may be produced at a profit. The following itemized statement of the cost of production, total receipts and net profit per acre will serve to illustrate what is being done in this connection.

Expenditures.

Cultivation:	
Sod mulch system.	
Cutting grass, ½ day, man and team at $3.50	$1 75
Pruning:	
3 days at $2.00 per day	6 00
½ day gathering brush at $1.50	0 75
Spraying:	
4½ days at $2.00 per day, for nozzle man	9 00
4½ days at 3.50 per day, for man and team	15 75
Picking:	
2 men, 2 days at $1.50 per day	6 00
Packing and Grading:	
2 men, 1½ days at $2.50 per day	7 50
Cost of spray material, five applications:	
68¾ gals. lime sulphur at 16¼c. gal.	11 16
88½ lbs. arsenate of lead at 7¾c.	6 85
26½ lbs. soluble sulphur at 6¼c. lb.	1 65
8 lbs. soap at 5c. lb.	0 40
3½ lbs. black leaf forty at $1.25	4 37
Packages:	
51 apple boxes at 15½c.	7 90
4 bbls. at 40c.	1 60
Corrugated boards, lining and wrapping paper	2 60
Total expenditures	$83 28

Receipts.

44 boxes No. 1 McIntosh at $2.25	$99 00
7 boxes No. 2 McIntosh at $1.75	12 25
4 bbls. Wealthy at $3.50	14 00
50 bus. windfalls at 50c.	25 00
Total receipts	$150 25
Receipts	$150 25
Expenditures	83 28
Net profit from 1¼ acres or $53.58 per acre.	$66 97
1914, net profit per acre	$205 31
1915, net profit per acre	53 58
Average for 2 years	129 45 per acre

NOTE.—It will be noted by the above figures that even with the light crop of apples that was on this orchard this year, and having to sell nearly half of them as windfalls due to a severe wind on September 26th, a net profit of $53.58 per acre still remained. Taking an average of the two years a profit of $129.45 per acre is shown. Next year will be the year for this orchard to bear heavy again, and with good success the average profit for the three years should be much higher than for two. The orchard should bear steadily every year after this. It is in good shape now.

The apples that were packed went up 85 per cent. No. 1. This we consider a good shownig with McIntosh Red in a year when scab was very prevalent, in many orchards not a single apple being free of scab. In some orchards that were only sprayed three times 60 per cent. of the fruit was No. 2 on account of scab. Our orchard would average 92 per cent. free of scab.

GRASSHOPPERS

In several sections of the Province grasshoppers have become a serious menace to crops. This applies particularly to the dry seasons. During the season just past ten counties where District Representatives are established had quite serious outbreaks of this pest, the loss being estimated at $86,500. In each instance the District Representative endeavored to demonstrate to the farmers an effective method of eradication. Some seventeen of these demonstrations were conducted covering an area of 674 acres. The method of treatment recommended in each case was as follows:

Bran	20 lbs.
Paris green or white arsenic	1 lb.
Molasses	2 qts.
Oranges or lemons	3 fruits.
Water	3½ gals.

In preparing the bran mash the bran and Paris green or white arsenic are mixed thoroughly while dry. The juices of the oranges or lemons are squeezed into the water and to this is also added the pulp and peel after cutting into fine bits. The molasses should then be added and when dissolved the mixture should be poured onto the dry bran and poison, stirring the whole constantly so as to dampen the bran thoroughly.

SPRAYING FOR BLIGHT AND SMUT

The potato crop is a very important one in several sections of the Province, yet only a limited number of farmers have come to appreciate the importance of spraying as a protection against blight. In ten of the counties where potatoes are quite largely grown District Representatives conducted thirty-one potato spraying demonstrations, covering in all an area of 785 acres. The same ten counties report 3,778 acres of potatoes as having been sprayed last year. Owing to the unfavorable season for potatoes in 1915 the rot was very prevalent and the value of spraying was clearly demonstrated, and more farmers will no doubt spray their potatoes against blight this year.

It is estimated that $5,000,000 was lost by the farmers during the past year due to the prevalence of smut affecting grain crops. Through the intelligent use of formalin this loss could be entirely eliminated.

To encourage the farmers to treat their grain for smut the District Representatives have conducted a large number of field demonstrations and have proved beyond a doubt the wisdom of using formalin. In many cases last year the treated grain was found to be free from smut whereas surrounding fields were affected to the extent of 15 per cent. and as high as 40 per cent. A special effort will be put forth next year to give this work even greater prominence than in the past with the hope that it may be more generally adopted.

SWEET CLOVER EXPERIMENTS

Until very recently, sweet clover has been looked upon as a roadside weed and considered unfit as a food for stock. However, a number of farmers throughout the Province are devoting considerable acreage to this crop and claim that the stock

Usually the final stage of an agricultural class is the banquet stage.

are very fond of it. While it is not likely to rival alfalfa there would seem to be districts throughout the Province where it might be grown to advantage. The District Representatives are watching this crop closely and have several experiments under way with a view to testing its value.

THE CANADIAN SEED GROWERS' ASSOCIATION

Among the various agencies at work in the Province in encouraging the production and use of better seed of the various classes of farm crops, the Canadian Seed Growers' Association has taken a prominent part. This organization is composed of farmers who take up the production of what is known as "Registered

Seed " under expert direction and control. The records and central offices are at Ottawa, but the Association works to some extent through provincial officers, including district representatives.

In view of the increasing demand for a better grade of seed than is usually available, a special effort has been made during the past couple of years to have seed produced in large quantities in what is known as seed centres. In these centres a number of men agree to grow the same variety and to obtain their " Elite Stock " seed from a chosen member of the centre. This movement promises sooner or later to revolutionize the seed growing business. When a number of these centres become located in different parts of the Province it should not be necessary to bring in from outside sources seed in any considerable quantities as sometimes has to be done.

There is also a possibility of creating a market with other Provinces. There are not many centres actually producing any considerable quantities as yet, but it is confidently expected that the number will increase substantially within the next two or three years.

HYDRO-ELECTRIC ON THE FARM

It is pleasing to note the added interest on the part of the farmers each year in the possibilities of electricity on the farm. To-day there are upwards of 900 farmers enjoying the benefits derived from its use, and from present indications the number will be greatly increased within the next few years. The District Representatives have co-operated with the Hydro-Electric Commission in bringing the value of electricity to the attention of the farmers, through the organization of special meetings, personal interviews, correspondence, etc. The equipment required will depend somewhat upon the type of farming practised and for convenience farmers in Ontario are divided into three classes, viz.: Dairy or Stock Farm, Mixed Farming, Fruit Farming.

1—DAIRY OR STOCK FARM

The electrical equipment necessary on this type of farm varies very considerably and depends largely on what the other farm equipment is, i.e., the capacity of the barn for holding cattle, and whether it is a dairy farm or a stock farm.

On a medium size dairy farm, having twenty head of milch cows, the equipment would be as follows:

A five horse-power motor permanently installed in some suitable location, belted to a main line shaft which runs from one end of the barn to the other, projecting through at one end so that arrangements may be made to drive either a drag saw or a buzz-saw in the yard. To this line shaft can be belted all the other machinery that is used in the barn, including a milking machine, a root pulper, fanning mill, straw cutter, silo filling box of either the carrier, elevator or small blower type, a grain grinder, oat roll, bone grinder. In some cases it is possible to arrange to drive a pump from this line shaft by belting to a jack arranged and set up at the pump. In most cases, however, we find that the pump is not so located that it can be driven from the barn line shaft.

In the dairy, which is usually a separate building, the equipment would consist of:

A milk separator, churn and butter worker, all of which may be belted from a one-inch line shafting installed on a wall or ceiling so located that any dripping of oil will not come in contact with the milk shelves or sink.

This line shafting is belted to a half horse-power motor.

The average type of farm house in the country districts will not require more than ten lamps, and will require possibly three switches.

In addition to this there is the lighting in the barn. One light should be installed in the hay-loft on one of the bents or the purloin plate, and the installation made in conduit, with a switch at the foot of the stairs in the stable to control it. In addition to this light there should be a light in the creamery, and about one light for every four cows, and one light for every two horses. There should also be a light in the feeding boxes of the cow stable, making a total in most barns of about ten lights on two or three switches.

The cost of the installation of lights on the farm is approximately as follows:

For concealed wiring in the house, from $1.50 to $2.50 per outlet.

For open wiring, 90c. to $1.50 per outlet.

For wiring installed in metal moulding in the barn—approximately $2.00 per outlet.

For wiring installed in conduit in the barn—from $2.50 to $4.50 per outlet.

The outlet in each case to count as the opening for a lamp or for a switch.

2—THE ORDINARY MIXED OR GRAIN PRODUCING FARM

The electrical equipment on this type of farm varies only slightly from that in the dairy or stock farm, depending on the number of head of stock kept through the winter. The equipment as estimated under the stock farm may be used as a guide for the needs of a farm of this type, keeping in mind that no farm that has less than ten head of milch cows can afford to put in any of the more expensive milking machines: but on these farms might be installed a vacuum type milking machine.

3—FRUIT FARM

The equipment on this type of farm varies vastly from that of the straight dairy or stock farm, as well as from the mixed farm.

The number of farms per mile, including districts such as may be found in Grantham Township for example, is much greater than that in mixed farming districts, the average size in the former being perhaps 25 to 30 acres, and in the latter about 150 acres in counties like Middlesex, Oxford and Elgin. The natural result is, that there is a possibility of more consumers per mile in fruit districts, but the average horse-power used per customer is much lower. Practically the only use that would be made of electric current on fruit farms, outside of the household, is for the pumping of water and for the operation of small box-making plants or shops.

Up to the present, in Ontario, the question of irrigation has not been given very much consideration. However, it is not improbable that this use for power on the farm will be developed in the near future.

In order to give some idea of the amount of work that is being done by electricity on the average farm, I give herewith a statement dealing with silo filling, chopping grain and sawing wood. It must be borne in mind that in addition to this work, pumping water, milking cows, separating milk, churning, lighting buildings, and many other services are being rendered.

Silo Filling. A 12 ft. x 40 ft. silo was filled and settled and refilled.

Threshing. 900 bushels wheat.
1,800 bushels oats.
1,500 bushels mixed grain.
500 bushels barley.

Sawed. 12 cords (stove length) wood.

Chopped. 3,800 bushels grain in the year.

The following extract from a weekly report of one of our District Representatives gives a comparison between the cost of electricity and that of gas and oil as well as an interesting experiment with poultry:

"When out looking for stock for New Durham Short Course I ran across an interesting experiment. Mr. G. H. Morris, of Hatchley Station, who is using the Hydro-Electric on his farm has his hen pen wired and keeps the lights going night and day, the pen being darkened with canvas during the day. He is getting splendid results from his hens. He has found them on the nest at twelve o'clock at night. While he has taken a greater interest in the poultry since the Hydro-Electric has been installed yet the results he has obtained would indicate that possibly working the hens a little harder did them no harm. From ninety-eight hens in January he sold eighty dozen of eggs and at time of writing is getting fifty eggs per day. The farmers in that district are all using Hydro power and find it not only handy but very economical. This man spent for gas and oil last year $76.80 and now heats his house, does his cooking, lights the house, silo, barn above and below, milks his twenty cows, pumps water—in fact, everything that needs doing about the buildings, for $96.00."

Hydro energy is, of course, only available at present to farmers on an economic basis in certain districts, but with the continued extension of the Hydro area its use is bound to become more general.

WORK WITH VEGETABLE GROWING

Although started only a few years ago, the work of the vegetable specialist, working to a considerable degree in co-operation with district representatives, has developed into large proportions and great usefulness.

Conferences with those engaged in vegetable growing as a business, addresses to agricultural classes, institutes and other gatherings, correspondence and personal interviews—in all these ways much effective educational work has been done.

In addition important demonstration and experimental work has been carried out with good results. For instance, an effort was made to prevent heavy losses due to Cabbage Root Maggot. In experimental work carried on in the vicinity of Toronto and London corrosive sublimate was used with excellent results at a low cost. Four ounces of corrosive sublimate was dissolved in forty gallons of water, and approximately one-half teacup full was applied over each plant and around the roots once a week for five weeks, from the time the plants, both cabbage and cauliflower, were set out in the field. The cost of materials and time for the treatment of 1,000 plants was found to be as follows: Seven four-ounce packets of corrosive sublimate at 12½c. per ounce, $3.50; five hours' time, one hour per week for man, 20c. per hour=$1.00; totalling $4.50 for time and material. With this material also the Cabbage Root Maggot was confined to less than 1%, where in the check rows, in the same patch, having no treatment whatever, the loss was 100%. As considerable interest and advertising has been given to tar felt paper disks for this insect pest, disks were purchased, and a complete record kept of this, and it was demonstrated that the disks did not give as good results, and the cost of adjusting, replacing, and cleaning 1,000 disks for five weeks cost approximately seven times as much as the treatment with corrosive sublimate. Realizing that one year's work is not sufficient time to give this substance, it is hoped to carry on demonstration patches in several sections of the Province this coming year with a view to testing out lesser quantities of corrosive sublimate and to verify results secured during the season of 1915.

Considerable work was also done in many sections of the Province giving instruction in the control of Green Aphis, or as is known to vegetable growers, green lice. Many sections were in danger of having their whole crop destroyed by the extraordinary number of green lice which appeared last season. Two forms of tobacco were used for this proposition as follows: One pint of nicotine dissolved in fifty gallons of water, and a solution of tobacco water resulting from soaking one pound of tobacco stems in one gallon of cold water for twenty-four hours. Fifty gallons of either of these solutions was sufficient for one acre, being applied by an ordinary potato or celery sprayer. Two sprayings, one week apart, in the majority of cases cleaned the whole crop. Cost of preparing a barrel of this solution was not over $1.75, and it was applied without any damage to practically all vegetable crops.

In spite of the unfavorable conditions of a very wet season splendid results were again secured in spraying celery to prevent blight along the same lines as demonstrated in 1914. Fourteen demonstration plots. aggregating approximately thirty-five acres, were conducted as follows: Thedford 1, London 3, Hamilton 1, St. Catharines 1, Burlington 1, Toronto 6, and Kingston 1. In this way and by holding meetings so the results could be observed they were brought to the attention of vegetable growers all over the Province and no doubt resulted in a great saving as the rows sprayed were practically free while the unsprayed was a failure.

Assistance was rendered in promoting the growing of onion seed in the vicinity of Leamington, but the severe wet weather practically destroyed the crop and only sufficient seed was secured for a foundation for work along the same line next season. On Pelee Island experiments were conducted in the growing of early tomatoes and more will be done along this line next season.

In order to ascertain some definite information regarding the extent of vegetable growing in back yards in cities and towns in the Province, a survey was made with the help of the District Representatives. A visit was made to five consecutive houses in ten different streets of one town in a county to make inquiries about this industry. The replies have been worked out on a percentage basis with the following results from twenty-three counties:

THIRTY-THREE COUNTIES.

Number received	1,451
Per cent. that grow vegetables	79%
Per cent. started growing 1915	12%
Longest period grown, average	32
Average number of years	7
Per cent. raising sufficient for summer	61%
Per cent. raising sufficient for winter	2½%
Per cent. having surplus for sale	13%
Per cent. desiring information	25%

On visiting some of these backyard gardens it was learned that the growing of vegetables in the backyard stimulated an interest in vegetables among townspeople, and as a result more vegetables were purchased by them from professional vegetable growers. An article of quality was demanded because they knew the first-class article from the poor one by growing it themselves. Some work was attempted on diseases of onions and of lettuce. This will be continued, as onion blight especially is causing heavy losses.

CO-OPERATION AND MARKETS BRANCH

Through this branch it is aimed to make available all the most up-to-date information on the subject of co-operation as it affects the rural districts that may be asked for or useful to rural organizations.

During the past year co-operation has made progress although that progress is necessarily slow. It would not perhaps be difficult to pull down existing systems but it is recognized that it would be unwise to destroy present marketing or purchasing machinery without having something better to take its place.

Considerable time has been devoted by this branch during the past year to a study of existing organizations of a more or less co-operative nature. In a number of cases it was found they were not working on a sound basis. To correct this and

Display at Toronto Exhibition which shows that proper packages are an important adjunct in marketing.

assist new organizations getting started on right lines a bulletin on organizing a co-operative marketing business has been issued and is being distributed to those interested.

A monthly list of products offered for sale by co-operative associations has been sent out to farmers' clubs and others, and has no doubt had a great value. The resulting business was of course handled direct by the parties interested and so no tabulation of the amount is possible. One illustration may be given. A Potato Growers' Association in one of the districts of New Ontario purchased two car loads of apples direct from a fruit growers' association thus affecting a saving on the transaction of $325. This was so satisfactory that it was followed by another order.

A number of fruit growers' associations have been assisted in a re-organization of their business. One association has built a $4,000 fruit storage house, the first in the Province to be wholly owned and controlled by an association. Other associations have effected improvements in their methods of financing so as to better buy supplies and pay for fruit as delivered.

Much effective work has been done on Manitoulin Island in co-operative organization. The success in this instance illustrates also the value of grading and thereby securing a price in accordance with the value of the article. Two years ago this Branch assisted the District Representative on the Island in organization of the Manitoulin Marketing Association, the chief commodity marketed at the present time being wool. Heretofore all wool had been sold to local storekeepers or buyers at a flat price. The last two years the Association members collected

Sheep on Manitoulin Island, where the wool is handled co-operatively.

their wool at some four shipping points, where each member's wool was separated into grades, each grade weighed and sold direct on this basis. During the last two years the members have received for the lowest grade (what is known as reject wool) about the same as the flat price paid by the buyers for mixed wool, the higher grades receiving advances as high as seven cents per pound. Not only have better prices been received but the wool of the members is being properly taken care of and prepared for market. Each member receives compensation for such extra care and for good quality, which he did not do under the old system. This Association, from experience gained in marketing wool is this fall undertaking the marketing of lambs and will in time extend its business to include other live stock and farm produce, so that the bulk of produce shipped for the Island will go direct from the producer and under a system that will encourage among the growers the practice of methods of cultivation and care in insuring the best quality.

Other parts of New Ontario are also getting started in co-operative organization to the mutual advantage of the farmers and the community. In the Rainy

River district the Potato Growers' Association now has six branches and an annual business aggregating $40,000. Nearly all the farmers in the district are included in the membership. Their example has been followed by the farmers in Thunder Bay district and during the past summer the Thunder Bay Marketing Association was formed after a series of educational meetings. The splendid local markets which exist in these districts are a great encouragement to co-operation on the part of the producers.

Assistance has also been given to the organization of seed centres for the production and sale of registered seed. Attention has also been devoted to the methods of marketing tender fruits and to the larger question of the better distribution of the same. Information has been given on a great variety of other phases of co-operation—in fact, wherever it was asked for or was likely to be used to advantage.

School parades usually of a patriotic nature were a feature at School Fairs during the past season.

MONTEITH DEMONSTRATION FARM

The past year has been the most satisfactory in the history of the Demonstration Farm at Monteith. The season was ideal until the time of harvest and the crops generally speaking did exceptionally well. Unfortunately, however, it rained almost incessantly from the time the grain was ready to harvest till very late in the fall. This made it very difficult to harvest the crops and resulted in greatly reducing their value. However, the crops at the farm were gathered in fair condition considering conditions. During the year five acres of new land were brought under cultivation, making a total of forty-five acres under crop.

To give some idea of the increase in production in grain and hay for the past season as compared with 1914 I have herewith the following statement:

——	1914	1915
	Bushels.	Bushels.
Fall Wheat	65	30
Spring Wheat	50	50
Peas	27	15
Oats and Peas	....	55
Barley	200	50
Oats	350	900
Total	692	1,100
	Tons.	Tons.
Red Clover	28	50
Alfalfa	2	2
Straw	7	20
Total	37	72

The acreage in crop in 1915 was greater by five acres than that of 1914. During the summer over 20 acres were cleared and will be ready for a crop next spring. This will make a total of 73 acres free of stumps and 250 acres slashed. The latter is being used as pasture for the present as it is not considered practicable to break it until the stumps have weathered for at least two years.

In conducting the work on this farm the problems of the settler are always kept in mind and an effort made to solve them. Early and late varieties of crops of all kinds are being tested. Thickness of seeding, effect of fall vs. spring plowing, deep vs. shallow plowing, under drainage, treatment of grain for smut, methods and cost of clearing land, and many like problems are receiving attention.

Live Stock. That the Timiskaming District is destined to be a live stock country is well recognized and for that reason considerable attention is given to live stock. Five Shorthorn cows are making a creditable showing at the pail and have been entered in the R. O. P. test. Each cow will give over 5,000 pounds of milk in the year. Two have already given close to 6,000 pounds in seven months and are still milking well. During the year three bulls have been supplied to Live Stock Improvement Associations. The important milking Shorthorn bull has served forty cows belonging to settlers within a radius of ten miles. This in itself will have a great influence upon the class of live stock in the district.

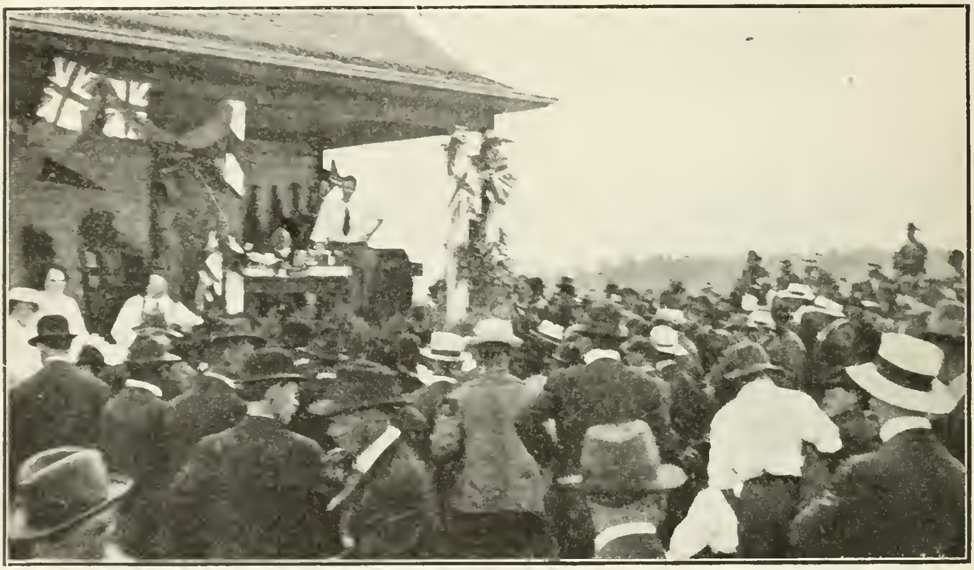
The Clydesdale stallion kept at the farm was travelled during the season over forty miles of territory and served upwards of forty mares.

The flock of Shropshire sheep have done well. The average yield of wool for the past two years has been ten pounds each. The settlers are taking quite an interest in this class of stock and the demand for pure bred rams is increasing each year.

Two Yorkshire sows have been kept for breeding purposes but this number will be greatly increased. The demand for breeding stock is very great, more than any other class of stock at the present time. Young sows eight weeks old are being sold to settlers at $5 each upon the purchasers signing an agreement to keep the animal for breeding purposes for at least two years.

Bees seem to do exceptionally well at the farm. This is well demonstrated by the following record of one hive:

Month.	1915.
June	28½ lbs.
July	91½ "
August	68½ "
September	28 "
	216 "



A portion of the excursion crowd listening to a Live Stock talk.

This same hive gathered 140 pounds of honey in 1914 making a total of 356 pounds in two seasons.

ANNUAL EXCURSION. As in other years a settlers' excursion was held at the farm on August 12, when 1,500 people spent a pleasant and profitable day. Every effort was made to acquaint the visitors with the work being done. Agricultural experts of the Department delivered practical addresses along agricultural lines, and farmers were also given an opportunity of hearing addresses from a number of prominent public men. A free lunch was served at the noon hour and every effort made to make the trip comfortable and pleasant. It is only right that I should mention the splendid arrangements made by the T. & N. O. Ry. for taking the people to and from the farm.

In addition to the work on the farm the manager has rendered valuable assistance outside by acting as judge at fairs, addressing meetings and assisting in many other ways to advance the interests of agriculture. In fact the manager of the farm is practically acting as District Representative in the Cochrane District.

COLONIZATION AND IMMIGRATION

As far as the British Isles were concerned immigration practically ceased with the outbreak of war. Strict instructions were given to the agents of the Government in Great Britain not to offer any encouragement to any man eligible for military service who might think of emigrating. At the same time, it was considered best to maintain the main part of the Province's organization in the British Isles pending the time it will be needed after the war. For the present several members of the staff are on active service, while others are doing good work for the Province along many lines which the war has brought into existence. The name of Ontario has been kept prominently before the British public and the results will no doubt later on be quite evident.

With the usual annual influx from Great Britain thus cut off, this branch was compelled to take other steps in the spring to secure farm labor. At that time it will be recalled there was a considerable surplus of unemployed in the towns and cities of the Province. It was felt that many of these had had previous experience on farms and many more would prove suitable for farm work. Accordingly arrangements were made to have an officer of the branch experienced in the selection of men visit every city and large town. The response was splendid and the scheme worked out to the advantage of both the municipalities and the farms. By reason of this propaganda and by reason of the fact that there were a few in every town and village available for seasonal work, the farm labor problem was well taken care of. In fact I doubt whether there has been as large and as satisfactory supply of farm labor in the Province for many years as in the past season.

Much advertising has been done as to the possibilities of New Ontario and many enquiries have been received and a great deal of information desseminated.

FACTORY INSPECTION BRANCH

Statistics, perhaps, best tell the story of the work of this branch during the past year. In that time, 11,455 inspections were made in 467 cities, towns and villages:

First inspections	8,113
Second inspections and re-visits	3,342
Total	11,455

This is an increase of some 1,400 inspections over last year, showing the extension of territory and increasing vigilance of the staff.

In these factories and mercantile establishments there were 195,762 employees. Of these 39 were under 14 years of age, and these were promptly dealt with; birth certificates were ordered and secured for 75 of questionable age, all of which showed that the legal age had been reached.

Recommendations made, dealing with the various sections of the Act, number 5,659, and other warnings or suggestions were given as existing conditions might require. These orders were followed up until advice was received that they had been complied with, or that measures were being taken to conform with the requirements of the Department.

The usual complaints were received during the year. All were investigated, and few on the whole were sustained. As before, the greatest number related to insanitary conditions and closet accommodation. Only five or six were in regard to the safety of employees, and these, with one or two exceptions, were not upheld. A number of others received pertained, as usual, to matters which it is not within our province to adjust.

The h.p. of some 4,217 boilers amounted to 375,660. Gas, 8,733. Electricity, 205,233. Water, 102,459.

Exigencies of trade caused us to issue during the 12 months overtime permits as follows:—

Under Section 34	167	
Special under Sub-section B. of Sec. 32 (military orders)	11	
Under Section 70 (Bake Shop Act)	14	English.
" " "	4	Yiddish.
Special under Sec. 70 (holiday trade)	10	
Total	206	

This is an increase over the preceding twelve months of 56 in regular overtime permits, and a decrease of 9 in Special Bake Shop permits.

Eleven prosecutions were instituted this year, and in all cases, with one exception, conviction was recorded and fines imposed.

S. Teperman, proprietor of the Dominion Bakery, was prosecuted under Section 70 for working employees on Sunday and fined $50.

H. Reuben, baker, also prosecuted under Section 70 was fined $10.

The proprietor of the United Bakery, charged with obstruction (Sec. 18, Sub-sec. 3), was fined $30. He was also fined $50 on another count, that of violating Section 70 *re* Sunday work.

E. Eckler, proprietor of the Standard Bakery, was fined $50 for violation of Section 70.

A. Mandell, baker, was fined $40 for working employees in excess of hours prescribed by the Act. A complaint had been received that men were working in excess of 12 hours per day, and investigation showed that the complaint was well founded, and information was laid with the above result. He was again indicted for violation of Section 70 but not convicted. Subsequently he was fined $25 for again working his employees in contravention of Section 70.

Morris Senderowitz, baker, prosecuted under Section 70, was fined $20.

The Dundas Fruit Package Co., Dundas, was fined $10 for employing child labor. This firm was prosecuted under Sections 11, 16, 25 and 60, pleaded guilty, and was fined as stated. The parents of the children were also indicted under Section 74, and let off with a warning and the costs of the case.

Mr. McFadden, manager of a confectionery store, Toronto, was fined $2 and costs for working an employee in excess of prescribed hours.

Several explosions took place during the year, resulting in one fatality and injury to several persons. An air tank in the Canadian Ornamental Iron Co.'s plant, Toronto, exploded, killing one man and injuring another. At the Remington Arms-Union Metallic Cartridge Co., Windsor, a premier knock-out machine exploded, injuring one woman.

The explosion of a gasoline tank at Langley's, "The Cleaner," Toronto, resulted in the injury of three persons.

There was only one steam boiler explosion during the year in this Province that came within our Act. On April 17th the boiler of Field Bros. small saw mill, operated by the family near Antioch, exploded about 8 o'clock in the morning, unfortunately killing two brothers. Cause: steam gauge was inoperative and safety valve had been weighted down, with the result that the internal pressure overtaxed the strength of the boiler and thereby caused explosion.

There was also an explosion of a traction engine at Belle River Farm, attended by injury to the owner and two other persons.

About 135 blue prints were examined (under Section 14) in connection with the erection or alteration of factory, shop, or office buildings.

An investigation regarding hours was made and 25 firms were found to be violating the one hour noon day regulation for females and youths.

Altogether the year has been a most trying one for those engaged in factory inspection because of fluctuating industrial conditions. Early in the year a number of factories were closed, while others were running on part time. Later, with the advent of war orders, all factories became exceedingly busy and new ones sprang up. The nature of the work changed, however, in many cases. This branch has endeavored to keep pace with these changes, and has used every effort to safeguard human life, while at the same time facilitating, as far as possible, the carrying out of orders which were urgent in the interest of the Empire.

STATIONARY ENGINEERS' BRANCH

In the Stationary Engineers' Branch is directed the work of issuing certificates to all stationary engineers who pass the prescribed examination. All stationary steam plants of 50 horse-power or over, and carrying over 20 pounds pressure, in the Province of Ontario, come within the meaning of our Act. Considerable work is detailed in examining the engineers and renewing their certificates each year.

There were approximately 8,600 engineers holding stationary engineers' certificates during the year 1915. Owing to the war there were fewer candidates for examination this year, the number being 820 as compared with 1,076 last year. A large percentage of the stationary engineers have enlisted for overseas.

Complaints regarding the violation of the Stationary Engineers' Act have been fewer than ever before.

On July 1st, 1914, an amendment to the Stationary Engineers' Act came into force compelling all engineers operating hoisting plants working at a pressure of 20 pounds or over, irrespective of horse-power, and used for hoisting in structural operations or excavating purposes, to hold hoisting engineers' certificates from this Board. When this amendment came into effect a hoisting engineer could obtain a certificate if he could satisfactorily fill in certai nofrms; if not, it was necessary for him to pass an examination. After July 1st, 1916, *all* hoisting engineers must obtain their certificates by passing the prescribed examination.

Since the passing of the amendment there have been 976 applications for hoisting engineers' certificates, and during the year 1915 there were 439 engineers holding hoisting engineers' certificates, 64 of these obtaining same by examination and 375 qualifying on the necessary forms.

When the amendment first came into force complaints were numerous, but they were promptly dealt with and settled satisfactorily. At the present time there are very few complaints.

All of which is respectfully submitted.

JAS. S. DUFF,

Minister of Agriculture.

FORTY-FIRST ANNUAL REPORT

OF THE

Ontario Agricultural College

AND

Experimental Farm

1915

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by A. T. WILGRESS, Printer to the King's Most Excellent Majesty
1916

Printed by
WILLIAM BRIGGS
Corner Queen and John Streets
Toronto

To His Honour Sir John Strathearn Hendrie, C.V.O., a Lieutenant-Colonel in the Militia of Canada, etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

May it Please Your Honour:

I have the honour to present the Forty-first Annual Report of the Ontario Agricultural College and Experimental Farm.

JAMES S. DUFF,

Minister of Agriculture.

Department of Agriculture,
Toronto, 1916.

THE ONTARIO AGRICULTURAL COLLEGE, GUELPH

Hon. James S. Duff, Minister of Agriculture, Toronto.

FACULTY OF INSTRUCTION, 1915.

(All, except the President, arranged in order of Seniority.)

G. C. Creelman, B.S.A., LL.D.	President
H. H. Dean, B.S.A.	Professor of Dairy Husbandry
C. A. Zavitz, B.S.A.	Professor of Field Husbandry
J. Hugo Reed, V.S.	Professor of Veterinary Science
G. E. Day, B.S.A.	Professor of Animal Husbandry
J. B. Reynolds, B.A.	Professor of English
R. Harcourt, B.S.A.	Professor of Chemistry
Miss Mary U. Watson	Director of Home Economics
John Evans	Professor of Manual Training
C. J. S. Bethune, M.A., D.C.L.	Professor of Entomology and Zoology
W. R. Graham, B.S.A.	Professor of Poultry Husbandry
W. H. Day, B.A.	Professor of Physics
E. J. Zavitz, B.A., M.S.F.	Professor of Forestry
J. W. Crow, B.S.A.	Professor of Horticulture
J. E. Howitt, M.S. Agr	Professor of Botany
D. H. Jones, B.S.A.	Professor of Bacteriology
L. Caesar, B.A., B.S.A.	Associate Professor of Entomology
W. J. Squirrell, B.S.A.	Associate Professor of Field Husbandry
H. H. LeDrew, B.S.A.	Lecturer in Economics and English
Wm. Hunt	Lecturer in Floriculture
Morley Pettit	Lecturer in Apiculture
E. W. Kendall	Lecturer in Manual Training
H. L. Fulmer, B.S.A.	Lecturer in Chemistry
R. R. Graham, B.A., B.S.A.	Lecturer in Physics
R. E. Stone, B.Sc., Ph.D.	Lecturer in Botany
A. W. Baker, B.S.A.	Lecturer in Entomolgy
T. H. Lund, B.S.A.	Lecturer in Bacteriology
F. N. Marcellus, B.S.A.	Lecturer in Poultry Husbandry
H. M. King, B.S.A.	Lecturer in Animal Husbandry
A. Leitch, B.S.A.	Lecturer in Farm Management
G. H. Unwin, B.S.A.	Lecturer in English and French
Miss M. A. Purdy	Demonstrator in Chemistry
Miss Grace Greenwood	Instructor in Normal Methods
Miss Jean Roddick	Instructor in Domestic Science
Miss Alta Dickey	Instructor in Domestic Art
Mrs. F. Doughty	Demonstrator in Domestic Art
Miss Mary McLennan	Demonstrator in Domestic Science
J. Spry, B.S.A.	Demonstrator in Physics
A. J. Galbraith, B.S.A.	Demonstrator in Chemistry
Miss Belle Millar	Demonstrator in Dairying
A. L. Gibson, B.S.A.	Demonstrator in Chemistry
Miss N. Nixon	Demonstrator in Household Administration
A. C. McCulloch, B.S.A.	Demonstrator in Poultry Husbandry
W. H. Wright, B.S.A.	Demonstrator in Botany
R. W. Brown, B.S.A.	Demonstrator in Dairy Husbandry
J. E. Britton, B.S.A.	Demonstrator in Vegetable Gardening
H. S. Fry, B.S.A.	Demonstrator in Fruit Growing
E. L. Davies, B.S.A.	Demonstrator in Bacteriology
W. L. Iveson, M.A.	Demonstrator in Chemistry
G. J. Spencer, B.S.A.	Demonstrator in Entomology
J. P. Sackville, B.S.A.	Demonstrator in Animal Husbandry
S. R. Curzon, B.S.A.	Fellow in Chemistry
P. L. Fancher	Instructor in English and Resident Master
E. M. James, B.A.	Instructor in Athletics

S. Springer	Bursar and Superintendent
S. H. Gandier, B.S.A.	Secretary
Miss J. Gardiner	Librarian
Miss A. O. Hallett	Assistant Librarian
W. O. Stewart, M.D.	Physician
Mrs. K. T. Fuller	Superintendent, Macdonald Hall
Mrs. M. Cunningham	Matron, Agricultural College
Miss M. K. Rutherford	Dietitian

ONTARIO AGRICULTURAL COLLEGE

AND EXPERIMENTAL FARM

1915

To the Honourable the Minister of Agriculture:

SIR,—I have the honour to submit herewith the Forty-first Annual Report of the Ontario Agricultural College and Experimental Farm, including the work of Macdonald Institute, for the year 1915.

THE YEAR'S WORK.

This has been a strange year in our history, for Britain has been fighting every day for her very existence.

During the winter months several members of our staff went from place to place in the Province helping with the "Patriotism and Production" Campaign. I believe the farmers put forth the greatest effort they have ever done, and this, together with an excellent season for growing crops, has enabled the Province of Ontario to produce the greatest quantity of field crops in her history.

More than two hundred of our students or graduates joined the colours and have gone forward to the fighting line. In addition, almost every student of the college is drilling and receiving instruction in military tactics, they will go forward when needed. A number of the staff have also gone to the front, so that the college in every line of activity is feeling the effects of the war.

The work of the college has gone on as usual in every department. The general attendance has fallen off about 25 per cent., but large numbers continue to patronize the short courses, and we had a large class of teachers in the summer courses.

A NEW COURSE.

A new course was added to the curricula during the summer of 1915 called "The School of Rural Leadership." The purpose of the course was to instruct and train all interested in the improvement of rural life along economic, social. educative, religious and recreative lines. This brought together the country ministers, farmers, teachers, and others interested in rural affairs. I believe this points to the beginning of a great movement for better things in country life. At the conclusion of the meeting, a resolution was passed asking that this course be repeated next year.

OTHER SHORT COURSES.

Our short courses have become so popular that a separate calendar is issued now for short courses alone. They embrace work in Stock and Seed Judging, Poultry Raising, Fruit Growing, Apple Packing, Bee-keeping, and Dairying. In addition to the regular students who come of their own volition. some eighty-seven are sent, on scholarship. by the Department of Agriculture, all prize-winners in the Acre Profit and Baby Beef Farm Competitions for Farmers' Sons in the Province of Ontario.

The attendance at these short courses in 1915 was as follows:—

Dairy Courses	121
Stock and Seed Judging	190
Poultry Raising	34
Fruit Growing	55
Apiculture	39
Total	439

Stock Judging.

No show was held in Chicago this year on account of the "Foot and Mouth" disease.

The Winter Fair in Guelph was again a great success.

The following is a list of our students who were prize-winners in each class:—

Beef Cattle.	*Dairy Cattle.*	*Horses.*
R. J. Bryden.	C. Patterson.	J. H. McCulloch.
W. H. Scott.	A. H. White.	J. G. Glavin.
W. R. Shaw.	A. G. Skinner.	H. W. Clarke.
J. W. Brownridge.	C. F. Luckham.	(Outsider).
(Outsider).	M. A. Powell.	A. G. Skinner.

Sheep.	*Swine.*	*Poultry.*
D. E. McEwen.	M. C. McPhail.	M. C. McPhail.
L. H. Hamilton.	(Outsider).	W. Strong.
M. F. Cook.	(Outsider).	K. Welton.
D. R. Schuyler.	A. B. Baird.	J. C. McAdam.
J. S. Steckle.	S. B. Stothers.	G. R. Wilson.

In the Inter-year Judging Competition the classes ranked as follows:—
Fourth Year. Third Year. Second Year. First Year.

COLLEGE WORK AND PROGRESS.

The following figures of attendance in all departments show that the College is splendidly maintaining the popularity which its work has won:—

(Figures for general course include students of winter term and new students who entered for fall term.)

General Course		559	
Specialists in General Course Work		13	
Manual Training (One Year Normal Course)		7	
Dairy Courses		121	
Stock and Seed Judging		190	
Poultry Raising		34	
Fruit Growing		55	
Apiculture		39	
			1,018
Domestic Science (at Macdonald Institute)		390	
Summer Courses—High School	28		
Public School teachers, first year	54		
Public School teachers, second year	23		
Rural School Inspectors	78		
School for Rural Leadership	61		
		244	
			634
Total			1,652

Analysis of College Roll (General Course), 1915.

From Ontario.

Algoma	8	Huron	9	Perth	12
Brant	11	Kent	5	Peterboro'	8
Bruce	8	Lambton	17	Prescott	4
Carleton	19	Lanark	5	Prince Edward	2
Dufferin	4	Leeds	1	Renfrew	4
Dundas	6	Lennox	6	Russell	3
Durham	7	Lincoln	10	Simcoe	10
Elgin	10	Middlesex	16	Stormont	2
Essex	11	Muskoka	3	Thunder Bay	3
Frontenac	6	Nipissing	3	Victoria	5
Glengarry	4	Norfolk	15	Waterloo	13
Grenville	12	Northumberland	5	Welland	7
Grey	4	Ontario	8	Wellington	34
Haldimand	6	Oxford	15	Wentworth	20
Halton	9	Parry Sound	4	York	61
Hastings	6	Peel	11		
				Total from Ontario.	452

From Other Provinces of the Dominion.

Alberta	11	New Brunswick	1	Saskatchewan	5
British Columbia	27	Nova Scotia	11		
Manitoba	1	Prince Ed. Island	4	Total from other	
		Quebec	1	Provinces	61

From Other Countries.

Argentine Republic	1	Japan	1	Spain	1
B. W. I.	3	Panama	1	U. S. A.	19
England	12	Scotland	3		
India	1	South Africa	4	Total from other	
				Countries	46

Ages and Religious Denominations.

The limits of age in the General Course, 1915, ranged from 17 to 36 years. The average age was 22.

Anglican	118	Evang. Association	1	Methodist	172
Baptist	35	Friends	8	No Religion	8
Christian Scientist	1	Greek Orthodox	1	Presbyterian	185
Congregational	6	Latter Day Saints	1	Roman Catholic	16
Disciples of Christ	1	Lutheran	1	Unitarian	1
Dutch Reform	3	Mennonite	1		

New Buildings.

The dining-hall, which was completed last year, is giving the greatest possible satisfaction to our students. Its splendid appearance, ample accommodation, and excellent equipment adds very much to the comforts of the students in attendance. Besides our students in residence, many who are rooming outside come to the new dining-hall for their meals.

During the summer the members of the Canadian Club of Toronto were entertained here for lunch, when the building was very much admired and the Minister of Agriculture complimented on the structure and equipment of the building.

The New Physics Building is now almost complete, and will permit of very material improvement in the instruction in that important department. As soon as the department moved into the new building, repairs were commenced on the old Biological Hall. The top floor was taken over entirely by the Department of Entomology and completely remodelled. The Department of Botany selected the second floor, and it was done over to suit their convenience. By the addition, then, of the New Physics Building, three departments have been very materially strengthened and improved.

Agricultural Representatives.

As might be expected, some changes naturally came about among the District Representatives. Some of these young men were promoted to special work in other provinces, and new men appointed to their places. They all met at the College for a week in July, when we were able to see something of their work through the excellent discussions that took place.

I believe that no better work is being done anywhere than these men are doing among the farmers of the Province of Ontario.

The following is a list of the men and their districts:—

County.	Representative.	Address.
Algoma	A. S. Smith	Sault Ste. Marie.
Brant	R. Schuyler	Paris.
Bruce	N. C. McKay	Walkerton.
Carleton	W. D. Jackson	Carp.
Dufferin	H. A. Dorrance	Orangeville.
Dundas	E. P. Bradt	Morrisburg.
Durham	R. S. Duncan	Port Hope.
Elgin	C. W. Buchanan	Dutton.
Essex	J. W. Noble	Essex.
Frontenac	A. W. Sirett	Sydenham.
Glengarry	D. E. McRae	Alexandria.
Grenville	J. E. McRostie	Kemptville.
Grey	H. C. Duff	Markdale.
Haldimand	G. L. Woltz	Cayuga.
Halton	W. F. Strong	Burlington.
Hastings	A. D. McIntosh	Stirling.
Kenora	P. Stewart	Kenora.
Kent	R. B. Hinman	Chatham.
Lambton	G. G. Bramhill	Petrolea.
Lanark	P. S. D. Harding	Perth.
Leeds	W. H. Smith	Athens.
Lennox and Addington	G. B. Curran	Napanee.
Manitoulin	I. F. Metcalfe	Gore Bay.
Middlesex	R. A. Finn	Box 663, London.
Muskoka and Parry Sound	F. C. Paterson	Huntsville.
Norfolk	Vacant	Simcoe.
Northumberland	R. S. Beckett	Brighton.
Ontario	R. M. Tipper	Whitby.
Oxford	G. R. Green	Woodstock.
Peel	J. W. Stark	Brampton.
Peterborough	F. C. McRae	Norwood.
Prince Edward	A. P. McVannell	Picton.
Rainy River	H. M. McElroy	Emo.
Renfrew	M. H. Winter	Renfrew.
Simcoe	J. Laughland	Collingwood.
Sudbury	H. B. Roy	Sudbury.
Thunder Bay:		
Fort William Section	G. W. Collins	Fort William.
Port Arthur Section	L. M. Davis	Port Arthur.
Temiskaming	W. G. Nixon	New Liskeard.
Victoria	A. A. Knight	Lindsay.
Waterloo	J. S. Knapp	Galt.
Welland	E. K. Hampson	Welland.
Wentworth	R. L. Vining	7 Market St., Hamilton.
York	J. C. Steckley	Newmarket.

New Bulletins Issued During 1915 by the College Staff.

No. 227.—Cherry Fruit Flies. L. Caesar and G. J. Spencer.
No. 228.—Farm Crops. Prof. C. A. Zavitz.
No. 229—Smuts and Rusts of Grain Crops. Prof. Howitt and Dr. R. E. Stone.
No. 232.—Field Beans. Prof. C. A. Zavitz.
No. 233.—Natural Swarming of Bees and How to Prevent it. M. Pettit.

Changes in Staff.

The following men have resigned and accepted other positions:—
J. B. Reynolds, B.A., Professor of English.
S. B. McCready, B.A., Professor of Nature Study.
J. W. Charlesworth, B.A., Lecturer in English and French.
W. R. Reek, B.S.A., Lecturer in Animal Husbandry.
A. J. Galbraith, B.S.A., Lecturer in Chemistry and Geology.
R. W. Brown, B.S.A., Demonstrator in Dairying.
A. C. McCulloch, B.S.A., Demonstrator in Poultry Husbandry.
N. Curtis, Resident Master, and Instructor in English.
W. Southworth, B.S.A., Plant Breeder.
D. W. Gillies, Instructor in Athletics.

The following appointments or promotions have been made to fill these vacancies:—

H. M. King, B.S.A., Lecturer in Animal Husbandry.
J. P. Sackville, B.S.A., Demonstrator in Animal Husbandry.
A. Leitch, B.S.A., Lecturer in Farm Management.
G. H. Unwin, B.S.A., Lecturer in English and French.
H. Sproule, Demonstrator in Dairying.
P. L. Fancher, Resident Master and Instructor in English.
G. F. Kingsmill, B.S.A., Assistant in Apiculture.
E. M. James, B.A., Instructor in Athletics.

ORCHARD INVESTIGATION.

Fruit Growing in Northern Ontario.

During the past few years we have investigated carefully the condition of and prospects for fruit growing in Northern Ontario, and as we found it to be extremely important that varieties for the northern districts should be capable of withstanding severe winter conditions our Department of Horticulture is now engaged in attempting to breed varieties of suitable hardiness. Through the kindness of V. M. Sevich, Chief Specialist in Plant Breeding of the Imperial Russian Department of Agriculture, we have secured a considerable quantity of seed of the hardiest desirable varieties of Russian apples and pears. We have been successful this year in growing about 5,000 seedlings from this seed. Some of these should be worthy of distribution in the colder regions of Ontario, and they should also be of value in further breeding work. We are also endeavouring by hybridization to secure better varieties of hardy plums and cherries for the northern country.

The following conclusions are based on our observations in Parry Sound, Algoma, Temiskaming, Rainy River, and Kenora:—

1. Strawberries, currants, and gooseberries can be grown with excellent success in any of these districts, provided due consideration is given the choice of varieties, soils and locations.

2. Red raspberries can be successfully grown in any of the districts mentioned, but special care is necessary in order to screen the canes from the sun on bright

days in winter and early spring. This is best accomplished by choosing locations protected *on the south* by belts of trees, windbreaks and the like.

3. Apples, plums and cherries are being successfully produced in Parry Sound, on Manitoulin Island, and in the southern part of Algoma district.

4. For trees and bush fruits in cold districts, lighter soils are preferred, and, if these can be had on northern slopes, so much the better. Special attention should be given to windbreak protection on the west and north, and to sun protection on the south.

Fruit Trees Injured in Old Ontario.

We have investigated again this year numerous cases of winter injury to fruit trees in the older parts of Ontario, and the following conclusions have been arrived at:—

1. Lack of adequate drainage is the direct cause of many cases of severe winter injury.

2. Root killing is common (even in the southern portions of the province) on exposed situations or in seasons when snowfall is light. For exposed situations, windbreaks on the west are recommended, and cover crops should also be made use of in order to retain all the snow possible.

3. Late growth of trees is especially to be guarded against, and fruit growers are particularly warned against late cultivation. Apples, pears, cherries and plums *should not be cultivated later than July 1st in any season, in any part* of Ontario. A cover crop should be sown at the last cultivation in order to check the growth of trees and cause the wood to ripen thoroughly. Peaches may be cultivated three or four weeks later than other fruits.

Peaches.

During the winter of 1913-14, which was very severe on peach buds in the province, Mr. Culham visited the various peach districts as soon as the fact of injury became known. Buds were collected from many sources and carefully examined in the laboratory here. These investigations showed that the Niagara District had suffered a complete loss, as all the buds were destroyed, but that the Lambton district still had a fair proportion of living buds. Comparatively little injury was found in the Leamington section. The peach crop of 1914 verified the observations made, and for the first time in many years the Niagara District failed to harvest a peach crop. Since the writing of last year's Annual Report, Mr. Culham has assembled temperature data for the three important peach districts, and while this data is unfortunately incomplete, owing to the breaking of a thermometer at the Leamington observation station about January 1st, 1914, the charted results are of very great interest. The chart shows that the Niagara section experienced a warmer autumn and fall season in 1913, but that it also experienced a sudden and extreme drop in temperature on November 26th. This cold snap was much less pronounced in Lambton, and scarcely noticeable in Leamington, and there is no doubt that a very large proportion of the injury done in the Niagara district was caused by this extreme dip. The injury in this locality was also rendered more severe because of the warm autumn and fall which immediately preceded, as the trees were kept in a growing condition and were consequently more subject to injury. The chart also shows that during January and February the Niagara district experienced higher maxima and lower minima than the Forest district. These extreme changes completed, no doubt, the destruction of the remaining buds. It is unfortunate that the data for Leamington are not available covering the months of January and February. It only remains to be said that Leamington harvested a record crop of peaches, while in the other two districts the size of the crop was directly related to the extremes of temperature experienced.

Apples at the College.

In spite of an unfavourable season, and the unusual prevalence of apple scab throughout the Province, our crop of apples was remarkably clean. This is attributed to the very careful and thorough work in spraying. It is also worthy of note that with apples a light crop over the Province generally, the crop harvested in the College orchard this season was the best on record. The young orchard planted in 1913 made excellent growth this season, and is in a very satisfactory condition.

HOME-GROWN VEGETABLE SEEDS.

Because of the great interest aroused in the seed trade business on account of war conditions in Europe, tests were made here during the past year in the growing of certain vegetable seeds, and we are able to report excellent success in the production of beet, carrot and onion seeds, with a partial success in cabbage. A splendid crop of seed was also produced from several plants of Paris Golden Self-Blanching Celery, planted in the greenhouse in the fall of 1914. One pound of seed was produced from five plants, and since good seed of this variety is worth in the neighborhood of $2.50 per *ounce* it will be seen that the venture proved extremely profitable.

A crop of celery of the variety mentioned was grown in the garden this year, from home-grown seed produced in the greenhouse in 1914. A comparative test was made of our own seed against the best commercial seed of the same variety, and everyone who saw the crop was impressed by the superiority of the plants grown from our own seed. The possibilities of improving the commercial varieties of vegetables by selection and breeding are no doubt very great, and we have already under way improvement work in the crops mentioned, and also in tomatoes, asparagus and rhubarb.

BACTERIOLOGICAL DEPARTMENT.

Work in Legume and Seed Inoculation.

A total of 2,918 cultures of legume bacteria for seed inoculation were sent out, made up as follows:—

Alfalfa, 2,267; Red Clover, 401; Alsike, Vetch, Sweet Peas, Peas, Beans, White Clover, Sweet Clover, Crimson Clover, Mammoth Clover, 250.

Distribution by Provinces is as follows:—

Ontario, 1,312; British Columbia, 733; Saskatchewan, 120; Auberta, 61; other Provinces, 41.

Five hundred and fifty cultures were sent to the British Columbia Department of Agriculture on request, for distribution.

Specimens Examined.

The following diseases and abnormal conditions were found in specimens submitted to us from all parts of the Province, for examination:—

Poultry.

Bacilliary White Diarrhoea	2 chicks.
Roup	2 cocks.
Peritonitis	4 hens.
Gastro enteritis	1 cock, 2 guinea hens.
Tuberculosis	19 hens and cocks.
Fowl cholerea	2 hens.
Anaemia	2 hens.
Abdominal dropsy	1 hen.
Blackhead	4 turkeys, 1 chick.
Poisoning	Several chicks, hens, ducks and geese.
Over feeding	7 hens.

Sheep.

Purulent Pneumonia	Lungs of 1 sheep.

Swine.

Liver and lungs	Too badly decomposed for diagnosis.

Cattle.

Tuberculosis	Several carcasses examined at slaughter house, all stages of disease found.
Black-leg	2 blood samples. B. anthracis symptomatici not found.

Plant Diseases.

Fire Blight	2 specimens.
Black Rot of Cabbage	1 specimen.
Soft Rot of Cauliflower	1 specimen.
Bacterial Wilt of Cucurbits	1 specimen.
Soft Rot of Potato	9 lots.
Tomato Disease	Physiological—several.
Crown Gall on apple	2 specimens.

Milk Samples.

Bacterial count	6
Ropy Milk	1
Milk Powder	1
Gassy Cheese	1

Water Samples.

Condemned for contamination	13
Passed as fit for consumption	24

Many other samples of material were received on which no positive diagnosis could be given owing to their bad condition on arrival.

Research.

Potato Rot, Canning, and Milking Machines.

During the summer and fall, as other duties would permit, considerable attention was given to a study of the potato rot so common in many sections. These studies are still in progress. Also an investigation with regard to a disease of glasshouse tomatoes has been conducted in conjunction with the Botanical Department. In connection with this latter, a paper was prepared and presented at the Vegetable Growers' meeting at the Parliament Buildings, Toronto, November 9th.

We have made some experiments in connection with the canning of fruits and vegetables, and we have a manuscript on this subject which we expect shortly to submit for publication as a bulletin.

As other duties would permit we have devoted some time to a study of the quality of milk secured by the use of milking machines. We have investigated conditions on a number of farms in the neighborhood of Woodstock, and have secured considerable information of importance in this connection. Tests of machine milk and methods of handling machines have been carried out at the College Dairy Barn from time to time with the idea of publishing a bulletin giving recommendations for the sanitary handling of milking machines.

FIELD HUSBANDRY.

Good Seed.

The Head of the Department of Field Husbandry in his report emphasizes very strongly the importance of good seed. He says:—

The farmer who does not secure the very best varieties of crops for his farm is certainly not living up to his opportunities. There is at the present time but little excuse for the farmer who does not grow the varieties which will best meet the conditions of farming which he is carrying out. Many of the leading kinds of crops now grown in Ontario were first tested at the Ontario Agricultural College and afterwards introduced over Ontario through the medium of the Ontario Agricultural and Experimental Union. Some of these varieties originated at the College, others were secured in Ontario, and still others were imported from other countries. Particular attention is called to the following outstanding varieties: O.A.C. No. 72 and O.A.C. No. 3 varieties of oats; Mandscheuri and O.A.C. No. 21 barley, Dawson's Golden Chaff and Imperial Amber winter wheat, Mammoth White winter rye, O.A.C. No. 61 spring rye, Common emmer, Rye Buckwheat, New Canadian Beauty and Early Britain peas, Pearce's Improved Tree beans, Hairy vetches, Early Yellow soy beans, White Cap Yellow Dent and Wisconsin No. 7 Dent corn, Salzer's North Dakota flint corn, Golden Bantam sweet corn, Early Amber sorghum, Ontario Variegated and Grimm alfalfas, Yellow Leviathan mangels, Empire State, Davies' Warrior and Extra Early Eureka potatoes.

Oats.

The past season has been a very peculiar one for crop production in Ontario. The summer was cool and exceptionally wet. Even in this abnormal season, however, important lessons were obtained through experiments with farm crops.

It is interesting to note that at the College the O.A.C. No. 72 variety of oats gave a yield at the rate of 103.5 and the American Banner of 92.8 bushels per acre. In each of the past nine years in which these two varieties have been grown under similar conditions the O.A.C. No. 72 has surpassed the Banner in yield per acre in each year, the average for the whole period of nine years for the former being 90.6 bushels and for the latter 72.5 bushels per acre. At the Provincial Winter Fair, held in Guelph in December, 1915, there were one hundred and thirty-seven entries of oats, divided as follows: O.A.C. No. 72, 57; Banner, 13; Abundance and Regenerated Banner, each 8; Sensation, 6; Lincoln, Improved Scotch, and Jeanette, each 4; Regenerated Abundance, Early Yielder and White Wave, each 3; Siberian and Daubeney, each 2; and sixteen other varieties, each 1. Four entries were unnamed. There were, therefore, in all twenty-nine named varieties. It will be seen that the O.A.C. No. 72 had more than four times as many entries as any other variety of oats. This variety also took first prize in the entries in connection with the Field Crop Competition.

Barley.

In the barley experiments at the College and throughout Ontario, the O.A.C. No. 21 still occupies highest place in yield of grain per acre. This variety has become exceedingly popular throughout the Province and is supplanting all other varieties, even the Mandscheuri, which the College introduced about twenty-five years ago, and which has done so much in the improvement of barley growing in Ontario. It is now estimated that about 95 per cent. of all the barley which is grown in Ontario belongs to the Mandscheuri or the O.A.C. No. 21 varieties. Of the forty entries of barley at the Provincial Winter Fair held at Guelph this year, not a single name occurs except the O.A.C. No. 21. According to the report of the Bureau of Industries for Ontario the yield of barley per acre for the past sixteen years as compared with the sixteen years previous has had an increase of about 23 per cent. This increase in yield per acre throughout Ontario for the last period as compared with the first period of sixteen years would amount to about thirty-five million dollars, or sufficient to maintain the Ontario Agricultural College at its present cost of maintenance for approximately one hundred and ninety (190) years.

Potatoes.

The season of 1915 was exceptionally unfavorable for potato-growing in Ontario, the average yield per acre for the Province being only 76 bushels per acre. The results of the experiments at the College for the past year are very interesting and important in showing the great variation in different varieties. One variety, viz., the Snowball, gave a yield of only 13 bushels per acre, and another variety, viz., the Hustler, under similar conditions gave a yield of 366 bushels per acre. The Extra Early Eureka, a medium early variety, gave an average of 326 bushels per acre in 1915, and an average of 232 bushels per acre for the past five years. This variety is not only a large yielder, but it is also one of the freest from rot of all the varieties of potatoes under experiment. In the average results for the past nine years the Davies' Warrior stands first with 235, and the Extra Early Eureka second, with 230 bushels per acre per annum. In comparing the varieties tested for a longer period of time the Empire State occupies the highest place in productiveness. These three varieties are all of good table quality, the Empire State being particularly good in this respect.

In a season like the present it has been difficult to get full advantage from the spraying materials with potatoes owing to the fact that the rains were so incessant. Our experiments at the College show a very great difference in the susceptibility of the different varieties of potatoes to the rot. For instance, in 1915 two varieties had less than one per cent. each of rot, and two varieties had upwards of fifty per cent. of rot, under similar conditions. Taking the average of experiments for five years it has been ascertained that those varieties which were the freest from rot were the Davies' Warrior, the Extra Early Eureka, the Stray Beauty and the Holborn Abundance, and those most subject to rot were the Early Rose and the Beauty of Hebron.

Smut.

There was an unusually large amount of smut throughout Ontario during the past season. It is probably a conservative estimate to put the loss in the oat crop caused by loose smut at from ten to twelve per cent., and in the winter wheat caused by stinking smut at from four to six per cent. This would be a direct loss to the Province of about five million dollars. If the farmers had treated their seed grain last autumn they might have had the grain practically free of smut this year. Of all the treatments which have been made at the College for the stinking smut of wheat and the loose smut of oats, the best results have been obtained by immersing the grain for twenty minutes in a solution made by adding one pint of formalin (40 per cent. formaldehyde) to 42 gallons of water. When this treatment has been carried out it has not injured the germination of the grain and the results have been entirely satisfactory as regards yield per acre and freedom from smut.

The quality of the seed which a man sows on his land is a good indication of the carefulness, the progress and the thrift of the farmer.

BOTANY.

The correspondence of this department continues to increase. During the past season, 1914-15, large numbers of letters were received enquiring about weeds, weed seeds and fungus diseases, and many specimens of plants and plant diseases were sent in for identification. Numerous samples of seed grain, clover and grass seed were also submitted for examination and purity test. The continued increase in our correspondence every year is partly due to the fact that the introduction of nature study and elementary agriculture into the curriculum of our public schools is stimulating the interest of the children and school teachers in regard to weeds, wild flowers and trees, and partly due to the fact that the farmers of Ontario are beginning to more fully realize, appreciate and take advantage of the facilities placed at their disposal by the Ontario Department of Agriculture.

Weeds.

Analysis of the correspondence received during the past twelve months indicates that the following weeds have attracted more attention during the past year: Dandelion (*Taraxacum officinale*) (in lawns), Wild Mustard (*Brassica arvensis*), Twitch Grass (*Agropyron repens*), Perennial Sow Thistle (*Sonchus arvensis*), Field Pepper Grass (*Lepidium campestre*) and Bindweed (*Convolvulus arvensis*).

Fungus Diseases.

The abnormal amount of rain during the past summer produced conditions favorable to the development and spread of fungi, and consequently numerous fungus diseases become prevalent in Ontario. Among those which caused serious loss to the farmers were: Loose Smut of Oats (*Ustilago avenæ*), Bunt or Stinking Smut of Wheat (*Tilletia foetens*), Late Blight and Rot of Potatoes (*Phytophthora infestans*), Late Blight of Celery (*Septoria petroselini*, var *apii*), Anthracnose or Pod Spot of Beans (*Colletotrichum lindemuthianum*), Apple Scab (*Venturia pomi*). These diseases have all been dealt with in various College bulletins and can all be kept under control by the timely and intelligent application of the treatments recommended.

Purity Tests of Clover and Timothy Seed.

Purity tests, according to the standard designated by the Seed Control Act, were made of forty-eight samples of clover and timothy seed. Out of twenty-one samples of timothy seed tested eleven graded No. 1, five No. 2, one No. 3, and four were disqualified. Of sixteen samples of red clover seed four graded No. 1, six No. 2, four No. 3, and two were disqualified. Out of nine samples of alsike four graded No. 1, two No. 2, and three were disqualified. Only two samples of alfalfa were tested for purity, one graded No. 1 and the other was disqualified.

Investigation Work.

During the past twelve months the following research work has been carried on: Co-operative experiments in weed eradication, spraying with Bordeaux mixture to prevent late blight of celery, studies of the life-history of the fungi *Septoria petroselini* var *apii*, which causes late blight of celery, experiments in the control of leaf blotch or black spot of roses (*Actinonema rosæ*), experiments in spraying to destroy dandelions, investigation of the cause and means of control of a peculiar winter disease of tomatoes, a survey of a portion of Ontario to discover to what extent the white pine blister rust is spread over the Province, and studies of the life-history of the fungus *Peridermium strobi* which causes the disease.

Co-Operation Experiments in Weed Eradication.

These experiments have now been conducted for four successive years. The weeds experimented with are Perennial Sow Thistle, Twitch Grass, Mustard, Bladder Campion and Ox-eye Daisy. Five experiments in all have been tried, viz.: the use of rape in the destruction of Perennial Sow Thistle; the use of rape in the destruction of Twitch Grass; a method of cultivation for the eradication of Bladder Campion or Cow Bell; spraying with iron sulphate to destroy mustard in cereal crops; a method of cultivation for the destruction of Ox-eye Daisy. Some fifty-eight farmers have co-operated in this work during the past four years. These experiments have not been so successful this past year as in former years, but this is due to the exceedingly wet weather of the past summer preventing the carrying out of the experiments according to directions. Those experimenters, however, who in spite of the bad weather were able to give the experiments a fair trial, report results which confirm those of the past three years. The results of the four years' co-operative weed experiments show:

1. That good cultivation, followed by rape sown in drills, provides a means of eradicating both Perennial Sow Thistle and Twitch Grass.

2. That rape is a more satisfactory crop to use in the destruction of Twitch Grass than buckwheat.

3. That rape gives much better results in the eradication of Twitch Grass and Perennial Sow Thistle when sown in drills and cultivated than it does when sown broadcast.

4. That thorough deep cultivation in fall and spring, followed by a well cared for hoed crop, will destroy Bladder Campion.

5. That Mustard may be prevented from seeding in oats, wheat and barley by spraying with a twenty per cent. solution of iron sulphate without any serious injury to the standing crop or to the fresh seedings of clover.

Experiments to Control Late Blight of Celery.

Spraying experiments to control Late Blight of Celery have now been conducted for three years. The first year both lime-sulphur and Bordeaux mixture were used, but, as the results of the first year's work indicated that lime sulphur was not as effective as Boardeaux mixture in the control of the blight, it was not used the following years. The results of this year's experiments, while not as marked as in the two previous years on account of the very wet season, confirm the results formerly obtained.

The results of the three years' experiments show conclusively that in seasons of normal rainfall loss from Late Blight of Celery can be prevented by spraying with Bordeaux mixture (4-4-40 formula), starting when the plants are in the seed beds and spraying at intervals of ten days or two weeks throughout the growing season. In this connection, it is interesting to know that experiments conducted under the directions of S. C. Johnston, Vegetable Specialist for the Ontario Department of Agriculture, have proved that such spraying is a commercial success.

Spraying Experiments to Prevent Rose Leaf Blotch.

Rose Leaf Blotch, caused by the fungus *Actinonema rosæ* is a disease about which many complaints are received each year. It damages roses both under glass and in the open. During the past three years spraying experiments have been conducted for its control. Bordeaux mixture and lime-sulphur have been tried.

The results of these experiments show, first, that lime-sulphur is more effective than Bordeaux mixture in the control of Rose Leaf Blotch; second that spraying with concentrated lime-sulphur (strength specific gravity 1.008) beginning in the spring before the buds open and repeating at intervals of ten days throughout the growing season, except when the roses are in bloom, will prevent damage from Rose Leaf Blotch, though the plants will be considerably disfigured by the spray mixture.

Experiments in Spraying to Destroy Dandelions.

During the past five years experiments have been made in spraying with a solution of iron sulphate to destroy dandelions in lawns. The results obtained have been uniformly satisfactory. The following is a brief account of this year's experiment. A plot on the College Campus, about one-eighth of an acre in size which was thick with dandelions, was sprayed five times during the summer with a twenty per cent. solution of iron sulphate. The spraying was done with a power sprayer drawn by two horses. For a considerable portion of the summer the grass was discolored, but this fall was greener and thicker than ever and almost entirely free from dandelions.

The results of five years' experiments warrant giving spraying with iron sulphate a trial on lawns that are badly infested with dandelions. Prepare a twenty per cent. solution of iron sulphate by dissolving two pounds of iron sulphate in each gallon of water. Apply this solution with a hand or knapsack sprayer in the form of a fine mist. A watering can is not satisfactory for spraying dandelions with. It is apt to drench the lawn too much with the iron sulphate solution, and, being made of tin, it soon becomes corroded by the iron sulphate. See that all the dandelions are thoroughly drenched with the solution. Rake off the blackened leaves two or three days after spraying and in dry weather, if possible, thoroughly water the lawn. Spray frequently enough during the season to prevent the dandelion leaves getting a start. Six applications at least will be necessary. Next season, in order to fill up the spaces caused by the destruction of the dandelions, reseed with pure lawn grass seed. Prepare the lawn for reseeding by raking it over with a coarse rake so as to stir the soil. Sow the seed when the ground is moist, rake it in well and roll. There is nothing like a good thick stand of grass to keep out dandelions and other weeds.

Important points to observe in spraying with iron sulphate to destroy dandelions: first, begin spraying early in the spring just as soon as the dandelion leaves begin to show in the lawn; second, do not be alarmed or discouraged if the lawn looks discolored and unsightly after spraying; the grass will not be permanently injured, and next year will be thicker and greener than ever; third, spray thoroughly and with a good pressure; fourth, repeat the spraying often enough during the summer to prevent the dandelion leaves getting a start.

The chief objections to spraying with iron sulphate are that it renders the lawn unsightly for a considerable portion of the summer and kills any white clover that may be in it. The white clover, however, can be renewed when the lawn is re-seeded, which is always necessary after spraying with iron sulphate in order to fill in the spaces formerly occupied by the dandelions, and the following year the grass will be greener and more luxuriant than ever.

White Pine Blister Rust (*Peridermium strobi, Kleb.*).

The fungus which causes this disease attacks both five-needled pines and various species of currants and gooseberries. It is capable of being exceedingly destructive to White Pines. In some parts of Europe it has destroyed many thousands of trees. On the leaves of currants and gooseberries it produces a rust known as the European Currant Rust, which is not generally considered a very serious disease but does, to some extent, injure the bushes.

The European Currant Rust was first observed in Ontario by the writer in the fall of 1914 on some black currants in a new currant plantation on the College farm. Shortly afterwards it was also found on currants in the Niagara district. Its presence in the Province was at once reported to the Deputy Minister of Agriculture. A conference was held to consider the best means of stamping out the disease. Those who attended this conference were: E. J. Zavitz, Provincial Forester; W. A. McCubbin, Assistant in Charge of the Dominion Laboratory of Plant Pathology; Prof. L. Caesar, Provincial Entomologist, and Professor J. E. Howitt, O.A.C., Guelph. As a result of the recommendations made at this conference, the following steps were taken in regard to the control of the disease: an Order-in-Council was passed by the Dominion Government prohibiting the importation of White Pines and other five-needled pines into Canada from Europe; the disease was included in the Ontario Fruit Pest Act and a circular letter sent to the nurserymen prohibiting the sale of White Pines and other five-needled pines for the present; a survey was commenced to ascertain to what extent the disease had spread over the Province.

The survey was placed under the directions of this Department. We began the work in the fall of 1914 and continued it during the spring and summer of this year (1915). The following is a summary of the reports received of this survey:

Counties visited: Brant, Dundas, Durham, Elgin, Halton, Kent, Lambton, Lincoln, Middlesex, Norfolk, Oxford, Waterloo, Welland, Wellington, Wentworth, York.

Counties and Places where Disease was Found.

BRANT:
Brantford—
W. C. Good .... 2 suspicious imported pines.
Mrs. F. Rutherford ..... 2 pines and 1 wild currant.

DURHAM:
Bowmanville—
Frank Squair .... 1 pine diseased.
1 pine suspicious.
Currants badly infected.
Kendall—
John Stewart .... 1 pine diseased.
1 pine suspicious.
Cultivated currants diseased.

HALTON:
Oakville—
Auburn Nurseries ...... 8 Pinus strobus diseased, 4 years old.
Ryrie Farms .... Cultivated currants, slight.
D. Savage .... Currants, slight infection.

KENT:
Electric—
Geo. Crawford .... Block of Pines; few suspicious trees in block.

LINCOLN:
Grimsby—
Mr. Sowerby .... Cultivated currants, diseased leaf.
Mr. Graham .... Cultivated currants, diseased leaf.
Place W. of Mr. Sowerby. Cutivated currants, diseased leaf.
South of Grimsby, E. side of mountain .... Wild currants and wild gooseberries.
Near Mr. Brooke's ...... Wild currants.
Mountain, S. of Grimsby. Infection found all along the road parallel to the mountain from ½ mile west of Grimsby Mountain road to Grimsby Beach Mountain Road, perhaps still east of this.

Disease has spread from first infested areas along the mountain beyond the village, in a N. E. direction. A slight infection as far as Grimsby Beach and north of the Village to lake.

WELLINGTON:
Fergus—
G. J. Jamieson .... Few suspicious pines.
Goldstone—
W. T. Whale .... Few suspicious pines.
Guelph—
O.A.C. Farm .... Imported pines and cultivated and wild currants.

WENTWORTH:	
Winona—	
E. D. Smith's Nurseries.	Small block of currants near pines.
E. D. Smith's Home Nurseries	24 imported pines, 1 cultivated currant.
T. Carpenter	1 currant bush.
W. of E. D. Smith's, E. of above	Black currants, ½ mile west.
	Black currants, 2 leaves, 1 mile east.
Neighborhood of E. D. Smith's and T. Carpenter's	Currants infected considerable distance, chiefly north and east.
Half mile beyond Ed. Henry's place	Slight infection for ½ mile.
Winona and Grimsby district	Light infection in all places.

From the above summary it is seen that the White Pine Blister Rust is quite widely spread in Ontario and is established on native white pines and wild currants and gooseberries. Insomuch as it has proved such a serious pest in Europe we cannot afford to take risks with it here in Ontario. It is, therefore, of utmost importance that prompt and effective measures should be taken to exterminate or hold this disease in check, for if it is neglected it will in the course of a few years in all probability spread over the entire Province and become a menace to our white pine forests and plantations.

Insomuch as this is chiefly a disease of white pines its control or extermination is largely a forestry problem. This Department can handle the scientific investigation necessary in a campaign for extermination, but with its present facilities cannot undertake the large amount of field work that will be necessary. It would seem, therefore, fitting and advisable that the Provincial Department of Lands and Mines through its division of Forestry should handle the field end of this work.

A Troublesome Disease of Winter Tomatoes.

In the spring of 1914 tomato plants showing a marked diseased condition of the leaves, stems and fruit were sent to this Department by a tomato grower living in the outskirts of Hamilton, Ontario. A visit was paid to the grower's forcing houses, and the disease was found scattered throughout two large houses, about ten per cent. of the plants being affected. The following December (1914) the trouble again appeared in one of these houses, and some three thousand plants were so badly diseased that the crop was a complete failure. The spring crop of 1915 in the same house was not seriously affected but many plants scattered here and there throughout the house showed clear evidence of the disease. In the spring of 1915 some diseased plants were found in forcing houses in the vicinity of London and Toronto, Ontario. In August, 1915, the disease was observed on field tomatoes in two localities near Toronto, Ontario, about one per cent. of the plants being affected.

This disease does not appear to be confined to Ontario. In Bulletin 43 of the Cornell University Agricultural Experiment Station published in September, 1892, Professor L. H. Bailey described a disease which he calls a "Winter Blight of Tomatoes." The symptoms given by Prof. Bailey for this trouble in many respects strongly suggest that it may have been similar to the disease found in Ontario.

In Bulletin 73 of the Ohio Agricultural Experiment Station Professor Selby described a blight of forced tomatoes which seemed to the writers to be similar, if not identical, with the disease in Ontario. Tomato plants showing the characteristic symptoms of the disease were, therefore, sent to Prof. Selby for examination. These were examined by one of Prof. Selby's assistants, Mr. A. S. Orcutt, who reported as follows:

"Upon examining the tomato material, and later conferring with Prof. Selby, it is our opinion that this is the same trouble which was reported from this station in 1896."

The same disease is also apparently found in the vicinity of Philadelphia. In January, 1915, diseased plants from forcing houses near Philadelphia were kindly sent to the writers by Mr. C. R. Orten, Plant Pathologist of the Pennsylvania State College. These, when carefully examined, were found to have spots and lesions on the stems, leaves and fruits characteristic of the disease which has caused the trouble in Ontario.

Symptoms of the Disease. This disease attacks the leaves, stems and fruits. It is usually first observed on the young leaves of the terminals. Affected leaves show distinct brown and blackened areas scattered between the larger veins. These are angular, or somewhat diamond shaped, and are usually so numerous and close together that a distinct pattern is seen when affected leaves are held up to the light. An examination with a hand lens reveals the fact that the discoloration is not confined to the mesophyll of the leaf, but extends to the secondary veins, and in some cases to the primary veins so that a browning and blackening of the vascular bundles is clearly evident.

Affected leaves do not develop normally. They at first appear somewhat stunted, and as the disease progresses, droop and finally wither up and die. In most cases observed the disease appeared to start on the upper young leaves and gradually work downwards on to the older leaves.

On the stems of the affected plants brown lesions are usually seen. These vary in size from mere specks to well marked areas from one to three c.m. long and about half as wide. They are not confined to any particular part of the stem, but are scattered throughout its length, being found just below the base of the petioles of affected leaves, at the base of healthy leaves, and frequently on the internodes some distance from the leaves. If cross sections of affected stems are examined under the hand lens the lesions are found to be almost superficial, the discoloration being confined to the epidermal cells and to the outermost cells of the cortex. Many of these lesions were examined carefully by the writers, but in no case did the discolorations appear to extend into the vascular bundles, the lesions always appearing isolated and local. Prof. Jones of the Bacteriological Department, however, reports that in examining some badly diseased plants, he found that the discoloration of the lesions appeared to extend into the vascular bundles.

Diseased fruits are characterized by brown sunken spots scattered irregularly over the surface and not confined to stem or blossom end. These vary very much in shape and size. They may be circular, oblong, angular or irregular in outline, and may be from less than a millimetre to eight or ten m.m. in diameter. The surface of the spots may be smooth and unbroken, or cracked and scabby. Frequently the spots coalesce so that considerable of the surface of the fruit is brown and scabby. Often these diseased areas are chiefly confined to the grooves between the ridges on the surface of the fruit. Some of the spots are merely superficial, the discoloration not extending to any extent into the flesh of the fruit, while from others the discoloration extends deeply into the fruit and can be traced from the epidermis along the septa to the centre. If diseased fruits mature the affected areas fail to color normally and remain hard and green. Very frequently the diseased fruit falls with coloring. When the spots or lesions are well developed the fruit is frequently more or less deformed and is spotted and scabby to such an extent as to render it useless for market purposes. When diseased fruits were removed from the plants and placed in a moist chamber, the spots failed to develop further.

Attempts to Discover the Causal Organism. When the diseased plants were received a superficial examination disclosed the blackening and browning of the vascular bundles of the leaves. This symptom suggested that the trouble might be Brown Rot of Tomatoes caused by *Bacillus solonacearum* (Erwin Smith). Microscopic examinations were made but no fungus or bacteria were found associated with the lesions on leaves, stems or fruits. Plates were poured but nothing was found, neither fungi nor bacteria, to which the disease could be attributed. Fearing that in some way our technique might be at fault specimens of diseased tomato plants were submitted for examination to Dr. Erwin Smith, Bureau of Plant Industry, Washington, D.C.; Prof. A. D. Selby, The Agricultural Experiment Station, Wooster, Ohio; Dr. E. A. Bessey, Michigan Agricultural College, and Prof. D. Jones of our own Bacteriological Department. All of these gentlemen kindly examined the material supplied and reported the results of their findings. None of them found any organism capable of producing the disease.

Experimental Work with the Disease. Experiments were carried on to determine if the origin of the disease was in the soil; if the disease might be caused by fumigating with hydrocyanic acid gas; if the disease could be transmitted from plant to plant by inoculation. Space and time will not permit of giving a full account of these experiments in this report. The following, however, is a brief summary of the results of our investigations concerning this disease:

1. This disease is widespread and capable of causing serious loss.

2. Little is known as to the cause of the disease.

3. Repeated microscopic examinations and plate tests with various media have failed to disclose a causal organism.

4. Inoculation experiments have given negative results.

5. The position and nature of the lesions and the fact that the disease fails to develop further in affected fruits when these are removed from the plants and placed in a moist chamber indicates that this is a so-called physiological trouble.

6. Experiments with hydrocyanic acid gas indicate that fumigation does not cause the disease.

7. Experiments in soil sterilized seems to indicate that the origin of the disease is in some way connected with the soil; but as no causal organism has been found it would seem that the disease might be due to some chemical or physical deficiency in the soil, which is apparently overcome by sterilization.

8. It is very important from the standpoint of the grower of winter tomatoes that further investigations be carried on to discover the cause and means of control of this most serious disease.

INSECTS OF THE SEASON.

Our Professor of Entomology reports as follows:

"As we anticipated, there was no renewal of the outbreak of Army Worms, which was so widespread and did so much damage to crops last year. Various factors combined to bring about this immunity. Besides the artificial measures adopted for checking the onward march of the caterpillars and destroying the hosts of marauders, other natural means of control were in operation. Multitudes were devoured by birds, toads, predaceous beetles and other animals; many more by parasitic insects both Dipterous and Hymenopterous, whose grubs fed inside the worms and caused their death before reaching maturity; thousands more died of starvation in the ravaged fields where their predecessors had devoured all the available vegetable food. The small percentage of moths that emerged in late summer would fly back to the natural breeding places of the insects along the margins of streams and in low-lying moist meadows. We are not likely to have another invasion similar to this remarkable outbreak for another dozen or score of years.

Though free from Army Worms, farmers and gardeners have been troubled this year with kindred species of Cutworms. Complaints were sent to me from twenty-three different places in this Province, describing the injury done to field crops, especially oats, which in many instances were completely destroyed. For most Cutworms the poisoned bran mash is an entirely satisfactory remedy, but this year the prevalent species was the Glassy Cutworm (*Hadena devastatrix*) which works beneath the surface of the soil and is not, therefore, attracted by the poisoned bait. In some cases it was practicable to bring the mash within reach of the worms by harrowing; but in others, where the crop was virtually destroyed, it seemed best to plow it up and sow buckwheat or corn in the expectation that the worms would have completed their growth and changed to the chrysalis stage before the new crop could be damaged.

Aphids were particularly bad this year on trees and plants of all kinds. The cold, wet season appeared to favor their multiplication and at the same time to be unfavorable to the parasitic and predaceous enemies.

Tent Caterpillars, both Forest and Orchard, were again abundant in many places. A very little trouble taken in early spring to destroy the tents and colonies would soon put an end to the pest.

It is of interest to note that the imported asparagus beetles which came to us about ten years ago, have now reached Owen Sound and are to be found all over the greater part of the Province.

Frog-hoppers or Spittle insects have been the subject of complaint in several quarters owing to their abundance in pasture fields. Moving the infested grass and weeds, which would dry up their supply of moisture, is a very simple and effective remedy.

Slugs and Myriapods, which do not belong to the insect class, have been very destructive in many gardens. The wet season was especially favorable to the former creatures, which thrive in damp, shady places. The abundance of the "Thousand-legged worms" and their attacks upon growing vegetables is not easy to be accounted for, as their usual food is rotten wood and other decaying vegetable matter.

Investigation Work.

The investigation work of the year was as follows:

1. Pear Blight. We continued our field study of this disease and its control, this being the third year devoted to the subject. The work was under the charge of Mr. A. H. Cowan, who showed himself a very reliable and able man for the purpose. Approximately twenty acres of pear trees of various sizes and varieties were under his inspection throughout the season. The Blight in these was kept under thorough control. Considerable new knowledge of the way in which the disease is spread has been gained, and the methods of detection and control im-

proved. In order to lessen the expense of the investigation and to increase the interest of the fruitgrower in the work, we charged each man whose orchard we looked after the sum of $1.75 per day for work actually done. No charge, however, was made for any work that was strictly experimental in character and the results of which were uncertain.

In order to have a proper opportunity to test out our method of control under all sorts of weather conditions, we intend to continue this work for another year or possibly for two years and then publish our results.

2. Peach Yellows and Little Peach. A number of experiments that somewhat to our surprise had given us negative results were repeated under different conditions this year. Further observations have been made on the results, as they appeared this year, of the experiments performed three years ago. As soon as these experiments are complete, we shall have a good deal of data on how these diseases are distributed and the length of time that elapses from inoculation until the symptoms of the disease can be detected on the foliage or fruit.

The inspection work of the year shows that there still continues to be a decrease in the number of diseased trees in all townships that have been thoroughly inspected for the last four years or even the last three years, but that in three townships, in two of which the inspectors had not done satisfactory work, there were more trees marked this year than last. Had it not been for these three townships there would have been a decided decrease in the total of the trees removed this year compared with last.

3. Spraying for San José Scale. (*a*) In consequence of a number of complaints about the difficulty of controlling San José Scale with either lime-sulphur or soluble sulphur, we selected an old, badly infested orchard near Grimsby of about 100 apple trees, chiefly Greenings, Spys and Baldwins, for demonstration purposes. Our outfit was an old Spramotor barrel pump in good working condition and with the proper equipment of hose, angle nozzles and spray rods. About four-fifths of the trees had been scraped and nearly all had been pruned. The mixtures used were lime-sulphur, 1.035 sp. gr.; soluble sulphur, strength 12½ lbs. to 40 gals. of water; Scalecide, strength 1 gal. diluted to 16 with water, and crude oil from Belle River emulsified with soap. About half the orchard was sprayed with lime-sulphur, about half of the remainder with soluble sulphur, and the rest of the trees, except eight, with Scalecide, the emulsified oil being used on these eight. Only one thorough spraying was given to each tree, and this was applied shortly before or as the leaf buds were bursting. The results exceeded our hopes. Lime-sulphur, soluble sulphur and Scalecide each gave about equally good results, the trees sprayed with these being so free from scale that when examined the last week in September, not more than one tree in five showed even a single living scale, and on no tree did we find more than three or four apples with scale on them. The emulsified crude oil also gave fair results, but not so good as the others. It was, however, slow to make and hard to use. The Scalecide, though giving as good results as lime-sulphur or soluble-sulphur, was twice as costly.

Our demonstration has, therefore, once more proved that the old mixtures are efficient and that when a fruit grower fails to control scale, one of the chief reasons for doing so is that the spraying has not been thoroughly done. Very few men seem to know what thoroughness means.

4. Spraying for Codling Moth and Apple Scab. The above mentioned orchard was given the regular two later sprayings, chiefly with the object of controlling Apple Scab and Codling Moth. Lime-sulphur, strength 1.010, and 2½

lbs. of arsenate of lead were used on most of the trees, and soluble-sulphur, 1 lb. to 40 gals. of water with 2½ lbs. of arsenate of lead, was used on the remainder. Both mixtures gave good results, but the latter burned a little, though not enough to amount to anything. The Scab was completely controlled, not a dozen scabby apples being found in the whole orchard. The Codling Moth was better controlled than we had expected, because the crop was light, and in such years it is very difficult to secure a high percentage of clean apples if the orchard has been previously neglected. However, not more than an average of 10 per cent. were wormy. The fact that in this district there was a smaller percentage of second brood than usual helped to this result.

Dry arsenate of lead was used instead of the paste form on a few rows of trees and proved as satisfactory as the latter.

5. Leaf-rollers (*Tortrix argyrosphila, T. semiferana, and T. rosaceana.* Last year we discovered that the Fruit-tree Leaf-roller which has been doing so much harm to apple trees in various parts of the United States has begun to attack at least two orchards in Ontario in great numbers. As the control of this pest was known to be difficult, it was deemed wise to begin a study of its habits and of the means of control this year so as to be able to advise fruit-growers how to deal with it should it continue to increase and become a serious menace. Consequently, a careful study of this Leaf-roller, and also of two other species that were found along with it, was made in Mr. Jas. E. Johnson's well-known apple orchard at Simcoe. The results of our work are being published in the annual report of the Entomological Society of Ontario, and short accounts will also appear in the various magazines likely to be read by fruitgrowers. We are glad that the work was undertaken because we now feel able to advise intelligent methods of control.

6. Apple Capsids. For several years we have been anxious to do further work on the life-history and means of control of these sucking insects that deform apples. The fact that the most common one of them all (*Neurocolpus nubilus*) was present in the same orchard at Simcoe in which we were studying the Leaf-rollers enabled us to give sufficient attention to it to work out its life-history and a fairly satisfactory means of control. These results are also being published in the annual report of the Entomological Society of Ontario.

7. Apple Maggot or Railroad Worm (*Rhagoletis pomonella*). We have had the life-history of this insect practically worked out for some time, but owing to the difficulty in finding satisfactory orchards in which to test what we feel fairly sure is a simple method of control, we have not been able to publish any full account of the pest. This year two orchards were sprayed with sweetened arsenicals for it in Norfolk County, and, while the results seem to confirm our previous conclusions, yet, owing to the wet weather and certain difficulties in the way of getting proper checks, we feel obliged to continue further experiments on control measures. Two orchards for the purpose have just recently been located and we hope to test the matter in such a thorough way next year as to settle this matter definitely.

8. Imported Poplar and Willow Borer or Curculio (*Cryptorhynchus lapathi*). Early in August a request was sent in to investigate the work of an insect that was destroying the willows and poplars on Toronto Island. The matter was looked into and it was found that the offender was the Imported Willow and Poplar Borer or Curculio. In order to be able to give the proper recommendations for control, it was found necessary to try from all available data and from our

own observations to work out the life-history of the insect in Ontario. This has been fairly well done and the Commissioner of Parks, Toronto, has been supplied with a full account of the insect, and also with recommendations as to the best methods of preventing further serious injury on the Island. An account of our investigation of this insect will also be found in the annual report of the Entomological Society of Ontario.

9. Peach-Tree-borer (*Sanninoidea exitiosa*). A good start has been made on the study of the life-history of this important pest, and several methods of control have been tested, none of which was entirely satisfactory. Sufficient knowledge, however, has been gained to enable us to make more rapid progress another season.

BEES.

Work with bees has gone on at the College and developed until now bee-keepers all over the Province look to us for inspiration and assistance.

Beeswax.

During the year, experimental work in this department has consisted largely of testing appliances in use by commercial bee-keepers. I might mention first the rendering of beeswax from old combs. Large quantities of beeswax are wasted annually for want of proper facilities for rendering it from old combs and scraps. The waste of wax in refuse from improper methods of rendering may be illustrated by the following account of a typical case:

We took one hundred and forty-six pounds of refuse from an ordinary press in the hands of a careful bee-keeper, put it through a Hershiser wax press and got twenty pounds of fairly good beeswax. The bee-keeper in question stated that at the rate he had been burning in his kitchen stove the price of a good wax press almost every year.

I might state that this wax press is a free contribution to our equipment from the manufacturers. The principle of its operation is that after the combs are thoroughly melted in boiling water, they are enclosed in cheese-cloth and placed in a press very similar to a cider press, except that it is so arranged that the cheeses are pressed under water and the water is kept at a boiling temperature by having heat applied directly to it by steam or by the flame of a stove underneath. After once pressing down, the pressure is slackened and the contents boiled to loosen up and force out more wax when the pressure is again applied. This is undoubtedly the best principle yet applied to the extraction of wax from old combs.

Appliances for Extracting Honey.

Extensive tests have been made on appliances for taking extracted honey. Various kinds of bee-escapes have been tested for removing bees from the combs before they are to be taken from the hives. If there is no brood in the super, the Porter bee-escape will practically clear the supers of bees in two or three hours. This avoids angering the bees as by the old plan of smoking, shaking and brushing the combs. It is also a saving of time and labor. This bee-escape is by no means new, but I find that bee-keepers require further "showing" and urging to appreciate it. I am making a feature of investigating devices and methods little known, and publishing when they show merit. Apiary efficiency has received far too little attention in the past.

Two different kinds of honey-extractors run by power have been tested and reported on.

Methods of taking honey from the extractor and delivering it to the storage containers have demanded a great deal of study. To the small bee-keeper who counts his crops by hundreds of pounds, this does not present a very large problem, but for the bee-keeper whose crop may be anywhere from 10,000 to 50,000 lbs., and the operation of extracting has to be done in a very short time, the problem is a difficult one, but by the most approved machinery it is possible for one person working alone to uncap, extract, and deliver into the store-tank easily two hundred pounds per hour. The 8-frame automatic extractor is operated by a gasoline engine. The honey is taken from the extractor by a rotary pump also operated by the engine, and delivered through rubber hose or galvanized metal piping into the store-tank.

Fresh from the machine the honey contains small particles of beeswax broken from the combs and also small air bubbles, and the clarifying presents a problem. For the small operator the cheese-cloth strainer answers the purpose, but this will not handle honey at the rate mentioned. Fortunately, however, all foreign matter which is likely to get into the honey is much lighter and will rise to the surface by gravity if honey is allowed to stand for a few days in the storage can. This has been found to be a satisfactory method, and the refuse is skimmed off the surface before the honey is filled into the selling packages.

Honey Knives.

Various kinds of knives for uncapping have been tested, and I am now recommending a knife with straight handle and long straight blade, long enough to reach across the comb so that one side of the comb can be uncapped with one steady stroke of the knife. It seems strange that this point should require mentioning, but I have had quite a struggle with manufacturers to get them to see the importance of making a knife of this kind. They are finally coming to the idea, however, and are adding several inches to the length of the knives they are marketing.

Cap Melting Devices.

The separation of the honey from the wax in the cappings shaved from combs for extracting has presented another problem to which a great deal of thought has been devoted by different investigators. I have tested a number of different devices. The problem is that at the melting point of wax, honey is very likely to be injured by over-heating or at least to absorb some of the wax flavor. Large quantities of honey are annually reduced in value or made unsaleable by improper methods of rendering cappings. I have tested a number of different devices and went so far as to have one made according to my own plans, but finally discovered the Peterson Capping Melter to be quite satisfactory. This is now on the market, and after a season of very thorough testing I am recommending it to bee-keepers with advice as to the method of using it.

You may wonder how I have been able to test these various appliances of large capacity with the very small honey crop which the College Apiary has produced. I think I explained in a previous letter that the immediate vicinity of Guelph is already over-stocked with bees, and our small College Apiary has been used for demonstration purposes to a considerable extent, so that the returns in honey have been very small. I have, therefore, taken these appliances to large commercial apiaries, and either tested them personally or had them tested by careful, practical bee-keepers.

Strains and Breeds and Their Ability to Resist Disease.

During the winter a bulletin on "Natural Swarming and How to Prevent It," was prepared and issued in May as Bulletin No. 233. This embodies results of co-operative experiments on this important phase of bee-keeping and has been much in demand amongst bee-keepers. The bulletin on "Bee Diseases in Ontario," No. 213, was revised and considerably enlarged. There was also issued a report on "Some Results of Co-operative Experiments on Races of Bees to Determine Their Power to Resist European Foul Brood." These experiments had been conducted co-operatively by bee-keepers in the European Foul Brood districts since the year 1910, and results indicated that several strains of Italian bees which had been under test, had proved to be quite good resisters of this disease. Resistance is more a matter of vigor than of race or strain. Results of tests show, however, that common black bees are exceedingly poor resisters and that Carniolans are not generally as good as Italians.

Apiary Inspection.

The inspection of apiaries was carried on as usual, after the preliminary conference of apiary inspectors held early in May. While marked progress is being made in the control of American Foul Brood, European Foul Brood is still spreading. It will be seen that the policy of making this primarily an educational campaign is being pursued, by the fact that 60 apiary demonstrations were held during the season with a total attendance of 1,910, an average of 32. In view of the rainy season, and the highly specialized nature of the subject this attendance is very encouraging. It is the first year in four that the average attendance has not shown an increase. The value of this work, great as it is, might be increased by establishing demonstration apiaries, particularly in districts infected by disease, where discouraged bee-keepers might be shown how bees can be profitably kept in spite of obstacles.

Spring Reports.

Nine hundred and ninety-three bee-keepers reported 37,317 colonies in the fall, and 31,310 colonies in the spring, an average of 31.5 colonies each, spring count, and showing a winter loss of 16.1 per cent. It was found by later reports, however, that in many parts of Ontario from 50 per cent. to 75 per cent. of the bees had died. This heavy loss was largely due to the unfavorable breeding season of 1914, causing many colonies to go into winter quarters with large numbers of old bees, also to the poor quality of the stores causing granulation and dysentery or starvation. In districts where much sugar syrup was fed in the fall, the loss was comparatively small. It seems that either the wintering problem has not been entirely solved even by the specialist, or he is not putting all his knowledge into practice.

AGRICULTURAL CHEMISTRY.

Many lines of work have been taken up in this Department and over 500 samples of different materials have been analyzed from outside sources, and reported upon. They include soils, fertilizers, cattle foods, human foods, insecticides, fungicides, impure water, and so forth.

Sprouted Wheat.

The warm wet weather at the time of wheat harvest caused a great deal of the grain to sprout, thus affecting its milling value. We spent a good deal of time on the study of the influence of germination of the wheat on the quality of the bread it will produce. The conclusion arrived at was that when not more than 10 per cent. of kernels had germinated the flour was as good as that from normal wheats. When 50 per cent. or more of the wheat had sprouted and the sprouts were long, the wheat was not fit for milling purposes. Our work formed the basis for the grading of the sprouted Ontario wheats, and it is interesting to note that 10 per cent. of sprouted kernels was allowed in the highest grade of Ontario winter wheat.

The western spring wheats have been very thoroughly studied this fall. As compared with that of last year the flour is weaker, but is better in color and the bread has a nicer texture.

Soil Survey.

We commenced actual charting in our preliminary soil survey in June and continued the work throughout the whole season. The survey in the following counties has been completed and mapping done in preparation for reporting when the preliminary survey of the Province is completed; York, Peel, Halton, Wentworth, Lincoln, Welland, Haldimand, Norfolk, Elgin, Middlesex, Oxford, and parts of Lambton, Kent, Brant and Wellington.

We have conducted two demonstration plots on definite types of soil. One at Walsh, Norfolk County, on light sand and one on the farm in connection with this College on clay loam. As is natural in the first year with fertilizer experiments, the results are confusing, but at Walsh with potatoes on the sandy soil, on land that had been all manured and limed, we raised the yield on fertilized plots more than six-fold over the check plots and got a yield of more than four hundred bushels per acre of Early Eureka potatoes.

On the plot at the College we had mangels this year, the average yield of check plots was about 25 tons per acre, the best yield of a fertilized plot was over 35 tons per acre.

We have also laid out and applied the materials for quite an extensive experiment with different forms of lime materials on the acid peaty soils of the Leamington marsh, and in the heavy clay soils of Welland County.

The various types of soils found in Haldimand were sampled this fall and we hope to get some analytical work done on them this winter.

Two new sources of potash are being studied in our fertilizing experiments. (1) Seaweed prepared experimentally at Clarke's Harbor, N.S., by Dominion Government under the direction of Dr. F. T. Shutt, Chemist of the Dominion Farm. (2) Felspar which has been fused along with a mixture of limestone and iron oxide cooled and finely ground. This treatment was invented by C. W. Drury, of

Queen's University, and is covered by patents in Canada and United States. According to our analysis the material contains about eight per cent. of potash, over ninety per cent. of which is soluble in a one per cent. citric acid solution. We included these materials in our field tests with fertilizers and also carried out several series of tests in pots. No conclusive results have been arrived at as yet.

ANIMAL HUSBANDRY.

The Dairy Herd.

A careful record is maintained of the feed consumed by each cow, and of her milk and butter production. We are entering all our pure bred cows in the Record of Performance as they freshen, and, to avoid confusion, we are dating all records from the time the cow was entered in the R.O.P. As a result of this change in method, our records for this year are not complete, very few of the cows having completed their period of lactation since they were entered in the R.O.P. We have a few grade cows which, of course, cannot be entered in the R.O.P., but, in reporting their records, we are following the same method as in the case of the pure breds.

The following is a record of our dairy herd to October 31st, 1915. To make it more clearly understood, there is a column showing the amount of milk per day each cow was giving on October 31st.

Name of Cow.	Breed.	Date of Calving.	Age at Calving.	Days in milk to Oct. 1st.	Milking on Oct. 1st.	Lbs. milk to Oct. 31.	Lbs. fat to Oct. 31.
Blackie	Grade	Dec. 28, 1914	13 years	307	38 lbs.	14,890.3	567.28
Springwood	"	Mar. 8, 1915	5 "	236	48 "	14,143.2	575.67
Molly Rue 3rd	Holstein	Jan. 23 "	6 "	280	37 "	13,266.9	507.19
Margaret Cornucopia	"	Jan. 8 "	9 "	295	34 "	12,941.2	475.41
Toitilla Rue 2nd	"	Mar. 29 "	4 "	215	44 "	10,988.4	378.05
Mercena Netherland 3rd	"	Dec. 10 "	3 "	325	18 "	10,938.0	395.56
Beauty of O.A.C.	"	Feb. 12 "	9 "	260	30 "	10,847.5	338.23
Iford Waterloo Baroness	Shorthorn	Jan. 1 "	6 "	304	10 "	10,180.4	383.18
Mercena Netherland	Holstein	April 16 "	5 "	193	43 "	10,093.7	328.24
Golden Rose	Shorthorn	Mar. 25 "	7 "	219	37 "	9,677.9	441.10
Beauty of O.A.C., 3rd	Holstein	May 23 "	5 "	161	52 "	9,390.1	305.60
Mercena Rue Rattler	"	Feb. 10 "	2 "	262	22 "	8,188.3	330.50
College Toitilla Rattler	"	Dec. 10, 1914	1.11 mo.	325	14 "	7,486.8	248.03
O.A.C. Glennie	Ayrshire	April 1, 1915	5 years	213	22 "	7,032.9	284.21
Brampton Tapon	Jersey	Dec. 1, 1914	4 "	335	17 "	6,995.8	391.23
Flora Hope	Shorthorn	Feb. 4, 1915	2 "	268	17 "	6,435.5	262.14
Toitilla Rue	Holstein	July 4 "	5 "	119	50 "	6,054.4	190,95
Molly Rue 2nd	"	July 29 "	4 "	94	40 "	5,903.8	220.28
Toward Point Ann, 3rd	Ayrshire	Jan. 10 "	3 "	294	5 "	5,844.7	236.82
Bargower White Soncie	"	Feb. 26 "	3 "	246	10 "	5,628.7	229.72
Bud's Minnie 2nd	"	Mar. 6 "	2 "	238	17 "	5,573.0	241.94
Molly Rue Rattler	Holstein	July 15 "	2 "	108	52 "	5,435.7	202.34
Bud's Minnie	Ayrshire	Feb. 16 "	3 "	256	20 "	5,380.3	220.99
O.A.C. Dreamy	Jersey	Nov. 18, 1914	5 "	347	....	5,075.4	298.41
Floss Guarantee	Ayrshire	Dec. 31 "	2 "	305	10 "	4,810.0	180.80
Queenie's Merger	Jersey	Feb. 2, 1915	2.1 "	270	7 "	4,533.9	228.04
O.A.C. May Queen	Ayrshire	May 27 "	6 "	157	20 "	4,150.7	158.57
Lady Maud	Shorthorn	Aug. 14 "	7 "	78	51 "	3,550.2	148.60
Brampton Reverencia	Jersey	May 25 "	4 "	159	20 "	3,321.8	146.32
Barrington Duchess	Shorthorn	Jan. 22 "	3 "	282	....	3,114.4	110.58

Name of Cow.	Breed.	Date of Calving.	Age at Calving.	Days in milk to Oct. 1st.	Milking on Oct. 1st.	Lbs. milk to Oct. 31.	Lbs. fat to Oct. 31.
Welbeck Princess Darlington	Shorthorn	May 15, 1915	4 years	169	8 lbs	2,976.4	119.24
Aughton Barrington	"	May 1 "	2 "	155	15 "	2,447.5	103.98
Iford Fairy Duchess	"	Aug. 24 "	4 "	68	35 "	2,214.9	102.14
Puddington Solo	"	Aug. 16, 1913	4 "	76	30 "	2,029.8	76.62
Brampton Dulcie	Jersey	Oct. 15, 1915	4 "	14	36 "	464.5	22.76
		Cows finished record during year.					
Barbara	Grade		4 years	365		12,776.0	397.71
Torrs Daisy Bell 3rd	Ayrshire		2 "	365		12,103.	451.00
O.A.C. Minnie	"		4 "	365		10,306.9	407.38
O.A.C. White Rose	"		4 "	365		8,836.	338.88
O.A.C. Dreamy 2nd	Jersey		4 "	365		6,439.	324.37

Cost of Milk and Fat on Pasture and in Stable.

During the months of June, July, August and September, thirty-two cows were pastured, and fifteen cows were fed in the stable on rations identical with those used in the winter. The stabled cows were given exercise in a small lot adjoining the stables.

The conditions as to lactation were as follows:—

Pasture Group. Twenty-three cows averaged 116 days from date of calving to commencement of test; 6 cows, or 18.7% of group, calved during test.

Stable Group. Twelve cows averaged 111 days from date of calving to commencement of test; 3 cows, or 20% of group, calved during test.

Method of Determining Cost.

(1) *Pasture Group.* This group was charged $5 per acre for rent of land; also, it was charged with preparation of land for crop, cost of temporary fencing, proportion of cost of seed, and cost of all additional feed, but cost of attendance was omitted. The average charge amounted to $1.87 per cow per month.

(2) *Stable Group.* This group was charged with cost of feed alone. cost of attendance being omitted as in the pasture group.

The results were as follows:—

Groups.	Cost of 100 lbs. of milk.	Cost of 1 lb. fat.
Pasture	45.1c.	11c.
Stable	86c.	22c.

From the standpoint of feed alone, pasturing proved much more economical than stable feeding.

This test must not be confused with a comparison of soiling with pasturing, because soiling was not practised with the stable fed cows.

Steer Feeding.

Alfalfa vs. Straw.

During the winter of 1914-15, alfalfa hay was compared with oat straw for steer feeding, the groups being given the same meal ration. Silage was also fed in the proportion of four pounds of silage to one pound of hay or straw. The steers were on feed for 118 days.

Valuation of Feeds. Alfalfa hay was valued at $12 per ton, silage at $3.50 per ton, meal from a mixture of home-grown grains at $25 per ton, and straw at $6 per ton.

There is always room for argument when it comes to attaching values to feeds, but the values adopted here are probably fair for the quality of feed used.

Summary of Results. The steers in the alfalfa group made more rapid gains in weight than those in the straw group. The alfalfa group made an average daily gain of 1.82 lbs. per steer, and the straw group 1.54 lbs.

The gain is reckoned from the shrunk weight of the steers at the city scales on the day of delivery.

Though the alfalfa steers made more rapid gains than those getting straw, they consumed a great deal more feed, and when feeds are valued, as stated above, the gains made by the alfalfa group cost $11.51 per hundred, and the gains made by the straw group cost $11.37 per hundred.

Financially, therefore, the results were very similar, though the steers fed alfalfa showed a little better finish than those fed straw.

Cottonseed Meal with Straw.

The object of this test was to ascertain whether the addition of a high-protein feed, such as cottonseed meal, to the ration of steers receiving a low-protein, bulky ration, would prove beneficial.

One group, therefore, was fed oat straw, corn ensilage, and meal from mixed home-grown grains.

A second group was fed the same bulky feed, and the same kind of mixed meal with the addition of a small allowance of cottonseed meal, the cottonseed meal constituting twenty per cent. of the mixture.

The amount of meal per steer per day was the same in each group.

Summary: The steers in the group fed cottonseed meal made an average daily gain per steer of 1.58 lbs., while those in the other group made an average daily gain per steer of 1.54 lbs.

The cottonseed meal cost $30 per ton, and other feeds are valued as in the test previously described. On this basis of valuation, the steers receiving cottonseed meal cost $11.81 per 100 lbs. gain, and those in the other group cost $11.37 for 100 lbs. gain.

In this test, therefore, the feeding of cottonseed meal was not profitable, although the steers fed cottonseed meal made somewhat larger gains than the others..

Pig Feeding.

Two tests were made with young pigs to compare three kinds of packing-house by-products with skim milk.

The first test was made with pigs which had just been weaned, and in the second test the pigs were about three months old when the test commenced.

The packing-house by-products are very concentrated, and hence, when they were used, they constituted only about eleven per cent. of the meal ration.

Valuation of Feeds. Following are the values placed upon the feeds used, which are the actual retail values of the ones purchased:—

Swift's Digester Tankage	$2 50 per cwt.
Harab Digester Tankage	2 40 " "
Harab Beef Meal	4 00 " "
Skim-milk	20 " "
Barley (poor quality and unsalable)	1 10 " "
Wheat Middlings	1 30 " "

Very little barley was used in either test.

Summary: The following table shows results of test No. 1:—

Group.	Average weight at beginning of test.	Average weight at close of test.	Average daily gain per pig.	Cost per 100 lbs. gain.
	lbs.	lbs.	lbs.	$ c.
Group I— Swift's Tankage, meal and water	33.6	157.0	1.01	4 33
Group II— Harab Tankage, meal and water.	31.4	160.4	1.06	4 10
Group III— Harab beef meal, meal and water	32.8	146.4	0.93	4 48
Group IV— Meal and water	32.8	156.8	1.01	3 61
Group V— Skim milk and meal	32.4	165.8	1.09	5 00

It will be noted that all pigs made very satisfactory gains, and that the cost of feed per 100 lbs. was very reasonable indeed.

The pigs in the meal and water group did exceptionally well under the circumstances, which makes this group very much cheaper than the others.

The pigs on skim-milk made the best gains, but in this test skim-milk at 20c. per hundred was more expensive than the other feeds used.

Following is the result of test No. 2:—

Group.	Average weight at beginning of test.	Average weight at close of test.	Average daily gain per pig.	Cost per 100 lbs. gain.
	lbs.	lbs.	lbs.	$ c.
Group I— Swift's Tankage, meal and water	69.4	153.8	1.14	4 23
Group II— Harab Tankage, meal and water	71.4	159.4	1.19	4 07
Group III— Harab beef meal, meal and water	73.8	155.2	1.1	4 76
Group IV— Meal and water	70.4	159.2	1.2	3 34
Group V— Skim milk and meal	73.0	171.2	1.33	4 32

As in test No. 1, the meal and water pigs in this test have done surprisingly well.

The skim-milk pigs made the largest gains, but the cost is higher than in other groups, except the group on beef meal.

All groups made their gains on a very reasonable feed cost.

In both tests meal and water alone proved the most economical ration.

Pasturing Hogs.

A test was made to compare rape and clover pasture, also to compare pasture feeding with pen feeding.

All groups were fed the same kind of meal ration, and each received an equal allowance of skim-milk, though the pigs on pasture were fed less meal than those in pens.

Values attached to feeds are the same as in previous tests, and, in valuing pastures, rent of land, cost of preparation, seed, etc., are all taken into account.

Summary: The following table shows the results:—

Group.	Average weight at beginning of test.	Average weight at close of test.	Average daily gain per pig.	Cost of 100 lbs. grain.
	lbs.	lbs.	lbs.	$ c.
Group I.—Rape pasture	97.1	163.1	1.01	4 40
Group II.—Clover pasture	95.5	171.1	1.16	4 08
Group III.—In pens	96.3	173.5	1.19	4 26

It will be noted that the clover pigs made the cheapest gains, while those in pens made the most rapid gains and more economical gains than those on rape pasture.

The food cost per 100 lbs. gain is very reasonable in all cases.

To be pastured to advantage, hogs should not weigh much less than 100 lbs. when turned out.

POULTRY.

Finding a Substitute for Wheat in Feeding Poultry.

The prices of feeds have been higher than in previous years without a corresponding increase in the prices of poultry products. Such a condition involves a close study of the prices of individual feeds; also their relative nutritive value for poultry. The price obtained for wheat during the early winter months of 1915 was such as to prohibit the use of this grain for poultry. For a number of years we have been feeding practically the same rations to the laying hens, largely for the reasons that it was easily obtained; that it was composed of common feeds in all parts of the Province; and further, that the nature of the work in breeding poultry would be best maintained by a constant method of feeds and feeding through a series of years. It may be added that the ration and the method of feeding had been in a trial along with many other well-known rations and feeding methods at another Experiment Station and was found to be as good as any, if not the best.

The general ration and methods of feeding in use for many years had to use but three grains, *i.e.*, wheat, corn and rolled or crushed oats, the weights consumed by the fowls of each kind of grain being about equal. Green food and vegetable food were supplied in the form of roots, cabbage, clover hay and sprouted oats. The animal food was supplied by giving buttermilk as a drink.

It was highly desirable this year to feed much more corn and no wheat if possible, therefore it was with some fear that after December, 1914, the wheat was taken out of the ration. It would appear evident that the feeding of corn only in the litter might not give the required exercise, and moreover the birds would be apt to become over fat, and further, if we could by any means feed a large quantity of roots, which were cheap, even if it took more labor, it would cheapen the ration and might counteract the excess of corn in the general feeding.

The plan of feeding was changed to meet the new conditions in that a wet mash was fed daily consisting of one-third in bulk of cooked pulped roots, and these were dried to a crumbly state with equal parts of shorts and ground barley, the shorts and barley meal tending to counteract the general tendency of roots as a laxative when fed in large quantities. By using this ration we did not materially decrease the egg production nor the hatching power of the eggs; in fact eggs never hatched better; but this result may be, and is probably due to a breeding problem. When wheat is selling at one dollar per bushel and corn at eighty cents per bushel, the extra labor entailed in following the above plan of feeding would not warrant this method of feeding under ordinary conditions. The year has certainly suggested that local circumstances may mean a change in feeding methods, and that a knowledge of various foods, both as to their composition and physical action, will permit one to use many combinations of feeds.

Importance of Succulent Food for Poultry.

A study of the importance of succulent green foods for poultry is indicating that the average poultryman can well afford to put forth a special effort to supply such daily, and furthermore, that such require particular attention during the hot summer months if a normal egg production is expected.

Breeding Problems.

For a number of years special attention has been paid to breeding problems with poultry. Outside of the general routine of business and class-room work one might say that nearly all effort was put forth in trying to produce a family of hens that would produce more eggs and were also fair meat producers. Just at the present time there are many people interested in increased egg production, and many breeders have undertaken this line of breeding. It appears to the writer that as an essential factor to permanent success there are some characteristics other than increased egg production that must not be overlooked, such as the hatching power of eggs, the size of eggs, the living power of the chicks. The work done in this department would indicate that the consideration of such characters is of prime importance unless one expects failure; in fact we have been forced to consider them whether we wished or not, otherwise some prominent lines would have ceased to reproduce, and, moreover, some extra heavy laying families have been broken up in order to get away from a permanent production of small eggs. The more characters considered the slower the progress, and each year brings more information as to why certain results are obtained. This work is worth while if for no other purpose than information obtained for use in the class-room.

It is gratifying to be able to report a slow but gradual improvement in hatching power of the eggs and the general quality of the stock. The birds hatched during the season of 1915 give promise of being better egg producers than previous generations; that is to say, they are more uniform in their production; perhaps none better than the best in other years, but fewer poor ones. It is certainly hopeful when the percentage of culls decreases.

DAIRYING.

In the Dairy Department tests were made of Canadian rennet and Canadian color to see if these materials could be made at home, and so render Canadian dairymen independent of foreign imports of these materials.

Two brands of Canadian rennet were experimented with, one was found to be too weak and the other too expensive at the present time. Two lots of cheese coloring, Canadian manufacture, were also tried, one sample used, according to direction, entirely faded out in a short time, and the other would not mix satisfactorily with the milk, and the color entirely disappeared in the whey. Meantime, we shall have to depend, therefore, on foreign countries to continue to supply our color and our rennet.

The question of pasteurizing milk for cheesemaking has come up again because of the demand of the public for safe food products. For two years we found the results of our experiments were unsatisfactory in the quality of the cheese produced. In 1915 the quality improved very much, and scored quite as high as that from normal milk. Our Professor of Dairying reports that fairly good cheese can be made by pasteurizing the milk, but that there is considerable extra labor and it is doubtful if the extra yield of cheese would pay for this. If, however, pasteurization becomes advisable or compulsory, it can be done in either large or small quantities with proper equipment.

Experiments were also conducted to prove the effect of salt on curd and cheese. Two and a half pounds of salt per 100 lbs. curd gave the best result, that is, the cheese scored highest in quality.

Composite Cream Tests.

There has been a good deal of discussion among factorymen as to whether it would be best to test each delivery of cream as it came in or to put all the samples of one man's cream together for a time then analyze the composite sample.

Our results go to prove that the man who is buying or manufacturing cream will get satisfactory results from composite sampling and save very much labor and testing. The sample bottles, however, should not be shaken, should be kept tightly corked, and in a cool place.

DRAINAGE.

Under the direction of the Department of Physics, the field drainage work has been carried on as in former years.

In 1915, 291 applications were received, 263 surveys were made, covering 15,336 acres, or 1,917 miles, of drains. Plots were also laid out in three counties, and half the field was drained in each demonstration.

The wet season of 1915 was not favorable to such tests, especially on newly-drained fields.

However, an average of $4.48 per acre was obtained on the drained plots over the undrained.

Soil Properties.

Experiments were started to study the porosity, moisture and temperature of soils as related to cultivation, drainage, water table and weather conditions.

It will take more than one season to get reliable data on this work, and the tests will be continued next season.

Lightning Rods.

During the summer considerable attention was paid to the manner in which lightning rods are being installed, and it was found that many agents are selling iron-centred rods, which are very short-lived, and should be absolutely prohibited, because experience has shown that the iron rusts out in a very few years, leaving only a thin shell of copper, which is not heavy enough to carry a bolt of lightning without melting. And besides, in many cases those installing rods are violating the fundamental scientific principles underlying the efficiency of rods. I cannot urge too strongly that legislation should be enacted at the forthcoming session of the Legislature regulating the entire lightning rod business. Only in that way will it ever be possible to protect the farmers from the frauds that are now being practised on them.

MACDONALD INSTITUTE.

As will be seen in the summary of attendance, Macdonald Institute has held its own during the year. In fact we have for many years had a long waiting list of students who could not be admitted to our classes because they could not be accommodated. This has enabled us to pick our students, and I think it is generally admitted that all the girls attending Macdonald Institute receive valuable instruction along the line of Household Science. Along with this instruction in the Institute has grown up two important side lines—one is the assistance to Women's Institutes, and the other the establishment of Macdonald Institute Branches.

Women's Institute Work.

The work of helping Women's Institute members to prepare papers for speeches for their meetings by lending them material from our library and loan collection continues. Up to date this year we have had requests for information on:

Home	90
House and housekeeping	66
Food and cookery	86
Dietetics	8
Health	47
Household Finance	25
Home Economics Education	67
Social Service, Clubs, Community Work, etc.	159
Gardening, etc.	16
Patriotic	23
Miscellaneous	22
	609

and the requests were answered with—

2,130 folders containing pamphlets, articles or clippings.
50 books.
6 special letters.
32 letters regretting that material wanted was lacking or already out on loan.
23 were referred to other Departments or to Mr. Putnam for answer.

Macdonald Institute Branches.

Some time ago we became convinced that Macdonald Institute could do successful extension work by movable schools in rural districts where there are many girls who cannot leave home. We worked out a tentative plan which proposed:—

1. To assemble all the essential equipment of a cookery class-room, a sewing-room, and a laundry class-room for twenty-four students doing practical work; to pack it in knockdown and freightable form for easy transportation; and withal capable of such snug and convenient arrangement that a single ordinary-sized schoolroom would accommodate both equipment and class.
2. To provide a first-class and experienced teacher.
3. To offer to plant this equipment and teacher for three months in some village centre, and give the regular Macdonald Institute Short Course in Domestic Science to a single class.
4. To secure the class through the local Women's Institute which would be quick to appreciate the advantage of such a course to its community, and through its acquaintance with local people and conditions would lose no time over the necessary canvassing.

The plan won favorable consideration and permission to try it.

We laid the scheme before the Ayr Women's Institute, offering Ayr the first Branch if they would undertake to secure the class. They agreed to try, and canvassed energetically with the aid of the following circular, which went into the hands of every person likely to be interested or to help gather the class.

Introductory.

The Ontario Agricultural College cannot accomodate all who wish to come to Macdonald Institute for Home Economics training; and many desire Home Economics training who cannot be spared from home. We believe the College can extend the usefulness of Macdonald Institute by opening branches here and there. We are now prepared to begin this work, and offer your community the opportunity of securing a *Macdonald Institute Branch.*

The following pages give full information about the teaching, course of study, equipment, etc., and indicate the procedure necessary to establish the Branch.

We hope your community will seize the opportunity to become Macdonald Institute Branch No. 1.

Yours truly,

G. C. Creelman, B.S.A., LL.D.

INFORMATION.

1. *The Ontario Agriculture College is prepared:—*

To open Macdonald Institute Branch No. 1 in Ayr, Ontario, provided at least 20 students agree to take the course.

To provide the necessary class-rooms and equip them with stoves, tables, sewing machines, etc.

To provide and pay a satisfactory teacher, who will be a member of the regular Macdonald Institute staff.

To maintain the work of the school.

To give 24 students a Short Course in Domestic Science with a choice of two elective subjects—the same as the Short Course given in guelph. (For description see the College calendar for 1915-1916.)

To offer Millinery and Embroidery as the two elective subjects.

To open the course September 27th, and close it December 17th, 1915; and occupy the students' time 5 days weekly for 5½ hours each day; or, if preferred, to spread the course over 20 weeks, occupying the students' time 3 days weekly, opening about the same time and closing about the end of February.

To hold an examination at the end of the course for any who wish to try it. Those passing would be eligible to enter the second term of Homemaker course in Guelph.

2. *Description of the Short Course in Domestic Science offered.*

The Short Course in Domestic Science is planned for those who cannot spend more than one term at the Institute. It does not aim to cover the ground of the long courses, and provides training chiefly in practical work, but is thorough as far as it goes.

Candidates for this course must be at least 17 years of age, and have the usual elementary education.

Students already proficient in plain sewing, may present garments made by themselves, in proof of proficiency.

If credited with plain sewing they will be permitted to join a more advanced class.

Classes are so arranged that any student of the course who desires, may try examinations and if passed enter the second term of the Homemaker course given in Guelph.

Following are the subjects prescribed:—

Plain Cookery	10	periods weekly.
Plain Sewing	4	"
Laundry	3	"
Foods	1	"
Sanitation	1	"
Home Nursing	1	"
Care of the House	3	"
English	2	"
Elective	4	"

The Electives offered will be Millinery and Embroidery.

See the regular calendar for a description of the work of the different classes.

3. *Candidates for admission to the Short Course in Domestic Science.*

Will fill out the application form attached, and deliver it to Miss ———————— Ayr, not later than August 1st, 1915.

Will understand that filling out the application and sending it in, signifies their intention to pay the fee and take the course, unless personal illness or disaster prevents.

4. *Students of Macdonald Institute Branch No. 1 will be required:—*

To register on the opening day.

To pay the $15.00 tuition fee on the opening day.

To provide themselves with all necessary aprons, etc., for the practical work; and to wear a simple cotton dress for all practical classes.

To provide their own material for sewing classes. The garments made are their own property.

To be regular and punctual in attendance. A student missing time equal to that of three weeks' classes will be dropped, without refund of fees.

To submit to the regular Macdonald Institute regulations for students boarding at home.

5. *Ayr is expected to:—*
Spread information about the course offered.
Decide whether the course shall be given in twelve weeks or in twenty weeks.

NOTE:—
The Ayr Women's Institute has undertaken to sound the feeling of the community with regard to this proposed course. For further information apply to its President or Secretary.
A local friend of the Women's Institute offers to Ayr, a Scholarship of $75.00 value, entitling the holder to one term's board, lodging and tuition in Macdonald Institute. It will be awarded to the student passing the best examination for admission to the second term of the Macdonald Institute Homemaker course.

By the middle of August the class was assured, a good teacher found and equipment under way. The Ayr School Board placed a vacant schoolroom at our disposal. The floor was old, the plaster broken and the walls dirty, but a few dollars spent on repairs, whitewash, scrubbing and white sash curtains converted it into an attractive place. For a small sum we induced the local plumber to give us the temporary installation and use of a household water system, including a fifteen-barrel cistern, hot-water boiler and sink all properly connected up with stove, roof pipes and waste receptacle, and after it was in place we were in a position to preach its virtues. The tables are on trestles, the cupboards mostly packing boxes, but everything essential is there.

The class opened September 27th last with twenty-two students, seventeen of them farmers' daughters driving from the country one to six miles every school day until December 17th. The work goes smoothly, and the students feel they are receiving full value for their $15 fee.

We consider Macdonald Institute Branch No. 1 a success, and hope it will be followed by many others.

APPOINTMENTS OF MACDONALD INSTITUTE GRADUATES IN 1915.

TEACHERS.

	Class of	Appointed to
Miss J. Bradley	1915	School for the Deaf, Belleville, Ont.
Mrs. Burns	1911	Central Technical School, Toronto, Ont.
Miss Greta Crowe	1913	Collegiate Institute, Galt, Ont.
" E. Cummings	1914	Public School, Ottawa, Ont.
" E. G. Dickinson	1915	" " St. Johns, Newfoundland.
" G. Dobson	1910	" " Toronto,Ont.
" K. Dowler	1915	" " Winnipeg, Man.
" V. Gardner	1906	" " Niagara Falls, Ont.
" C. E. Green	1910	Normal School, Ottawa, Ont.
" E. M. Groff	1914	Public School, Brandon, Man.
" E. G. Graham	1915	" " Stratford, Ont.
" H. T. Job	1912	Ontario Agricultural College, Guelph.
" M. C. Kaye	1913	Normal School, North Bay, Ont.
" M. L. Kelso	1915	Public School, Brandon, Man.
" C. A. Kennedy	1915	" " Smith's Falls, Ont.
" E. H. McMurtry	1914	" " Kamsack, Sask.
" F. M. McNally	1914	Collegiate Institute, Brantford, Ont.
" G. Manning	1915	Havergal College, Toronto, Ont.
" A. E. Robertson	1904	Toronto University, Toronto, Ont.
" E. J. Rogers	1915	Consolidated School, Guelph, Ont.
" F. A. Twiss	1907	Dept. of Education, Regina, Sask.

Housekeepers and Dietitians.

	Class of	Appointed to
Miss M. I. Campbell	1914	Jackson Sanatarium, Dansville, N.Y.
" W. G. Clarke		Hospital, Lindsay, Ont.
" M. B. Daniel	1909	P. & S. Hospital, San Antonio, Texas.
" C. Doering	1913	McDonagh Boys' School, McDonagh, Md.
" P. Gray	1915	Industrial Farm, Thornhill, Ont.
" R. Lampkin	1911	Substitute Dietitian, Johns Hopkins Hospital, Baltimore, Md.
" L. McLellan	1913	Eitel Hospital, Minneapolis, Minn.
" M. Mactavish	1911	Homeopathic Hospital, Buffalo, N.Y.
" E. Master	1915	O. A. C., Guelph, Ont.
" R. Nesbitt	1914	Private house, London, Ont.
" M. Montgomery	1915	Beal Hall Boston. Mass.
Mrs. M. Oliver	1913	Hurley Hospital, Flint, Mich.
Miss K. C. Vaughan	1908	City Hospital, Brantford, Ont.
" M. Smith	1915	Ferry Hall, Lake Forest, Mich.

Women's Institute Work.

	Class of	Appointed to
Miss R. M. Black	1914	Mr. Putnam's Department.
" B. McDermand	1915	Mr. Putnam's Department.

List of Graduates from Home Economics Courses in 1915.

Graduates of the Two-year Normal Course in Domestic Science:

1. Miss C. Tena Black........Hawkestone, Ont.
2. " Jean C. Bradley........316 Brock St. N., Sarnia, Ont.
3. " Lila M. Cockburn........40 Park Ave., Guelph, Ont.
4. " Grace Conover........Brampton, Ont.
5. " Jessie Crews........R.R. No. 3, Trenton, Ont.
6. " Ethel G. Dickinson........Rennie's Mill Road, St. Johns, Nfld.
7. " Kathleen Dowler........66 St. James Place, Winnipeg, Man.
8. " Lena Grothier........Newboro, Ont.
9. " Ethel G. Hannah........78 Elliott Row, St. John, N.B.
10. " Mary L. Kelso........Brandon, Man.
11. " Bessie McDermand........Lakeview, Ont.
12. " Gladys Manning........156 Mavety St., Toronto, Ont.
13. " Renee D. Rocher........Koster, Transvaal, S.A.

Graduates of the One-year Normal Course in Household Science:

1. Miss Muriel Foote........Fonthill, Ont.
2. " Zella E. Hanham........Port Colborne, Ont.
3. " Olive B. Hayes........Parkhill, Ont.
4. " Lilla B. Isbister........Wingham, Ont.
5. " Hazel W. Jacques........81 Brunswck Ave., Toronto, Ont.
6. " Catharine A. Kennedy........269 Brock St., Sarnia, Ont.
7. " Jennie M. Kiteley........R.R. No. 1, Bradford, Ont.
8. " E. Jennie Rogers........Wardsville, Ont.
9. " Winifred Westcott........Sault Ste. Marie, Ont.
10. " Iva G. Everson........Oshawa, Ont.

Graduates of the Housekeeper Course:

1. Miss Winifred Downey........260 Dundas St., Belleville, Ont.
2. " Pearl M. Gray........Eden, Ont.
3. " Carrie H. Martin........Preston, Ont.
4. " Elizabeth Master........New Dundee, Ont.
5. " Mary Montgomery........Lanark, Ont.
6. " Lenora Panton........Milton West, Ont.
7. " May Smith........Petrolia, Ont.

Graduates of Associate Course:

1. Miss Margaret H. Davis........New Westminster, B.C.
2. " Miriam J. Dunbar........Guelph, Ont.
3. " Mary I. Campbell........Preston, Ont.
4. " Louise Creelman........O.A.C., Guelph, Ont.

Graduates of Homemaker Courses:

Class C.

1. Miss Olive Brubacher....................Berlin, Ont.
2. " Vera E. Burling....................Pickering, Ont.
3. " Cora Cleghorn....................Berlin, Ont.
4. " Marjorie C. McQueen....................Edmonton, Alta.

Class A.

1. Miss Isabel Cochran....................Toronto, Ont.
2. " Agnes E. Hallett....................Guelph, Ont.
3. " Margaret Hanna....................Sarnia, Ont.
4. " M. Naomi Horning....................Ancaster, Ont.
5. " Jean Kemp....................Owen Sound, Ont.
6. " Alice Lahey....................Brantford, Ont.
7. " Louise E. Laughlin....................Caledon, Ont.
8. " Isabel S. Murray....................Toronto, Ont.
9. " Emma E. Oldham....................Wallaceburg, Ont.
10. " Catharine W. Sparrow....................Toronto, Ont.
11. " Marjorie C. Widdifield....................Newmarket, Ont.
12. " Mary A. Williamson....................St. Mary's, Ont.

Class B.

1. Miss Dorothy Anderson....................167 Lowther Ave., Toronto, Ont.
2. " Ethel Featherston....................R.R. 2, Milton, Ont.
3. " Isabel Hearst....................80 Glen Road, Toronto, Ont.
4. " Edna N. Mayhew....................Huntsville, Ont.
5. " Leah V. McCarthy....................3 Elm Ave., Toronto, Ont.

Summary of Attendance in 1915.

A.—January to June, completing the College year of 1914-1915.	
1. *Normal Domestic Science* (Two-year):	
(*a*) Juniors	14
(*b*) Seniors	14
2. *Normal Household Science* (One-year)	10
3. *Associate:*	
(*a*) Juniors	8
(*b*) Seniors	7
4. *Housekeeper:*	
(*a*) Juniors	9
(*b*) Seniors	11
5. *Homemakers*—One-year Course	50
6. *Short Course in Domestic Science:*	
(*a*) Winter term students	24
(*b*) Spring term students	18
7. *Optional*	7
8. *Student-workers*	3
9. *Public School students*	66
B.—September to December, opening the College year of 1915-1916.	
1. *Normal Domestic Science:*	
(*a*) Juniors	12
(*b*) Seniors	14
2. *Associate:*	
(*a*) Juniors	15
(*b*) Seniors	7
3. *Housekeeper:*	
(*a*) Juniors	8
(*b*) Seniors	8
4. *Homemakers*—One-year Course	46
5. *Short Course in Domestic Science*	18
6. Branch Short Course in Domestic Science in Ayr	22
7. *Optional*	3
8. *Student-workers*	2
9. *Public School students*	41
C.—Students counted in both above lists.	
1. *In long courses*	41
2. *In Public School classes*	6

D.—Total number of students in 1914 414
Total number of students in 1915 390

NOTE.—The smaller total of 1915 is due to dropping one practice-teaching class from the public school, owing to the One-year Normal class being dropped.

GRADUATES OF THE SCIENCE OF AGRICULTURE, 1915.

Beatty, H. A., Walsh, Alta.
Bell, W. J., 65 Mont St., Guelph.
Bligh, R. D. L., Lakesville, Kings Co., N.S.
Burrows, L. F., 91 Cork St., Guelph, Ont.
Campbell, A. M., Berea, Durban, Natal.
Colquette, R. D., Cabri Station, Sask.
Cory, A., Prince Albert, Sask.
Crawford, H. G., Wilton Grove, Ont.
Creelman, J. M., O.A.C., Guelph.
Croskery, W. M., Kinburn, Ont.
Culverhouse, P. E., 116 Jameson Ave., Toronto.
Cumming, R. E., South Gower, Ont.
Donald, F. C., Mandamin, Ont.
Donaldson, R. W., Port Williams, Kings Co., N.S.
Dustan, Alan Gordon, Bridgetown, N.S.
Finn, R. A., Fletcher, Ont.
Foyston, B. E., Minesing, Ont.
Freeborne, S. G., Magnetawan, Ont.
Frejd, D., Box 108, Bruce Mines, Ont.
Gordon, E. G., Elora, Ont.
Gray, A. J., Cartagena, Spain.
Hales, J. P., Guelph, Ont.
Hall, E. R., St. Albert, Alta.
Hampson, E., Mount Forest, Ont.
Harris, A. G., Hope Gardens, Kingston, Jamaica.
Hart, E. W., Burford, Ont.
Hinman, R. B., Wicklow, Ont.
Hogarth, E. G., Exeter, Ont.
Holmes, H. M., Raymond, Alta.
Horobin, H. P., Cornwall-on-Hudson, N.Y., U.S.A.
Kedey, W. M., Box 27, Fitzroy Harbor, Ont.
Kerr, W., Bronson, Ont.
Laird, D. G., Gibson's Landing, Howe Sound, B.C.
Locke, W. A., Brinston, R.M.D., Ont.
Manton, G., Eglinton, Ont.
McQueen, M. J., Guelph, Ont.
Mucklow, Gordon, c/o W. Fernie, Box 308, Victoria, B.C.
Neff, E. F., General Delivery, Hamilton, Ont.
Neilson, J. A., Port Dover, Ont.
Nourse, C. B., Strathmore, Edenburg Co., O. R. Colony.
Paterson, F. C., Ellesmere, Ont.
Pawley, N. H., Mayfield, Ont.
Peren, G. S., Kelowna, B.C.
Ponton, J. N., Bromptonville, Que.
Robb, O., R.R. No. 2, Branchton, Ont.
Sackville, J. P., Bewdley, Ont.
Sands, D. Richard, Corunna, Ont.
Shipton, J. C., Annapolis Royal, N.S.
Smith, D. M., 35 McPherson Ave., Toronto, Ont.
Stratford, R. K., Brantford, Ont.
Tawse, W. J., 246 Suffolk St., Guelph, Ont.
White, W. R., R.R. 1, Myrtle Station, Ont.
Winslow, J. H., Chelsea Green, via London, Ont.

RECIPIENTS OF ASSOCIATE DIPLOMAS, 1915.

Agar, J. C., 520 Fraser Ave., Edmonton, Alta.
Agar, E. Z., 531 16th St., Edmonton, Alta.
Anderson, N. S., Forest, Ont.
Bagsley, H. E., 9 Southview Ave., Toronto, Ont.
Bell, W. J., 65 Mont St., Guelph, Ont.
Bissett, William, Goderich, Ont.
Bonham, R. L., R.R. No. 1, Copetown, Ont.
Boulton, Ormond E., White Cove, Queen's Co., N.B.
Bradley, C. A., Carsonby, Ont.
Brownlee, Frank L., North Gower, Ont.
Brubacher, Ralph, St. Jacob's, Ont.
Campbell, H. M., Walkerton, Ont.
Clark, George A., Poole, Ont.
Clarry, Angus G., Locust Hill, Ont.
Cowan, Aubrey H., Napanee, Ont.
Cox, Cecil, 721 Prospect Ave., Buffalo, N.Y.
Cudmore, Harold J., Bronte, Ont.
Davey, A., Grimsby, Ont.
Davis, H. L., 814 Fifth Ave., New Westminster, B.C.
Delahay, J. S., R.R. No. 2, Pembroke, Ont.
Elder, R. C., Canfield, Ont.
Evans, O. C., Box 477, Chilliwack, B.C.
Evans, P. A., Chilliwack, B.C.
Fallis, R. H., Jarvis, Ont.
Fleming, Robert R., Oton, Ont.
Fuller, J. C., Stratford, Ont.
Fulton, Andrew, Lumby, B.C.
Gautby, C., Simcoe, Ont.
Gautby, L. B., Simcoe, Ont.
Graham, C. N., Bexley, Ont.
Gregory, P. S., R.R. No. 3, St. Catharines, Ont.
Hammond, H. L., Port Dover, Ont.
Hanlan, L. H., Oxford Mills, Ont.
Hempson, J. A., Great Glacton Hall, Essex, England.
Hoey, O., Campbellford, Ont.
Hill, W. G., 18 Farnham Ave., Toronto, Ont.

RECIPIENTS OF ASSOCIATE DIPLOMAS, 1915.—*Continued.*

Hill, W. H., 9 Langham St., London W., England.
Hockey, J. F. D., 59 Culp St., Niagara Falls, Ont.
Hunter, V. R., Cavan, Ont.
Keillor, S. E., Wallacetown, Ont.
Keirstead, R. M., 76 Lowther Ave., Toronto, Ont.
Kelly, C. D., 435 14th Ave. W., Vancouver, B.C.
Kernighan, John S., R.R. 4, Goderich, Ont.
Knox, R. G., R.R. 2, Indian River, Ont.
Lane, A. C., 130 Cambridge St., Guelph, Ont.
Lawrence, J. M., Mandamin, Ont.
Luckham, C. F., R.R. 4, Forest, Ont.
Macdonald, J. A., Guelph, Ont.
Marritt, W. G., Keswick, Ont.
Martin, I. B., Bobcaygeon, Ont.
Mason, H. C., 120 Hawthorne Ave., Toronto, Ont.
Meek, C. M., Newmarket, Ont.
Merkley, F. K., Williamsburg, Ont.
Murdock, F. G., "Aldie," Guelph, Ont.
McConnell, A. D., R.R. 2, Grand Valley, Ont.
McKillican, L., St. Elmo, Ont.
McLoughry, E. I., R.R. 4, Markdale, Ont.
McMullin, W. B., Blytheswood, Ont.
McPhail, M. Clifford, R.R. 4, Galt, Ont.
Neale, J. C., Lambeth, Ont.
Nixon, C. M., Box 577, Sault Ste. Marie, Ont.
Oswald, Donald, Vankleek Hill, Ont.
Parker, W. G., Cass Bridge, Ont.
Parsons, John W., Jarvis, Ont.
Percival, S. E., R.R. 4, Kemptville, Ont.
Riach, H. R., Wheatley, Ont.
Roger, J. C., 169 Florence St., Ottawa, Ont.
Rowley, E. G., Aldershot, Ont.
Saxton, C. W., R.R. 1, Grovesend, Ont.
Selwyn, H. H., 545 Gilmour St., Ottawa, Ont.
Shearer, T. E., Bright, Ont.
Simmons, A. F., Courtland, Ont.
Skinner, G., St. Mary's, Ont.
Slack, P. B., Claremont, Ont.
Springstead, A. E., 32 Reginald St., Hamilton, Ont.
Steckley, H. B., Bethesda, Ont.
Stokes, Clifford, Berlin, Ont.
Timms, J. N., Windsor, Ont.
Ure, R. D., R.R. 3, Maidstone, Ont.
Waterman, J. M., Fraserville, Ont.
Waters, M. S., Kenilworth, Ont.
Watt, R. S., Langton, Ont.
Western, E. A., Windermere, Ont.
Williams, G. A., Guelph, Ont.
Wilson, J. R., 35 Scarboro Rd., Toronto, Ont.
Wood, W. E., R.R. 4, Mitchell, Ont.

PROFESSIONAL DAIRY SCHOOL CERTIFICATES ISSUED DURING 1914.

Cameron, Alex., Lock Katrine, N.S.	Buttermaking
Junker, H., Tavistock, Ont.	Buttermaking
McLean, John, Jarvis, Ont.	Buttermaking
Shepard, W. F., Berlin, Ont.	Buttermaking
Such, Arthur, Aylmer W., Ont.	Buttermaking
Sutherland, J. R., Baddeck, N.S.	Buttermaking
Baxter, R. M., Innerkip, Ont.	Cheesemaking
Clendenning, King, Banner, Ont.	Cheesemaking
Davies, J. W., R.R. No. 3, Belmont, Ont.	Cheesemaking
Macdonald, T. C., Listowel, Ont.	Cheesemaking
Phillips, Stanley, Caistorville, Ont.	Cheesemaking
Silver, Leslie, St. Thomas, Ont.	Cheesemaking
Falconer, Harold, Stellarton, N.S.	Buttermaking
Bird, W. J., O.A.C., Guelph, Ont.	Cheesemaking

MEDALS, SCHOLARSHIPS AND PRIZES AWARDED APRIL, 1915.

FIRST YEAR SCHOLARSHIPS.

Scholarships of $20 in money were awarded for groups of subjects in First Year work as follows. Highest standing with a minimum of forty per cent. of the marks of each subject, and an aggregate of seventy-five per cent. of the total number of marks allotted to the subjects in the group:—

Group 1.—English and Mathematics—N. James, R.R. 1, Dublin, Ont.

Group 2.—Animal Husbandry, Dairy, Field Husbandry, Veterinary Science—W. F. Geddes, Kinburn, Ont.

Group 3.—Botany, Chemistry, Geology, Manual Training, Physics, Zoology—C. W. Leggatt, St. Andrew's, Scotland.

Group 4.—Apiculture, Horticulture, Poultry—J. S. Logan, R.R. 4. Hamilton, Ont.

The George Chapman Scholarship.

(A prize of $20 in books awarded on the work in English of the first two years.)

The three divisions of the work under the English Department are taken into consideration in awarding the prize, namely, English Literature, English Composition and Public Speaking. Winner in 1915—E. G. Rowley, Aldershot, Ont.

Prizes.

Three prizes of the value of $10 each in books were awarded as follows:—

One to the second-year student who composed and read before a committee the best essay on a subject assigned for the year, viz., "Mixed Farming in Ontario." J. C. Neale, Lambeth, Ont.

One to the student who stood first in general proficiency on first- and second-year work—Theory and Practice.—E. G. Rowley, Aldershot, Ont.

One to the student who ranked highest in general proficiency and obtained first-class honors in his major subjects in the fourth year.—H. G. Crawford, Wilton Grove, Ont.

Canada Industrial Scholarships.

First.—$50—R. D. Colquette, Cabri Station, Saskatchewan.
Second.—$30—B. E. Foyston, Minesing, Ont.
Third.—$20—W. M. Croskery, Kinburn, Ont.

Medals.

Governor-General's Silver Medal.—First in general proficiency, first- and second-year work, 1914-15. Winner—E. G. Rowley, Aldershot, Ont.

All of which is respectfully submitted.

G. C. Creelman,
President.

FINANCIAL STATEMENT.

COLLEGE DEPARTMENT.

Expenditure.

Salaries and wages	$82,465 13
Servants' paylist	6,385 43
Meat, bread, groceries, laundry, engine-room supplies and fuel	46,392 14
Advertising, printing, postage and stationery	3,997 09
Expenses, Short Courses	1,696 37
Temporary assistance	1,906 35
Student labor	3,221 95
Travelling expenses and extra lectures	1,846 19
Library	1,998 17
Scholarships	110 00
Telephone service, rents, etc.	622 34
Furnishings and repairs	4,799 84
Sewage	540 00
Contingencies	1,349 97
Maintenance, 5 laboratories and gymnasium	7,328 09
Total Expenditure	$164,659 06
Less Revenue	46,054 21
Net Expenditure	$118,604 85

Revenue.

Board	$30,255 50
Tuition and laboratory fees	14,298 50
Chemical analyses	185 75
Rent of rooms	183 00
Rent of cottages	252 50
Rent of post office boxes	41 00
Supplemental Examinations	234 00
Fines and breakages	536 05
Sundries	67 91
Total Revenue	$46,054 21

Student Labor.

(12 Months.)

Total per Month.

November and to December 5.	$886 82
January	682 69
February	332 11
March	282 10
April	79 35
May	55 95
June	110 34
July	144 45
August	78 26
September and October	569 88
Total	$3,221 95

To Different Departments.

College	$275 75
Chemical	37 16
Botanical	5 86
Bacteriology	17 73
Physical	64 91
Entomology	3 64
Gymnasium	19 21
Library	5 33
Macdonald Institute	4 19
Farm	700 42
Experimental	487 72
Dairy	23 42
Poultry	283 70
Pomology	731 81
Landscape Gardening	196 48
Mechanical	258 48
Apiculture	106 14
Total	$3,221 95

MACDONALD INSTITUTE AND HALL.

Expenditure.

Salaries and wages	$16,890 00
Servants' paylist	2,170 50
Meat, bread, groceries, furnishings, repairs, engine-room supplies, fuel and labor on grounds	18,147 33
Maintenance of laboratories in Institute	2,701 07
Library and stationery	666 35
Total Expenditure	$40,575 25
Less Revenue	21,924 17
Net Expenditure	$18,651 08

Revenue.

Board	$13,923 07
Tuition and laboratory fees	7,790 50
Supplemental Examinations	30 00
Fines and breakages	169 60
Sundries	11 00
Total Revenue	$21,924 17

FARM DEPARTMENT.

Expenditure.

Permanent improvements	$981 54
Wages of men, foreman and stenographer	9,398 46
Purchase and maintenance of stock	9,393 19
Farm maintenance, including repairs, blacksmithing, binder twine, seed, furnishings, fuel, light, advertising, printing, stationery, tools, implements, etc.	2,699 91
Contingencies	349 63
Total Expenditure	$22,822 73
Less Revenue	11,033 04
Net Expenditure	$11,789 69

Revenue.

Sale of Cattle:—		
10 Bulls at from $40.00 to $260.00	$1,343 50	
Lease of bull	125 00	
14 Heifers at from $58.00 to $200.00	1,003 00	
5 Cows at from $40.00 to $60.00	242 00	
2 Steers at from $85.00 to $90.00	175 00	
2 Grade calves at from $2.00 to $24.00	26 00	
21 Cattle, 28,120 lbs. at from $7.75 to $13.00 cwt.	2,683 30	
		$5,597 80
Sale of Pigs:—		
11 Boar pigs at from $10.00 to $20.00	$139 00	
24 Sows at from $12.00 to $30.00	523 50	
23 Hogs, 4,480 lbs. at from $7.15 to $8.00 cwt.	322 61	
		$985 11
Sale of Sheep:—		
22 Ewes at from $11.00 to $19.00	$326 00	
3 Rams at from $10.00 to $15.00	36 00	
8 Lambs at $8.00	64 00	
		426 00

Sale of Milk:—		
15,492 quarts at 4c.	$619 68	
129,069 lbs. at from $1.25 to $1.60 cwt.	1,960 30	
1,659.69 lbs. fat at from 27c. to 36c.	489 38	
		$3,069 36
Service of animals		144 00
Sale of 2,100 lbs. middlings at $25.00 per ton		26 25
Sale of 2,100 lbs. hay at $15.00 per ton		15 75
Sale of 4,000 lbs. silage at $3.00 per ton		6 00
Sale of 4,000 lbs. roots at $3.00 per ton		6 00
Sale of wool, 345 lbs. at from 25c. to 26c.		87 77
Maintenance of 13 horses for 1 year at $50.00		650 00
Sundries		19 00
Total Revenue		$11,033 04

EXPERIMENTAL DEPARTMENT.

Expenditure.

Permanent improvements	$627 94
Assistant, specialist in plant breeding, stenographer, foreman, teamsters and laborers	13,743 96
Seeds, manure and special fertilizers	962 21
Furnishings, implements, repairs, blacksmithing, etc.	898 98
Printing, postage, stationery and contingencies	472 66
Feed of horses	200 00
Total Expenditure	$16,905 75

DAIRY DEPARTMENT.

Expenditure.

Permanent improvements	$491 83
Wages, including foreman, cheesemaker, buttermaker, engineer, stenographer and book-keeper, assistant and official tester of dairy cattle	3,179 50
Purchasing, hauling and manufacturing milk into butter and cheese	3,532 75
Furniture, furnishings, repairs, etc., laboratory expenses, gas, chemicals, etc., and contingencies	902 62
Fuel and light	300 00
Total Expenditure	$8,406 70
Less Revenue	3,954 47
Net Expenditure	$4,452 23

Revenue.

Sale of cheese, 8,575 15-16 lbs. at from 7c. to 50c.	$1,484 44
Sale of butter, 66 lbs. at from 15c. to 27.6c.	14 33
Sale of cream, 1,780.9 qts. at 25c.	445 23
Sale of milk, 50 qts. at 4c.	2 00
Sale of butter fat, 4,451.9 lbs. at from 28.5c. to 37c.	1,406 34
Sale of skimmilk and buttermilk, 146,920 lbs. at 25c. cwt.	367 28
Sundries	34 85
Rent	200 00
Total Revenue	$3,954 47

DAIRY SCHOOL.

Expenditure.

Permanent improvements	$67 25
Wages of instructors, engineer, janitor, stenographer and book-keeper	2,297 50
Cleaning, painting, repairs and contingencies	190 54

Dairy appliances, separators, vats, expenses cheese and butter judges, inspecting factories, etc.	$388 07
Advertising, printing, stationery, books, papers, etc.	112 24
Fuel and light	599 12
Purchase of milk for cheesemaking and cost of hauling milk and cream	2,616 60
Total Expenditure	$6,271 32
Less Revenue	2,389 00
Net Expenditure	$3,882 32

REVENUE.

Sale of cheese, 6,960 9-16 lbs. at from 10c. to 50c.	$1,148 35
Sale of cream, 808 qts. at 25c.	202 00
Sale of butter fat, 1,948.31 lbs. at from 30c. to 36c.	651 30
Sale of skimmilk, 62,680 lbs. at 25c. cwt.	156 70
Sale of ice cream, 39⅞ gallons at from 75c. to $1.20	40 35
Breakages	15 80
Fees	159 00
Sundries	15 50
Total Revenue	$2,389 00

POULTRY DEPARTMENT.

EXPENDITURE.

Wages of assistant, stenographer, and temporary assistance	$2,397 55
Permanent improvements	99 09
Purchase of stock	295 74
Furnishings and repairs	999 21
Fuel, light and contingencies	1,097 64
Experiments with incubator, fattening and feed	4,996 93
Feed of horse	50 00
Total Expenditure	$9,936 16
Less Revenue	5,193 87
Net Expenditure	$4,742 29

REVENUE.

Sale of Live Poultry—595 birds for		$1,031 15
Sale of Dressed Poultry:—		
8,267½ lbs. at from 9c. to 55c.	$1,430 76	
28½ pairs chickens at from $1.00 to $1.25 per pair	34 13	
		1,464 89
Sale of Eggs for Hatching:—		
5,865 eggs at from 3½c. to 10c.	$508 43	
681 settings at from 75c. to $1.50	952 80	
		1,461 23
Sale of Eggs for Domestic Use:—		
4,785 7-12 dozen at from 10c. to 60c.		1,236 60
Total Revenue		$5,193 87

POMOLOGY DEPARTMENT.

EXPENDITURE.

Permanent improvements	$225 77
Foreman, firemen, stenographer, teamsters and laborers	3,999 44
Manure, trees, plants, bulbs, implements, tools, furnishings, repairs and contingencies	1,649 84
Fuel and light	350 00
Feed of horses	200 00
Total Expenditure	$6,425 05
Less Revenue	1,044 06
Net Expenditure	$5,380 99

REVENUE.

Sale of fruit and vegetables, as per statements rendered monthly.........	$1,044'06

LANDSCAPE GARDENING DEPARTMENT.

EXPENDITURE.

Permanent improvements	$121 72
Foreman, assistant, fireman, teamsters, stenographer and laborers.........	3,886 01
Manure, trees, plants, bulbs, seeds, tools, furnishings, repairs and contingencies	949 52
Fuel and light	358 76
Feed of horses	100 00
Total Expenditure	$5,416 01

MECHANICAL DEPARTMENT.

EXPENDITURE.

Salary of foreman	$1,000 00
Tools, furnishings and repairs	248 69
Total Expenditure	$1,248 69

APICULTURE DEPARTMENT.

EXPENDITURE.

Wages, equipment and maintenance	$1,749 46
Less Revenue	24 00
Net Expenditure	$1,725 46

REVENUE.

Sale of honey, 240 lbs. at 10c.	$24 00

SOIL PHYSICS DEPARTMENT.

EXPENDITURE.

Services and expenses of temporary assistants in connection with Farm Drainage Demonstrations	$3,999 85

FORESTRY DEPARTMENT.

EXPENDITURE.

Contingencies	$82 50

SUMMARY.

	Expenditure.	Revenue.	Net Expenditure.
College	$164,659 06	$46,054 21	$118,604 85
Macdonald Institute and Hall	40,575 25	21,924 17	18,651 08
Farm	22,822 73	11,033 04	11,789 69
Experimental	16,905 75	....	16,905 75
Dairy	8,406 70	3,954 47	4,452 23
Dairy School	6,271 32	2,389 00	3,882 32
Poultry	9,936 16	5,193 87	4,742 29
Pomology	6,425 05	1,044 06	5,380 99
Landscape Gardening	5,416 01	....	5,416 01
Mechanical	1,248 69	....	1,248 69
Apiculture	1,749 46	24 00	1,725 46
Soil Physics	3,999 85	....	3,999 85
Forestry	82 50	....	82 50
	$288,498 53	$91,616 82	$196,881 71

S. SPRINGER,
Bursar and Superintendent.

ENROLMENT, 1915

AGRICULTURAL COURSES.

Regular Course in Agriculture.

Senior Class.

(January to April).

Beatty, H. A., Walsh, Alta.
Bell, W. J., 65 Mont St., Guelph, Ont.
Bligh, R. D., Lakeville, N.S.
Burrows, L. F., 91 Cork St., Guelph, Ont.
Colquette, R. D., Cabri Station, Sask.
Cory, A., Prince Albert, Sask.
Crawford, H. G., Wilton Grove, Ont.
Creelman, J. M., O.A.C., Guelph.
Croskery, W. M., Kinburn, Ont.
Culverhouse, P. E., 116 Jameson Ave., Toronto, Ont.
Cumming, R. E., South Gower, Ont.
Donald, F. C., Mandamin, Ont.
Donaldson, R. W., Port Williams, N.S.
Dustan, A. G., Bridgetown, N.S.
Finn, R. A., Fletcher, Ont.
Foyston, B. E., Minesing, Ont.
Francis, J. F., Burford, Ont.
Freeborn, S. G., Magnetawan, Ont.
Frejd, D., Box 108, Bruce Mines, Ont.
Goodman, F. L., Box 245, Port Dalhousie, Ont.
Gordon, E. G., Elora, Ont.
Gray, A. J., Cartagena, Spain.
Hales, J. P., Guelph, Ont.
Hall, E. R., St. Albert, Alta.
Hampson, E., Mount Forest, Ont.
Harris, A. G., Hope Gardens, Kingston, Jamaica.
Hart, E. W., Burford, Ont.
Hinman, R. B., Wicklow, Ont.
Hogarth, E. G., Exeter, Ont.
Holmes, H. M., Raymond, Alta.
Horobin, H. P., Cornwall-on-Hudson, N.Y.
Jackson, G. H., Guelph, Ont.
Kedey, W. M., Fitzroy Harbour, Ont.
Kerr, W., Bronson, Ont.
Laird, D. G., Gibson's Landing, Howe Sound, B.C.
Locke, W. A., Brinston, R.M.D., Ont.
Manton, G., Eglinton, Ont.
McQueen, M. J., Guelph, Ont.
Mucklow, G., Box 308, Victoria, B.C.
Neff, E. F., Hamilton, Ont.
Neilson, J. A., Port Dover, Ont.
Patterson, F. C., Ellesmere, Ont.
Pawley, N. H., Mayfield, Ont.
Peren, G. S., Kelowna, B.C.
Ponton, J. N., Bromptonville, Que.
Robb, O., Branchton, Ont.
Sackville, J. P., Bewdley, Ont.
Sands, D. R.., Corunna, Ont.
Shipton, J. C., Annapolis Royal, N.S.
Smith, D. M., 35 McPherson Ave., Toronto, Ont.
Steckle, H. S., Strasburg, Ont.
Stratford, R. K., Brantford, Ont.
Tawse, W. J., 246 Suffolk St., Guelph, Ont.
Townsley, W. A., Box 278, Vancouver, B.C.
White, W. R., Ashburn, Ont.
Winslow, J. H., Chelsea Green, via London, Ont.

Junior Class.

(January to April).

Abraham, R. H., Chatham, Ont.
Adair, L. C., Nottawa, Ont.
Aiton, R. M., Brown's Corners, Ont.
Atkins, E. W., Box 684, E. Lansing, Mich.
Atkinson, G. C., West Brook, N.S.
Baird, A. B., Box 381, Fredericton, N.B.
Beaumont, S. W., Bracebridge, Ont.
Bennett, W., 53 Crescent St., Peterboro, Ont.
Brownridge, J. W.., Brandon, Man.
Bryden, R. J., 880 Hellmuth Ave., London, Ont.
Burrows, A. R., Guelph, Ont.
Carncross, E. E., Cloverdale, B.C.
Clark, G. A., Poole, Ont.
Coke, J., Erin, Ont.
Connon, P. C., 8 Watson St., Aberdeen, Scotland.
Cotsworth, F. B., 231 Seventh St., New Westminster, B.C.
Coughlan, M. H. Hope River, P.E.I.
Culp, E., Vineland Station, Ont.
Curran, H., Orillia, Ont.
Dougherty, J. L., Pembroke, Ont.
Dow, N. D., Lacombe, Alta.
Duncan, C. C., Jordan Harbour, Ont.
Elgie, R. H., 448 Wellington St., Sault Ste. Marie, Ont.
Elliott, D., Agincourt, Ont.
Fancher, P. L., Florence, Ont.
Ferguson, C. D., Valetta, Ont.
Fitzgerald, E. J., St. Ives, Ont.
French, H. S., Vernon, B.C.
Glavin, J. G., 124 Vernon St., Worcester, Mass.
Griffin, R. J., R.R. 1, Sarnia, Ont.
Hill, W. H., 9 Langham St., London W., England.
Hogan, E., Hope River, P.E.I.

Junior Class.—Continued.

Huckett, H. C., Meadsfoot, Cuckfield, England.
Jones, M., 459 King St., London, Ont.
Lackner, C. E., Chesley, Ont.
Langley, B., Oak Ridges, Ont.
Lawson, E. V., Dunlop, Ont.
Lewis, R. M., Yarmouth, N.S.
Lord, L., Penticton, B.C.
Lord, S. N., 35 Lakeview Ave., Toronto, Ont.
Martin, N. R., Springfield, Ont.
McCulloch, J. H., New Abbey, Kirkcudbrightshire, Scotland.
Macdonald, W. P., New Lowell, Ont.
McDermott, A. M., Elmvale, Ont.
MacIntosh, J. M., West River, N.S.
McLarty, J. E., Rodney, Ont.
McLennan, D. M., Lancaster, Ont.
Morse, T. W., 861 Bathurst St., Toronto, Ont.
Murray, R., 75 Sheldrake Boulevard, N. Toronto, Ont.
Oldfield, H. G., R.R. No. 1, Inglewood, Ont.
Reilly, E. E., R.R. 4, Spencerville, Ont.
Romyn, A. E., Box 75, Pretoria, South Africa.
Rowland, H. F., 62 Elm Ave., Toronto, Ont.
Schuyler, D., Box 166, Brantford, Ont.
Scott, W. H., Hastings, Ont.
Shaw, W. R., Clyde River, P.E.I.
Skelton, R. J., Tavistock, Ont.
Small, E. L., Wallacetown, Ont.
Steele, J. A., Almonte, Ont.
Stothers, S. B., Mafeking, Ont.
Strong, W., Guelph, Ont.
Townsend, D. G., Box 149, Dundas, Ont.

Sophomore Class.

(January to April).

Agar, J. C., 520 Fraser Ave., Edmonton, Alta.
Agar, E. Z., 561 16th St., Edmonton, Alta.
Anderson, N. S., Forest, Ont.
Arnold, C. L., Brockville, Ont.
Bagsley, H. E., 9 Southview Ave., Toronto, Ont.
Bisset, W., Goderich, Ont.
Bonham, R. L., R.R. 1, Copetown, Ont.
Boulton, O. E., White Cove, N.S.
Bradley, C. A., Carsonby, Ont.
Brownlee, F. L., North Gower, Ont.
Brubacher, R., St. Jacobs, Ont.
Campbell, H. M., Walkerton, Ont.
Case, G. W., Aurora, Ont.
Chamberlain, C., Precious Corners, Ont.
Clarry, A. G., Locust Hill, Ont.
Cowan, A. H., Napanee, Ont.
Cox, C., 721 Prospect Ave., Buffalo, N.Y.
Cudmore, H. J., Bronte, Ont.
Currey, C. H., Newmarket, Ont.
Currie, D., Carlisle, Ont.
Davey, A., Grimsby, Ont.
Davis, H. L., 814 Fifth Ave., New Westminster, B.C.
Delahay, J. S., R.R. 2, Pembroke, Ont.
Dempsey, J. A., Stratford, Ont.
Edwards, G. H., Onondaga, Ont.
Edwards, H. S., Onondaga, Ont.
Elder, R. C., Canfield, Ont.
Evans, O. C., Chilliwack, B.C.
Evans, P. A., Chilliwack, B.C.
Fallis, R. H., Jarvis, Ont.
Fenwick, F., Jordan Harbour, Ont.
Fleming, R. R., Orton, Ont.
Forman, C. T., Victoria Mines, Ont.
Fuller, J. C., Stratford, Ont.
Fulton, A., Lumby, B.C.
Gautby, C., Simcoe, Ont.
Gautby, L., Simcoe, Ont.
Graham, C. N., Bexley, Ont.
Graham, H. W., Britannia Bay, Ont.
Gregory, P. S., R.R. 3, St. Catharines, Ont.
Grierson, E. A., Hazeldean, Ont.
Hammond, H. L., Port Dover, Ont.
Hanlan, L. H., Oxford Mills, Ont.
Hempson, J. A., Great Glacton Hall, Essex, England.
Henry, C. W., Thornton, Ont.
Hill, W. G., 18 Farnham Ave., Toronto, Ont.
Hockey, J. F., 59 Culp St., Niagara Falls, Ont.
Hunter, V. R., Cavan, Ont.
Johns, J. R., Hampton, Ont.
Keillor, S. E., Wallacetown, Ont.
Keirstead, R. M., 76 Lowther Ave., Toronto, Ont.
Kelly, C. D., 435 14th Ave. W., Vancouver, B.C.
Kernighan, J. S., Benmiller, Ont.
Knox, R. G., R.R. 2, Indian River, Ont.
Lane, A. C., 130 Cambridge St., Guelph, Ont.
Lannin, F. R., South Mountain, Ont.
Lawrence, J. M., Mandamin, Ont.
Lee, C., Paris, Ont.
Linn, A. R., Campbellville, Ont.
Lovekin, C. R., Newcastle, Ont.
Luckham, C. F., Birnam, Ont.
Malcolm, W. F., 68 Emerald St. S., Hamilton, Ont.
Mallory, L. H., Belleville, Ont.
Mann, A. J., Colquitz, B.C.
Marritt, W. G., Keswick, Ont.
Martin, I. B., Bobcaygeon, Ont.
Mason, H. C., 120 Hawthorne Ave., Toronto, Ont.
Meek, C. M., Newmarket, Ont.
Merkley, F. K., Williamsburg, Ont.
Mills, J. M., Retirement, Montego Bay, Jamaica, B.W.I.
Morton, B. W., Newmarket, Ont.
Munro, A. M., 854 Ave. C., Bayonne, N.J.
Murdock, F. G., "Aldie," Guelph, Ont.
McArthur, J. A., North Lancaster, Ont.
McConkey, O., Cayley, Alta.

Sophomore Class.—Continued.

McConnell, A. D., R.R. 2, Grand Valley, Ont.
McCook, E. A., Campbellford, Ont.
McCurry, J. B., Hurdman's Bridge, Ont.
McKillican, L., St. Elmo, Ont.
McLoughry, E. I., R.R. 4, Markdale, Ont.
McMullin, W. B., Blytheswood, Ont.
McNeil, J. A., R.R. 2, Dutton, Ont.
McPhail, M. C., R.R. 4, Galt, Ont.
McPharlin, J. G., Essex, Ont.
Neale, J. C., Lambeth, Ont.
Newman, R. B., Rathburn, Ont.
Nixon, C. M., Box 577, Sault Ste. Marie, Ont.
Oswald, D., Vankleek Hill, Ont.
Parker, W. G., Cass Bridge, Ont.
Parsons, J. W., Jarvis, Ont.
Patton, G. E., Villa Nova, Ont.
Percival, S. E., R.R. 4, Kemptville, Ont.
Pulleine, H., Stanhope, England.
Railton, J. A., Fonthill, Ont.
Rawson, C. L., Woodstock, Ont.
Roger, J. C., 169 Florence St., Ottawa, Ont.
Rowlands, W. A., 130 Stanley Ave., Hamilton, Ont.
Rowley, E. G., Aldershot, Ont.
Runnalls, P. L., Barrie Island, Ont.
Saxton, C. W., R.R. 1, Grovesend, Ont.
Selwyn, H. H., 545 Gilmour St., Ottawa, Ont.
Shearer, T. E., Bright, Ont.
Simmons, A. F., Courtland, Ont.
Sirett, A. T., Rosseau, Ont.
Skinner, G., St. Mary's, Ont.
Slack, P. B., Claremont, Ont.
Smith, G. L., Orono, Ont.
Springstead, A. E., 32 Reginald St., Hamilton, Ont.
Steckley, H. B., Bethesda, Ont.
Stickle, A. H., 2354 Queen St. E., Toronto, Ont.
Stokes, C., Berlin, Ont.
Thomson, J. C., 806 E. York Ave., North Yakima, Wis.
Timms, J. N., Windsor, Ont.
Ure, R. D., R.R. 3, Maidstone, Ont.
Waterman, J. M., Fraserville, Ont.
Waters, M. S., Kenilworth, Ont.
Watt, R. S., Langton, Ont.
Western, E. A., Windermere, Ont.
Whyte, F. G., 1106 13th Ave. W., Vancouver, B.C.
Wiggins, F. A., R.R. 4, Kemptville, Ont.
Williams, G. A., Guelph, Ont.

Freshman Class.

(January to April).

Almey, J. R., R.R. 3, Petrolia, Ont.
Ames, G. A., 387 Kingston Rd., Toronto, Ont.
Anderson, W. M., Islington, Ont.
Appleby, J. B., Paris, Ont.
Arnold, G. J., 206 Victoria Rd., Old Charlton, Kent. Eng.
Bogart, H. W., Chesterville, Ont.
Boucher, W. H., Carp, Ont.
Boys, H. W., King, R.M.D., Ont.
Bremner, J. A., Ethel, Ont.
Brooks, G. F., R.F.D. 1, Kingston, Ont.
Brown, A. T., R.R. 9, Peterboro', Ont.
Brown, R. C., Box 44, Calgary, Alta.
Brown, R. W., Summerland, B.C.
Brown, W. R., 83 Silver Birch Ave., Toonto, Ont.
Brydon, R. K., 115 Bedford Rd., Toronto, Ont.
Chesley, E. T:, 76 Carling Ave., Ottawa, Ont.
Chester, W. M., 26 Stepney Causeway, London, Eng.
Christie, H. F., R.R. No. 1, Vankleek Hill, Ont.
Clare, F., McAlpine, Ont.
Clarke, J. B., Keremeos, B.C.
Cooper, T., R.R. No. 1, Wallenstein, Ont.
Copeland, R. C., Bank of Toronto, Collingwood, Ont.
Corbett, R. R., R.R. 1, Deroche, B.C.
Crockard, A. T., 109 Victoria St., Sarnia, Ont.
Cunnington, C., R.R. 1, Inglewood, Ont.
Davis, H. R., 43 Glasgow St., Guelph, Ont.
Delamore, A. J., Tilden Cottage, Onteora Club, Tannersville, N.Y.
Delaplante, J. H., 152 Soldiers Place, Buffalo, N.Y.
Dell, H. H., Forbes Ave., Guelph, Ont.
DeLong, G. E., Rossmore, Ont.
Delworth, C., Weston, Ont.
Dickson, N., R.R. No. 2, Guelph, Ont.
Dodding, D., Lower Nicola, B.C.
Donaldson, E. R., Arnprior, Ont.
Duff, C. W., 110 Myrtle Ave., Hamilton, Ont.
Durnin, T. M., Dungannon, Ont.
DuToit, A. G., De Wet Station, Worcester, South Africa.
Erb, J. H., R.R. No. 3, Stratford, Ont.
Fairles, W., Bloomington, Ont.
Ferguson, F. L., Parkhill, Ont.
Fidlar, D. G., Lambeth, Ont.
Finch, J., London, Eng.
Fleming, C., R.R. No. 3, Woodstock, Ont.
Forman, K. W., Northfield, Mass, U.S.A.
Galbraith, G., Hornby, Ont.
Geddes, W. F., Kinburn, Ont.
Haines, F. C., Parry Sound, Ont.
Hallworth, C. K., 121 Walker Ave., Toronto, Ont.
Halsey, R. F., 72 Orange St., Brooklyn, N.Y.
Hamilton, L. H., Arthur, Ont.
Hammond, W. A., Port Dover, Ont.

Freshman Class.—Continued.

Hancock, M. L., Box 145, Fonthill, Ont.
Harrop, C., Park Hill Farm, Milton, Ont.
Hawley, W. S., Camden East, Ont.
Heimpel, L. C., R.R. No. 2, Petersburg, Ont.
Henderson, J. F., 308 Crawford St., Toronto, Ont.
High, I. V., South Cayuga, Ont.
Hill, L., R.R. No. 2, Kippen, Ont.
Hoard, C. W., R.R. No. 3, Stirling, Ont.
Hunter, W. H., The Maples, Ont.
Irwin, B., Weston, Ont.
Jakes, W. C., Merrickville, Ont.
James N., R.R. No. 2, Dublin, Ont.
Johnston, W. A., Clifford, Ont.
Johnston, W. D., Douglas, Wyoming, U.S.A.
Jordan, M. D., Hazaribagh, India.
Kay, W. J., R.R. No. 3, Rockwood, Ont.
Kemp, E. L., R.R. No. 6, Owen Sound, Ont.
Kent, H. G., 135 Glen Rd., Toronto, Ont.
Knowles, G., Langley Prairie, B.C.
Lambert, C. B., East Northfield, Mass., U.S.A.
Lavis, G. E., Morrisburg, Ont.
Leach, W. B., 4 South Drive, Toronto, Ont.
Leggatt, C. W., St. Serfs, St. Andrews. Fife, Scotland.
Leslie, P. G., R.R. No. 1, Cheltenham, Ont.
Logan, J. S., R.R. No. 4, Hamilton, Ont.
Long, L. C., Namao, Alta.
Lowell, V. C., 96 Cowan Ave., Toronto, Ont.
Macfarlane, G. S., Eagle Place, Ont.
Macklin, J. M., Whalley, Lancashire, Eng.
Malyon, M. W., Uxbridge, Ont.
Marshall, N. A., 129 Kohler St., Sault Ste. Marie, Ont.
Matheson, A. P., National Liberal Club, Whitehall Place, London, S. W., Eng.
Maybee, H. J., Hilton, Ont.
Merrick, R. C., 110 Admiral Rd., Toronto, Ont.
Michael, G. W., Sherkston, Ont.
Middleton, R. E., Essex, Ont.
Moore, W. B., Burlington, Ont.
Moses, E. N., Hagersville, Ont.
McAdam, J. A., Vankleek Hill, Ont.
McArthur, D. C., R.R. No. 4, Appin, Ont.
McBeath, J. C., Woodstock, Ont.
McCulloch, O. D., R.R. 1, Port Perry, Ont.
McEwan, D. E., Byron, Ont.
McGregor, D. G., Fergus, Ont.
McGuire, M. E., R.R. No. 2, Spencerville, Ont.
McKee, P., Paquette, Ont.
McLean, J. W., Snelgrove, Ont.
McLeod, N., Binnington, Ont.
McNaughton, H. J., New Liskeard, Ont.
McWhinney, H. S., 107 Roxborough St., E., Toronto, Ont.
Nelson, A. R., 113 Julia St., Sarnia, Ont.
Nelson, C. S., Fenwick, Ont.
Newton, R. G. V., Box 448, Woodstock, Ont.
O'Neill, L. A., Bradford, Ont.
Osborne, W. J., R.R. 1, Cottam, Ont.
Parfitt, E. H., 1066 82nd St., Brooklyn, N.Y.
Patterson, C. F., R.R. 8, Watford, Ont.
Pearson, H. W., Billing's Bridge, Ont.
Pilcher, W. C., Wycliffe College, Toronto, Ont.
Pixley, G. S., R.R. No. 3, Harrowsmith, Ont.
Raymond, A. B., Empress Hotel, Victoria, B.C.
Read, D. G., 561 King St., Peterboro', Ont.
Riley, C. W., Camden East, Ont.
Rothwell, C. C., Navan, Ont.
Roy, E., Russeldale, Ont.
Sanderson, C. E., Sault Ste. Marie, Ont.
Scott, W. G., 78 McDonnel St., Peterboro', Ont.
Seymour, C. N., Azabu, Tokyo, Japan.
Shaw, C. F., Smith's Falls, Ont.
Shaw, H. J., Smith's Falls, Ont.
Shaw, J. G. B., Navan, Ont.
Shorey, W. P., R.M.D., 4, Napanee, Ont.
Sibbit, R. H., R.R. No. 1, Kingston, Ont.
Silverthorn, G., Summerville, Ont.
Singer, R., Fergus, Ont.
Smedley, G., Blenheim, Ont.
Smith, J. L., Queensville, Ont.
Snyder, A. W., Islington, Ont.
Snyder, E. S., Berlin, Ont.
Steele, T. M., 137 Mornington St., Stratford, Ont
Stephens, E., R.R. 1, Brigden, Ont.
Stevenson, H. E., 52 Woolwich St., Guelph, Ont.
Stewart, V. A., Fenelon Falls, Ont.
Stones, J. G. K., Clayton le Dale, Eng.
Sullivan, J. H., 2210 Longest Ave., Louisville, Kentucky.
Switzer, R., Kirkton, Ont.
Teeple, L. O., R.R. 4, Woodstock, Ont.
Walker, C. V., R.R. 4, Malton, Ont.
Walker, J. L., R.R. 1, Teeswater, Ont.
Walker, W., Strawberry Vale, Victoria, B.C.
Wallace, D. M., 835 Ave. C., Bayonne, N.J., U.S.A.
Ware, B. W., Haileybury, Ont.
Watt, A. L., 367 Lansdowne Ave., Toronto, Ont.
Watt, M. A., Langton, Ont.
Wilcox, C. W., Lynedoch, Ont.
Wilson, A. E., Pakenham, Ont.
Wilson, G. R., Merrickville, Ont.
Woolley, H. H., Wilsonville, Ont.

Course for the Degree of B.Sc. (Agr.).

(January to April).

Third Year.

Foulds, F. E., 58 Fuller Ave., Toronto. Ont.

Irregular Students.

(January to April).

Altenburg, M. J., Gananoque, Ont.
Armstrong, P. P., Monteith, Ont.
Hartley, C. V., 48 Brant Ave., Brantford, Ont.
Letourneau, Firmin, Mount Louis, Que.
Mitchell, E. R., Collingwood, Ont.
McGregor, J. H., Desboro, Ont.
McDonald, Miss, Guelph, Ont.
Phillippe, R., Oka Agr. College, Que.
Scarlett, E. C., 95 Lyndhurst Ave., Toronto, Ont.
Sproule, W. H., Vankleek Hill, Ont.

Normal Course in Manual Training.

(January to April).

Gillies, D. W., O.A.C., Guelph, Ont.
Rowe, G. F., Orono, Ont.
Shackleton, A. V., Crewe, Ont.

Short Course in Stock and Seed Judging.

Adams, S. W., St. Catharines, Ont.
Agnew, K., Milton, Ont.
Alguero, A. J., 78 Essex St., Guelph, Ont.
Allen, S., Bothwell, Ont.
Armstrong, D. W., Kinburn, Ont.
Athawes, W., Hamilton,, Ont.
Atkinson, C., Rock Mills, Ont.
Baldwin, E. R., Smithville, Ont.
Barrett, T. B., Port Dover, Ont.
Barton, L., R.R. 2, Uxbridge, Ont.
Bennett, C. F., Oshawa, Ont.
Birdsall, C. W., Courtland, Ont.
Blackburn, B., R.R. 2, Uxbridge, Ont.
Broughton, C. E., Whitby, Ont.
Bradford, S., Amaranth Station, Ont.
Brigham, A., Blythe, Ont.
Brink, F. C., Hickson, Ont.
Brodie, J. N., Muncey, Ont.
Brown, C. W., R.R. 1, Norval, Ont.
Brown, E. M., Corinth, Ont.
Brown, W. A., Lynnville, Ont.
Buchanan, G., Flesherton, Ont.
Butler, D., R.R. 5, Simcoe, Ont.
Cameron, O., Emo. Ont.
Campbell, A., Foxey, Manitoulin.
Cantelon, N. W., No. 1, Hornby, Ont.
Carnahan, E. H., Meaford, Ont.
Carry, M. S., Kinburn, Ont.
Clark, W., R.R. 1, Mitchell, Ont.
Cockburn, E. S., Puslinch, Ont.
Cockburn, J. M., Puslinch, Ont.
Collyer, T., Hillcrest Stock Farm, Norwood, Ont.
Coutts, G. D., Midhurst, Ont.
Cowieson, A., Queensville, Ont.
Crawford, A., Greenshields, Alta.
Crawford, W. J., Walkerton, Ont.
Crocombe, G. W., Islington, Ont.
Crombie, J., Mono Mills, Ont.
Crossman, C. E., Taunton, Ont.
Culham, C., Sheffield, Ont.
Cutten, H., Downers Grove, Ill.
Daniel, K. R., Ingersoll, Ont.
Davis, S. C., Brantford, Ont.
Denison, A., Edwards, Ont.
Denster, H., Hedgley, Ont.
Devlin, S., R.R. No. 4, Milton, Ont.
Dougherty, H., R.R. No. 1, Jarvis, Ont.
Dow, G., Cromarty, Ont.
Downs, G., Hornby, Ont.
Dunn, J. P., 188 Oxford St., London, Ont.
Earle, H., Ida, Ont.
Early, H. W., R.R. No. 1, Norval, Ont.
Eaton, J. E., Carlyle, Ont.
English, A., Norwood, Ont.
Fallis, R., R.R. No. 3, Millbrook, Ont.
Ferguson, H. D., Alvinston, Ont.
Fletcher, C., R.R. No. 4, Milton, Ont.
Flynn, L., Tamworth, Ont.
Ford, R. R., R.R. No. 4, Milton, Ont.
Ford, W. E., R.R. No. 4, Milton, Ont.
Forsyth, J., Stouffville, Ont.
Fox, W., Bloomfield, Ont.
Fraser, J., Ohsweken, Ont.
Gastle, R. O., Carlyle, Ont.
Gillan, N., Pakenham, Ont.
Goltz, A. A., Bardsville, Ont.
Good, J. B. L., 37 Durham St., Guelph, Ont.
Gowdie, R., R.R. No. 2, Petrolea, Ont.
Graham, H. I., Markdale, Ont.
Graham, W. R., Markdale, Ont.
Gray, A., Rockwood, Ont.
Griffin, A. C., Waterdown, Ont.
Haight, S., Pawpaw, Mich.
Hamilton, F. C., 546 Confederation Life Chambers, Toronto.
Hamilton, W. B., Chesterville, Ont.
Harding, R. H., Thorndale, Ont.

Short Course in Stock and Seed Judging.—Continued.

Harris, H. W., R.R. No. 1, Mount Forest, Ont.
Harrop, H., Milton, Ont.
Hartley, D., Milton, Ont.
Haskett, C. A., Denfield, Ont.
Hawes, E., R.R. No. 3, Georgetown, Ont.
Hayes, H. H., Athens, Ont.
Heddie, J., Wilkesport, Ont.
Hetherington, M., Hilton, Ont.
Hickling, R. N., R.R. No. 2, Barrie, Ont.
Hilliard, G. H., Caledon, Ont.
Virgil, H., Burlington, Ont.
Howes, G., Vernon, Ont.
Humber, T., Cottam, Ont.
Innes, A., R.R. No. 1, Bright, Ont.
Innes, N., R.R. No. 1, Bright, Ont.
Jarvis, C., Milton, Ont.
Jasper, T. H., Carlsruhe, Ont.
Jemmings, R., Barrie Island, Manitoulin.
Johnston, G., Pretoria, Ont.
Kearns, J. J., Tamworth, Ont.
Kennedy, H. A., Alexandria, Ont.
Kernick, W. J., R.R. No. 3, Exeter, Ont.
Kibble, W., R.R. No. 2, Princeton, Ont.
King, H. M., R.R. No. 1, Woodstock, Ont.
Lamb, C. L., Walkerton, Ont.
Lamont, C., Mount Brydges, Ont.
Laughlin, H. D., Belfontain, Ont.
LeRoy, A., R.R. No. 1, Freeman, Ont.
Leslie, W., R.R. No. 3, Milton, Ont.
Lindsay, E., Hornby, Ont.
Locking, P., Emo, Ont.
Manning, G. F., Woodville, Ont.
Marchant, V., Schomberg, Ont.
Martin, B., Corbyville, Ont.
Maus, J. W., Plattsville, Ont.
Maynard, S., R.F.D., 3, Chatham, Ont.
Mewbure, C. L., Hamilton, Ont.
Monkman, M. D., Brampton, Ont.
Moore, G., Forks Road, Ont.
Moore, S., Walmer, Ont.
Mooreland, H., Harrowsmith, Ont.
Morgenroth, J. G., Tavistock, Ont.
Morham, W. C., Wawbewawa, Ont.
Morrison, E. A., Yarmouth Centre, Ont.
Morrison, J., R.R. 2, Creemore, Ont.
Morton, R. P., Keswick, Ont.
Myerscough, W., Bealton, Ont.
McCague, H. D., Gormley, Ont.
McCann, C. E., R.R. No. 4, Milton, Ont.
McDougall, C. K., R.R. No. 1, Milton, Ont
McDougall, J., R.R. No. 1, Rockwood, Ont.
McGregor, M. E., Oshawa, Ont.
McIlwain, A. E., Nile, Ont.
McKenzie, A., R.R. No. 3, Lakeside, Ont.
McKenzie, R., Murillo, Ont.
Neil, E. R. F., Lucan, Ont.
Nephew, B., Finch, Ont.
Norrish, C. H., R.R. No. 1, Campbellville, Ont.
Oliver, R., R.R. No. 2, Waldemar, Ont.
O'Neill, R. O., Paquette Station, Ont.
Orr, W., Glenburnie, Ont.
Owens, C., Kinburn, Ont.
Parker, R. R., Humber Bay, Ont.
Parkhill, S. M., Paris, Ont.
Partridge, I. O., R.M.D., Barrie, Ont.
Paterson, W., Southwood, Ont.
Patterson, E. E., R.R. No. 4, Milton West, Ont.
Peacock, V. H., Elizabethville, Ont.
Peart, C. D., Guelph, Ont.
Pennington, J. C., Teeswater, Ont.
Phillips, J. W., R.R. 1, Aberton, Ont.
Philp, C., R.R. No. 2, Janetville, Ont.
Pincombe, A., Strathroy, Ont.
Pressey, T. E., Arkona, Ont.
Quinlan, J. T., R.R. No. 1, Barrie, Ont.
Ratcliffe, W., R.R. No. 4, Markdale, Ont.
Reed, A., Reaboro, Ont.
Riach, H., Wheatley, Ont.
Robertson, A., Ice Lake, Manitoulin.
Robertson, C., Barrie, Ont.
Robertson, J. A., R.R. No. 3, Kerrwood, Ont.
Robins, W. R., Solina, Ont.
Roy, A., Russeldale, Ont.
Roy, M., R.R. No. 4, Milton, Ont.
Roy, P., Oka. Agr. College, Que.
Russel, J., Russeldale, Ont.
Ryan, W., Renfrew, Ont.
Salisbury, J. C., Brampton, Ont.
Saunders, T. B., 213 Poplar Plains Road, Toronto, Ont.
Service, J., R.R. No. 3, Milton, Ont.
Shaw, G., Mono Road, Ont.
Simpson, W. E., R.R. No. 1, Milton, Ont.
Smith, H., Pakenham, Ont.
Smith, H. J., Oakville, Ont.
Smith, M., R.R. No. 3, Chatham, Ont.
Smith, T. G., Walkerton, Ont.
Smyth, L., Kent Centre, Ont.
Snell, H. C., R.R. No. 1, Centralia, Ont.
Snyder, F. E. C., Brampton, Ont.
Statton, J., R.R., Mitchell, Ont.
Stewart, A. M., Waba, Ont.
Strohem, C., De Cewsville, Ont.
Sulston, N., R.R. No. 2, Princeton, Ont.
Summerby, C. H., Paris, Ont.
Swinn, A. E., Maybee, Ont.
Switzer, E., R.R. No. 4, Milton, Ont.
Thompson, W., Hornby, Ont.
Topham, G. A., Burgessville, Ont.
Turnbull, L. L., Delhi, Ont.
Walker, J., R.R. No. 2, Caledonia, Ont.
Williamson, C., R.R. No. 8, St. Thomas, Ont.
Williamson, J., Mindemoya, Manitoulin.
Wilmott, J. H., R.R. No. 1, Milton, Ont.
Wilson, T., Milton, Ont.
Windecker, E., Cayuga, Ont.
Whitelaw, G., R.R. No. 1, Guelph, Ont.

Short Course in Fruit Growing.

Atkins, E. P., Hawkestone, Ont.
Atkins, E. W., Hawkestone, Ont.
Biggar, W. E., 134 Balsam Ave., Toronto, Ont.
Brown, R. J., Cedar Springs, Ont.
Cooper, A. E., 13 Otter Ave., Toronto, Ont.
Crocombe, G. W., Islington, Ont.

Short Course in Fruit Growing.—Continued.

Crone, E. M., Mandamin, Ont.
Dampier, R., Ospringe, Ont.
Daniel, K. R., Ingersoll, Ont.
Davison, G. T., 61 Cambridge St., Guelph, Ont.
Dawes, H. B., St. Williams, Ont.
Dunn, W., Lucan, Ont.
Eaton, J., Carlisle, Ont.
Eyre, G. F. C., Brighton, Ont.
Feasby, R., Brougham, Ont.
Frodsham, A. W., Fergus, Ont.
Gill, Mrs. R. J., Brockville, Ont.
Good, J. B. L., Bronte, Ont..
Gordon, G., 6 Tiffany St., Guelph, Ont.
Griffin, A. C., Waterdown, Ont.
Hamilton, T. C., 546 Confederation Life Chambers, Toronto.
Haviland, W., Delhi, Ont.
Inderwick, C. C., Perth, Ont.
Jemmett, G. C., Vittoria, Ont.
Johnston, A. A., R.R. 1. Ilderton, Ont.
Kinloch, W., Winona, Ont.
Lamont, C., Mount Brydges, Ont.
Lancaster, L. A., St. Williams, Ont.
Mather, O., Brampton, Ont.
Mather, Mrs. O., Brampton, Ont.
Mersen, H. C., St. Catharines, Ont.
McGolpin, W. C., 21 Wilson Ave., Toronto, Ont.
McGuire, W., Clover Valley, Ont.
McKeehrin, C., Caledonia, Ont.
Morrison, C. L., Yarmouth Centre, Ont.
Morrison, P., c-o Dr. Grant, Thedford, Ont.
Nickerson, W. C., St. Catharines, Ont.
Nobel, J., 97 Brant Ave., Brantford, Ont.
Palmer, H. A., 332 Cannon St. E., Hamilton, Ont.
Parker, R. R., Humber Bay, Ont.
Parsons, W. H., Grimsby, Ont.
Patterson, W., Southwood, Ont.
Pauli, C. E., New Hamburg, Ont.
Picken, J. B., Winona, Ont.
Picken, W. H., Winona, Ont.
Randall, J., St. Catharines, Ont.
Reesor, R. A., 145 Rusholme Road, Toronto. Ont.
Riley, J., Spencerville, Ont.
Ryan, W., Grimsby, Ont.
Saunders, T. B., 213 Poplar Plains Road, Toronto, Ont.
Stewart, A., Waba, Ont.
Strathy, Mrs., Hawkestone, Ont.
Turnbull, L., Delhi, Ont.
Williams, C., R.R. No. 8, St. Thomas, Ont.
Wilson, W., Oakville, Ont.

Short Course in Poultry.

Altenburg, M. J., Gananoque, Ont.
Andrews, Mrs. E., 16 Poplar Ave., Hamilton, Ont.
Bach, J. E., 139 Glengrove Ave., Toronto, Ont.
Clemens, D. C., 251 Frederick St., Berlin, Ont.
Davison, G. T., 154 Dundern N., Hamilton, Ont.
Dollery, A. E., 212 Ossington Ave., Toronto, Ont.
Gilboe. F., 79 Berlin St.. Guelph, Ont.
Gill, R. J., Brockville, Ont.
Goodall, O. M., Cheviot, Sask.
Hamilton, B. D., Lorne Park, Ont.
Hardy, E., Vivian, Ont.
Holtby, Mrs. E., Belmont, Ont.
Inderwick, C. C., Perth, Ont.
Isbister, C., R.M.D., 1, Innerkip, Ont.
Kennedy, A. C., Clinton, Ont.
Lawlor, T. A., 325 Simcoe St. S., Oshawa, Ont.
Leach, Mrs. E. M., 3 Ethelwynn Ave., Toronto, Ont.
Lees, J., Hamilton, Ont.
Mather, O., Brampton, Ont.
Morgenroth, J. G., Tavistock, Ont.
Morrison, Miss Alice, Yarmouth Centre, Ont.
Morrow, J., Essex, Ont.
Munro, Miss F., 308 Jarvis St., Toronto, Ont.
Noble, J., Brantford, Ont.
Pearson, Miss V., 31 Hawthorne Ave., Toronto, Ont.
Randall, J., St. Catharines, Ont.
Robinson, D., Hamilton, Ont.
Robinson, G., Bronte, Ont.
Sanduskey, K., 328 Beatrice St., Toronto, Ont.
Shaver, P. A., Finch, Ont.
Thompson, Margaret, R.R. N. 2, Watford, Ont.
Turnbull, J. A., Canfield, Ont.
Welsh, J. K., Niagara-on-the-Lake, Ont.

Short Course in Dairying.

Abbs, W. A., Underwood, Ont.
Akin, H. J., Evanston, Ill., U.S.A.
Anderson, H., Dungannon, Ont.
Archer, H., Belmont, Ont.
Bain, G., Thamesford, Ont.
Barker, Miss, R.R. No. 7, Guelph, Ont.
Bauer, A., R.R. 7, New Dundee, Ont.
Baynham, L., Centralia, Ont.
Boadway, J. E., Stouffville, Ont.
Bramhill, W., Palmerston, Ont.
Brewer, E., 72 Wellesley St., Toronto, Ont.
Burnett, L., Dutton, Ont.
Chisholm, T., St. Andrews, N.S.
Christoffersen, R., Beaverton, Ont.
Clark, H., Corinth, Ont.

Short Course in Dairying.—Continued.

Coatsworth, E. E., 438 Main St., Buffalo, N.Y.
Colpitts, A. B., Forest Glen, N.S.
Daniel, K., Ingersoll, Ont.
Dickie, D., Central Onslow, N.S.
Evans, T., Calgary, Alta.
Gallant, B., St. Raphael, P.E.I.
Gillespie, C. L., White Church, Ont.
Gloin, H., Sparta, Ont.
Harrison, S., Chesley, Ont.
Hefler, W., 429 Church St., Toronto, Ont.
Higinbotham, C. F., 28 Beach St., Greenfield, Ont.
Hogan, J. J., Peterboro', Ont.
Holmes, F., Tara, Ont.
Keene, A., Brantford, Ont.
Kennedy, E., Harwood, Ont.
Kirkley, F., Wallard, Sask.
Liddle, C., Wardsville, Ont.
MacIntyre, O. G., 24 Bellwood Ave., Ottawa, Ont.
MacLeod, E., Scotsburn, N.S.
Misener, W., Bismarck, Ont.
Mitchell, A. R., Collingwood, Ont.
Morse, J., Trowbridge, Ont.
Murray, W. J., St. Andrews, Scotland.
Pearsell, W., Cannington, Ont.
Phelps, S., Corinth, Ont.
Pollock, R., 129 Norfolk St., Guelph, Ont.
Reesor, G., 821 Broadview Ave., Toronto, Ont.
Robinson, A., Pembroke, Ont.
Saldana, T., Libres, Argentine Rep.
Scott, J., Bury St., Edmunds, Eng.
Seehaver, H., Molesworth, Ont.
Smith, H., Pakenham, Ont.
Sproule, W., Vankleek Hill, Ont.
Stewart, G. L., R.R. 1, Ilderton, Ont.
Sullivan, C., Bruce Mines, Ont.
Trandill, P., 55 Cork St., Guelph, Ont.
Wallis, L., Mossley, Ont.
Williams, W. D., Clinton, Ont.
Wilson, A., Oakville, Ont.

Cow Testing Course.

Atkin, H. J., Evanston, Ill., U.S.A.
Alguero, A., Panama City, Panama.
Allen, H., New Durham, Ont.
Allen, L., Harley, Ont.
Archer, H., Belmont, Ont.
Ashworth, A. H., Denfield, Ont.
Ashworth, D. A., Denfield, Ont.
Boadway, J. E., Stouffville, Ont.
Burnett, L., Dutton, Ont.
Christofferson, R., Carthage, Ont.
Clara, J. F., McAlpine, Ont.
Coatsworth, E., Buffalo, N.Y., U.S.A.
Corrigan, W., Carrying Place, Ont.
Crooker, R., Boston, Ont.
Dean, W. J., Brantford, Ont.
Dunn, J., 118 Oxford St., London, Ont.
Gallant, B., St. Raphael, P.E.I.
Gibson, A., New Castle, Ont.
Gloin, H., Innerkip, Ont.
Grummett, E., Echo Place, Ont.
Johnston, W. D., Guelph, Ont.
Keene, A., Woodstock, Ont.
Lawlor, T., Oshawa, Ont.
McIntyre, O., Ottawa, Ont.
McLean, J., Jarvis, Ont.
Mitchell, A. R., Collingwood, Ont.
Morrison, C., Yarmouth Centre, Ont.
Scott, J., Burford, Ont.
Shaw, J., Guelph, Ont.
Shepard, J. G., Bloomfield, Ont.
Shutt, D. B., Toronto, Ont.
Smith, H., Pakenham, Ont.
Sproule, W., Vankleek Hill, Ont.
Stewart, A. L., Eden Grove, Ont.
Sullivan, C., Bruce Mines, Ont.
Teeple, L. O., R.R. 1, Woodstock, Ont.
Trendell, P., Guelph, Ont.
Wallis, L., Mossley, Ont.
Wardell, J., Boston, Ont.
Welsh, H. B., Hampton, Ont.
Welsh, V., Hampton, Ont.
Wilson, A., Oakville, Ont.
Wood, W. E., Mitchell, Ont.

Ice-Cream Course.

Allan, R. G., Peterborough, Ont.
Anderson, J., Renfrew, Ont.
Bramhill, W., Palmerston, Ont.
Brewer, E., Toronto, Ont.
Dickie, D., Central Onslow, N.S.
Evans, T., Calgary, Alta.
Goodwin, W. J., Welland, Ont.
Harrison, S., Palmerston, Ont.
Hefler, W., Toronto, Ont.
Lister, W. G., Chatham, Ont.
Quirie, R., Welland, Ont.
Salkeld, T. J., Goderich, Ont.
Smith, R. E., Selkirk, Ont.
Williams, W., Clinton, Ont.

Dairy Instructor's Course.

Bird, W. J., Guelph, Ont.
Boys, T. F., Lambeth, Ont.
Gracey, A. E., Woodstock, Ont.
Herns, F., London, Ont.
McKenzie, G., Ingersoll, Ont.
McMillan, D., Stratford, Ont.
Richwood, G., Essex, Ont.
Smith, J. B., Alton, Ont.
Thompson, A. R., Atwood, Ont.
Travis, G., Tillsonburg, Ont.

Short Course in Apiculture.

Allen, F. A., R.R. 8, London, Ont.
Barrett, W., 134 Ferrier Ave., Toronto, Ont.
Bedell, F. H., R.R. 5, Belleville, Ont.
Boyes, N., Fenwick, Ont.
Burke, H., Reaboro, Ont.
Calvert, Mrs. F. C., 68 Queen St., Guelph, Ont.
Campbell, J., Magog, Quebec.
Colwill, T. J., 68 Queen St., Guelph, Ont.
Cooper, A. E., 13 Otter Ave., Toronto, Ont.
Craig, C., North Gower, Ont.
Davidson, J. C., Oakwood, Ont.
Duffitt, Miss L. G., 274 Beech Ave., Toronto, Ont.
Dyke, Miss, Dept. of Health, City Hall, Toronto.
Dyke, J., Fort William, Ont.
Fogelburg, Mrs., 155 Lancaster St., Berlin, Ont.
Gibson, W. E., Cataract, Ont.
Hampson, Mrs., 15 Rodman St., St. Catharines, Ont.
Hilliard, G. H., Caledon, Ont.
Inderwick, C. C., Perth, Ont.
Jones, F., 26 St. George St., Toronto, Ont.
Leslie, R., R.R. 3, Georgetown, Ont.
Lewis, E., Cayuga, Ont.
Lowry, J., 40 Salisbury Ave., Toronto, Ont.
Martyn, E. H., Port Hope, Ont.
Mather, O., Brampton, Ont.
Miles, C., Milliken, Ont.
McConkey, Miss, 141 Queen St., Guelph, Ont.
MacDougall, J., Grant, Ont.
Noble, J., Brantford, Ont.
Pauli, G. E., New Hamburg, Ont.
Rose, F. H., Stamford, Ont.
Sifton, H. L., Palmyra, Ont.
Stewart, Miss, 215 Woolwich St., Guelph, Ont.
Teeple, E. J., Battersea, Ont.
Van Dyke, Mrs., Hamilton, Ont.
Watson, T. H., Box 344, Hamilton, Ont.
Whillans, T., Hurdman's Bridge, Ont.
Wood, W. E., R.M.D. 4, Mitchell, Ont.
Wray, T., 28 Augusta St., Hamilton, Ont.

SUMMER COURSES.

Science Teachers.

First Year.

Adams, J. J., 28 Askin St., London, Ont.
Bell, Edwin T., 53 Spruce St., Toronto, Ont.
Brown, J. W., R.R. 4, Guelph, Ont.
Bunton, Geo. W., Port Hope, Ont.
Copeland, Geo. E., Port Hope, Ont.
Cowan, Wilfrid K., Brownsville, Ont.
Dobbie, Isabella C., New Liskeard, Ont.
Dore, H. C., Wingham, Ont.
Elliott, Clarence, 19 Oxford St., Toronto.
Elliott, F. V., R.R. 4, Ilderton, Ont.
Forrester, J. W., Smith's Falls, Ont.
Graham, Hugh H., Fenelon Falls, Ont.
Heviland, H. J., Hagersville, Ont.
Jordan, John C., Dublin, Ont.
Pentland, G. E., Beamsville, Ont.
Shales, Walter E., Kincardine, Ont.
Smith, Daniel E., Burlington, Ont.
Summers, C., Stouffville, Ont.

Science Teachers.

Second Year.

Bowden, Wm. L., Dresden, Ont.
Butson, Wm. G., Dresden, Ont.
Corkill, E. J., Napanee, Ont.
Fleming, Robert W., Watford, Ont.
Gulston, C. S., Lefroy, Ont.
Hume, J. P., Goderich, Ont.
Macdonald, John A., Guelph, Ont.
McMillan, G., 201 Powell Ave., Ottawa, Ont.
Shook, Muriel, 114 Simpson Ave., Toronto, Ont.
Spark, G., Exeter, Ont.

Public School Teachers.

First Year.

Beamish, Catherine A., Woodbridge, Ont.
Binnie, Clara G., Proton Station, Ont.
Blanchard, Joseph H., 180 Hillsborough St., Charlottetown, P.E.I.
Clarke, Mamie, R.R. 5, Embro, Ont.
Cole, Gladys, Tavistock, Ont.
Coutts, H. H., Waterloo, Ont.
Darrach, Miss C. I., Schomberg, Ont.
Dickson, Chirstina F., R.R. 3, Brussels, Ont.
Finch, Burt A., Belmont, Ont.
Finlayson, Miss Janet, 20 Gerrard St. E., Toronto, Ont.
Galloway, Wm. H., R.R. 1, Arkona, Ont.
Good, F. A., Fredericton, N.B.
Graham, Laura, North Gower, Ont.
Halliday, Clarence P., Chesley, Ont.
Hild, Anna, Medicine Hat, Alta.
Holmes, Laura E., Newton, Ont.

Public School Teachers—First Year.—Continued.

Howard, Emerson B., 278 Campbell Ave., Toronto.
Jamieson, Elmer, Ohsweken, Ont.
Johns, Addison F., 1485 Danforth Ave., Toronto.
Lamont, Agnes, Wardsville, Ont.
Lamont, Janet, Wardsville, Ont.
Langford, May, Waterdown, Ont.
Leach, Eva, North Gower, Ont.
McCorquodale, Elizabeth M., R.R. 3, Woodstock, Ont.
McCort, Nellie L., R.R. 3, Bolton, Ont.
McClure, J. Corinne, R.R. 2, Norval, Ont.
MacDonald, David G., Port Elgin, Ont.
McDonald, Mary J., Dalhousie Sta., P.Q.
McEwan, Amy J., Iroquois, Ont.
MacLennan, Miss Maria, 118 Brock St., Sarnia, Ont.
MacTavish, Jean, R.R. 1, Ripley, Ont.
Mills, A. R., Fort William, Ont.
Moffatt, Laura, North Gower, Ont.
Moses, James D., Hagersville, Ont.
Nesbitt, Ada W., Aylmer, Ont.
Owens, Margaret, R.R. 2, Grenville, P.Q.
Pattinson, Helen, Burlington, Ont.
Pomeroy, John B., Bridgeport, Ont.
Ramsey, Isabel, Hyde Park, Ont.
Robinson, Ralph W., R.R. 3, Komoka, Ont.
Rundle, Eva M., Dundalk, Ont.
Rundle, Vida, Dundalk, Ont.
Sheppard, Eva A., Orono, Ont.
Snetsinger, Miss G. M., 373 Queen's Ave., London, Ont.
Speers, Mina V., New Lowell, Ont.
Sutherland, Anna M., Ingersoll, Ont.
Weir, Miss F. A., R.R. 1, Waterdown, Ont.
Wendt, Wm. F., Mildmay, Ont.
Whaley, Mary A., Union, Ont.
White, Miss O., R.R. 1, Sault Ste. Marie, Ont.
Whitelaw, Florence, Box 41, Woodstock, Ont.
Wilson, Miss B. A., R.R. 1, Franklin, Ont.
Yeo, Mabel L., Staffa, Ont.
Zeron, Miss Frances, Morrisburg, Ont.

Public School Teachers.

Second Year.

Armstrong, D. W., 327 Margueretta St., Toronto.
Benham, James W., 13 Extra St., Guelph, Ont.
Beynon, Miss Josie M., Temperancevville, Ont.
Cheer, Winnifred, Richard's Landing, Ont.
Eastcott, A. E., 48 Harbord St., Toronto, Ont.
Freeman, Cecil E., Bowesville, Ont.
Grant, Wm. H., Hazeldean, Ont.
Grunig, G. J., Emsdale, Ont.
Hamilton, Sarah, 173 Hunter St., Peterboro, Ont.
Harrison, Estelle, Staffa, Ont.
Henry, Mildred, Springfield, Ont.
Lovell, Bessie G., Wroxeter, Ont.
Mahon, Katherine, Aberfoyle, Ont.
McClure, Sarah, R.R. 2, Weston, Ont.
McDonald, Irene J., Harrison's, Ont.
McLean, Mary B., Rodney, Ont.
Neelands, Ruth, Forest, Ont.
Newman, Violet, R.R. 5, Spencerville, Ont.
Roblin, Miss L. R., R.R. 5, Belleville, Ont.
Sadler, Annie J., R.R. 3, Eganville, Ont.
Smith, Maria, R.R. 3, Cobden, Ont.
Weston, Evelyn, R.R. 4, St. Mary's, Ont.
Weston, Verda, R.R. 4, St. Mary's, Ont.

Public School Inspectors.

Atkin, W., St. Thomas, Ont.
Bald, W., Port Elgin, Ont.
Benson, J. E., Picton, Ont.
Boyes, R., Campbellford, Ont.
Breuls, I. D., Pembroke, Ont.
Broderick, G. E., Lindsay, Ont.
Burgess, M., Owen Sound, Ont.
Campbell, A. L., Weston, Ont.
Campbell, N. W., Durham, Ont.
Christie, D. M., Sudbury, Ont.
Clarke, H. J., Belleville, Ont.
Cole, J. M., Woodstock, Ont.
Colles, W. H. G., Chatham, Ont.
Conn, Henry, Sarnia, Ont.
Cook, H. Frank, Simcoe, Ont.
Craig, J. J., Fergus, Ont.
Craig, F. A., Kemptville, Ont.
Crewson, M., Glengarry, Ont.
Day, I., Orillia, Ont.
Denyes, J. M., Milton, Ont.
Ferguson, T. R., Uxbridge, Ont.
Field, J. M., Goderich, Ont.
Finn, J. P., Ottawa, Ont.
Froats, J., Finch, Ont.
Froats, W. C., Carleton Place, Ont.
Galbraith, R., Mount Forest, Ont.
Galbraith, W. J., Brampton, Ont.
Garvil, J. L., Barrie, Ont.
Green, L. A., Sault Ste. Marie, Ont.
Green, V. K., Winchester, Ont.
Hamilton, W. J., Fort William, Ont.
Huff, S., Toronto, Ont.
Hutchison, R. A., Whitby, Ont.
Ingall, E. E., Ottawa, Ont.
Ireland, W. W., St. Catharines, Ont.
Irwin, Wm., Stratford, Ont.
Jamieson, T., 115 Strathcona Ave., Ottawa, Ont.

Public School Inspectors.—Continued.

Johnston, H. D., Strathroy, Ont.
Jones, J. E., 104 Henderson Ave., Ottawa, Ont.
Jordan, A. A., Sturgeon Falls, Ont.
Kilmer, E. E. C., Brantford, Ont.
Lees, Richard, Peterborough, Ont.
Liddy, W. R., Orangeville, Ont.
Longman, E., Barrie, Ont.
Marshall, J. W., Welland, Ont.
Maxwell, D. A., Windsor, Ont.
Michael, F. L., Perth, Ont.
Mulloy, C. W., Aurora, Ont.
Minns, J. E., Wellington, Ont.
Moore, J. L., Parry Sound, Ont.
McCool, John, Walkerton, Ont.
McDougall, N., Petrolea, Ont.
McNab, G. G., Renfrew, Ont.
Nelson, J., Vankleek Hill, Ont.
Nesbitt, D. A., Napanee, Ont.
Norman, L., Galt, Ont.
Odell, M., Cobourg, Ont.
Paterson, R. A., Ingersoll, Ont.
Power, J. F., 33 Dalton Ave., Toronto, Ont.
Putman, J. H., Ottawa, Ont.
Reid, M. R., Sharbot Lake, Ont.
Ritchie, J., Port Arthur, Ont.
Scovell, H. B., Bracebridge, Ont.
Sheppard, F. W., Berlin, Ont.
Slemon, E. T., 703 Gilmour St., Ottawa, Ont.
Smith, J. H., Stratford, Ont.
Smith, J. H., Chatham, Ont.
Standing, T. W., Brantford, Ont.
Stevens, W. H., Lindsay, Ont.
Sullivan, J. F., 873 Hellmuth St., London, Ont.
Summerby, W. J., North Bay, Ont.
Taylor, J. A., St. Thomas, Ont.
Thompson, P. J., 804 Hellmuth Ave., London, Ont.
Tilley, W. E., Bowmanville, Ont.
Tom, J. Elgin, Goderich, Ont.
Truscott, S. A., Kingston, Ont.
White, R. O., North Bay, Ont.

School for Rural Leadership.

Aitkin, W. E. M., R.R. 2, Ravenna, Ont.
Aitken, Mrs. W. E. M., R.R. 2, Ravenna, Ont.
Brown, Florence, R.R. 2, Ilderton, Ont.
Bailey, Miss, R.R. 3, Auburn, Ont.
Bell, J. R., Laurel, Ont.
Bemister, Geo., Haliburton, Ont.
Blanchard, J. H., Charlottetown, P.E.I.
Bridgette, S. J., Lucknow, Ont.
Clarke, C. F., Harrow, Ont.
Collins, Walter D., Exeter, Ont.
Conway, W., Auburn, Ont.
Carpenter, W. F., Horning's Mills, Ont.
Dunlop, Miss Anna, Brussels, Ont.
Currie, H. W., Cromarty, Ont.
Draper, C. D., Milton, Ont.
Edgar, J. D. (Rev.), 118 Yorkshire St., Guelph, Ont.
Farquharson, C. D., St. George, Ont.
Gandier, Rev. Alfred, Knox College, Toronto, Ont.
Galvin, P., Norwood, Ont.
Guest, Miss E. J., 30 McMaster Ave., Toronto, Ont.
Hamilton, J. D., Goderich, Ont.
Hayes, Father, Breckin, Ont.
Herbert, M., Belton, Ont.
Hinman, E. B., R.R. 5, Colborne, Ont.
Hislop, Miss Susan, Brussels, Ont.
Holdsworth, C. W., Havelock, Ont.
Kidd, J. A., Cookstown, Ont.
Kiteley, W. M., Florence, Ont.
Kennedy, Allan P., Stayner, Ont.
Lindsay, N., Dover Centre, Ont.
Laing, A., Auburn, Ont.
Lundy, Rev., Brussels, Ont.
Matherson, P., Walter's Falls, Ont.
More, Rev. J. H., Box 72, Caledon East, Ont.
Moir, Rev. M., Guelph, Ont.
McMillan, Angus, Macdonald College, Quebec.
McAlpine, W. S., Delta, Ont.
McCulloch, Rev. R., Ilderton, Ont.
McNaught, Miss B., West Monkton, Ont.
McRoberts, A. C., Corinth, Ont.
Radford, J., Chippewa, Ont.
Rose, Rev. W. G., Milton, Ont.
Reed, Wm., Paris, Ont.
Ryott, Rev. F. C., Kirkton, Ont.
Riddell, W. A., Confederation Life Bldg., Toronto.
Ryder, Joseph, Parry Sound, Ont.
Ryrie, Harry, Oakville, Ont.
Ryrie, James, Oakville, Ont.
Schofield, Rev. J. W., Freeman, Ont.
Shearer, Rev. W. K., Drumbo, Ont.
Stover, Miss, Forbes Ave., Guelph, Ont.
Tucker, Rev. S. T., Deseronto, Ont.
Wilson, Miss Alberta, 1906 H. St. N.W., Washington, D.C.
Zavitz, Miss Edith, R.R. 2, Ilderton, Ont.
Zavitz, Miss Camilla, R.R. 2, Ilderton, Ont.

New Students in Agricultural Classes, September 17th.

First Year.

Alguero, Adalberto J., Panama, Rep. of Panama.
Allan, Douglas R., 140 Carling Ave., Ottawa, Ont.
Andress, Ashley L., Indian River, Ont.
Argue, Wm. Frederick, 590 Lisgar St., Ottawa, Ont.
Atkin, Edward J., Box 382, Leamington, Ont.
Atkin, Ray, North Malden, Ont.

New Students in Agricultural Classes.—Continued.

Aylsworth, D. F., Bath, Ont.
Barber, John S., Rossmore, Ont.
Bateson, Fulton R. V., 192 Albert St., London, Ont.
Bolton, Willard E., Wiarton, Ont.
Brink, R. Alexander, Beachville, Ont.
Buchanan, Angus H., Kemptville, Ont.
Bews, Russell, 94 Emerald St. S., Hamilton, Ont.
Caldwell, D'Eyncourt, 289 Wolsley St., Port Arthur, Ont.
Caldwell, Wm. C., Carp, Ont.
Campbell, C. Arleigh, R.R. 1, Marshville, Ont.
Carr, Samuel L., Burnhamthorpe, Ont.
Carson, Hugh A., Oakville, Ont.
Cassels, Henry, 42 King St. W., Toronto, Ont.
Clark, Andrew P., Tyvan, Sask.
Cline, Courtland A., 161 Sandford Ave. N., Hamilton, Ont.
Coatsworth, Emerson E., 428 Main St., Buffalo, N.Y.
Cochrane, John H., Brougham, Ont.
Cody, Walter B., 55 Wentworth St. S., Hamilton, Ont.
Cook, W. O., Kingston, Ont.
Cook, Milford, R.R. 5, Brampton, Ont.
Cornell, Stanley G., Troy, Ont.
Costogue, Dick C., 55 Hansom Place, Brooklyn, N.Y.
Coulter, Wm. H., Bethany, Ont.
Crews, Kenneth W., Trenton, Ont.
Cunningham, Harold S., Wakesiah Farm, Nanaimo, B.C.
Duff, Mark, Myrtle, Ont.
DuToit, Arnoldus M., "Bellevue," De Wet Sta., Worcester, U.S.A.
Ferguson, Geo. W., Box 233, Cobourg, Ont.
Fisher, John, Muncey, Ont.
Flatt, Chas. M., R.R. 2, Hamilton, Ont
Forrest, Robert, Hillbank, Vancouver Id., B.C.
Gardhouse, Wilbert W., Weston, Ont.
Goudie, Elton B., Hespeler, Ont.
Gowland, R. Cecil, Fergus, Ont.
Grant, Gerald S., 9 Queen's Park, Port of Spain, Trinidad, B.W.I.
Grunder, Neil A., R.R. 1, Tiverton, Ont.
Gunn, Wallace R., Avonmore, Ont.
Hale, Harold A., Wardsville, Ont.
Haley, Newton G., Springford, Ont.
Hamilton, Frederick W., Box 284, Guelph, Ont.
Hammersley, Alfred S., 67 Forbes Ave., Guelph, Ont.
Hanna, D., 60 St. Clair Ave. E., Toronto, Ont.
Hardy, Howard W., Oakwood, Ont.
Harkness, Norman J., R.R. 1, Sundridge, Ont.
Hart, Dougal H., R.R. 3, Woodstock, Ont.
Hetherington, Thos. F., 94 Roper Ave., Toronto.
Higgins, J. Ross, Kemptville, Ont.
Hodgins, Vibert W., Preston, Ont.
Howarth, Chas. M., 6 Hurndale Ave., Toronto, Ont.
Hunter, Gordon F., 628 Huron St., Toronto, Ont.
Inderwick, Chas., Perth, Ont.
Ingraham, Robt. C. J., Petrolea, Ont.
Jackson, Chas. F., Straffordville, Ont.
Jones, Thomas H., Fruitland, Ont.
Karn, Freeman M., R.R. 1, Woodstock, Ont.
Karn, Lloyd W., R.R. 1, Woodstock, Ont.
Kezar, John H., Britannia Heights, Ont.
Kimball, Donald A., Vineland Station, Ont.
Main, Cecil R., R.R. 2, Branchton, Ont.
Martin, Gordon L., 136 Holton Ave. S., Hamilton, Ont.
Mason, George R., Vineland Station, Ont.
Matheson, Duncan J., R.R. 3, Lucknow, Ont.
Mead, Arthur W., Riverside Farm, R.R. 1, Smithville, Ont.
Mills, Donald L., R.R. 1, Tilbury, Ont.
Minielly, Edmund G., Wyoming, Ont.
Moore, Arthur R., Box 43, Lindsay, Ont.
Munro, John B., Slate River Valley, Ont.
Musgrave, Arthur H. K., 48 Collier St., Toronto, Ont.
McDonald, Wilfrid D., Wiarton, Ont.
McGowan, Ravenna, Ont.
McKay, Wm. G., R.R. 4, St. Mary's, Ont.
McKenzie, Stewart, R.R. 4, Harriston, Ont.
McLean, John, Jarvis, Ont.
Nelson, Hunter J., Laurel, Ont.
Neville, Andrew E., Cottam, Ont.
Nimmo, Wm. R., 65 College St., Port Arthur, Ont.
Odell, Frederick C., Box 242, Ottawa, Ont
Oliver, Richard W., 187 Hughson St. S., Hamilton, Ont.
Patterson, Delbert J., R.R. 3, Newbury, Ont.
Pearsall, Luke W., Oro Station, Ont.
Peters, W. R., Uno Park, Ont.
Porter, Schuyler J., Brooklin, Ont.
Powell, Melvin A., R.R. 4, Kemptville, Ont.
Raymond, Richard D., Bournedale, Mass.
Renwick, Herbert L., Hespeler, Ont.
Rutter, Henry M., 11 Howard St., Belleville, Ont.
Scouten, Walter, Wilton, Ont.
Secord, Richard R., R.R. 1, Harley, Ont.
Shales, John M., Box 49, Perth Road, Ontario.
Shield, Thos. H., 153 Benson Ave., Peterboro', Ont.
Shutt, Donald B., 71 St. Clements Ave., Toronto.
Sibbick, Glendon R., Richwood, Ont.
Smith, James R., 320 Fairmont Ave., Ottawa, Ont.
Steckle, John S., R.R. 2, Berlin, Ont.
Stewart, Andrew M., Waba, Ont.
Stillwell, Erwin C., Merrickville, Ont.
Story, Harold M., 45 Paisley St., Guelph, Ont.

New Students in Agricultural Classes.—Continued.

Stover, Miles H., Elginburg, Ont.
Surgenor, Wm. J., Cornwall, Ont.
Taylor, Earl J., St. George, Ont.
Taylor, Walter S., 647 Don Mills Rd., Todmorden, Ont.
Thomas, Fletcher S. P., Streetsville, Ont.
Thompson, Brodie, Box 727, Port Hope, Ont.
Tice, Cecil, Dunboyne, Aylmer, Ont.
Toole, Howard, Mount Albert, Ont.
Wadsworth, John, Lambeth, Ont.
Walker, Roy E., R.R. 1, Milverton, Ont.
Way, James I., 24 Gladstone Ave., St. Thomas, Ont.
Weld, Douglas S., 50 Ridout St., London, Ont.
Western, Hubert U., Windermere, Ont.
White, Ralph E., R.R. 1, Myrtle Station, Ont.
Whitelock, J. E., R.R. No. 3, Woodstock, Ont.
Wilson, Robt. J., 21 Ferrier Ave., Toronto, Ont.
Wilson, Wm. J., Tyvan, Sask.
Wiltshire, Arthur E., R.R. 3, New Westminster, B.C.
Wood, Wm. Y., Rockton, Ont.
Wyatt, Herbert, R., R.R. 1, Cottam, Ont.
Ziegler, Walter T., 24 Paulding Ave., Tarrytown, N.Y.

Second Year.

Edgar, James D., 118 Yorkshire St., Guelph, Ont.
Fisher, Murray W., Burlington, Ont.
Flock, John A., Burlington, Ont.
Lindenburg, Alexis, Worcester, S. Africa.
Mitchener, Alvin V., R.R. 3, Port Rowan, Ont.
Munro, A. D., North Lancaster, Ont.
Robinson, William, 176 Ossington Ave., Toronto, Ont.
Richards, T. C., Glencairn, Ont.
Stoddart, Thomas, Copper Cliff, Ont.

Third Year.

Austin, Wm. J., R.R. No. 5, Simcoe, Ont.
Begg, Robert E., Tiverton, Ont.
Bird, Wm. J., 108 Eglinton Ave. W., N. Toronto, Ont.
Clark, H. W., Stouffville, Ont.
Guild, A. W., Jordan Harbour, Ont.
Harding, Alexander, Lougheed, Alta.
Lawrence, John W., Mandamin, Ont.
Manton, Wm. D., Eglinton, Ont.
Neff, Harvey W., General Delivery, Hamilton, Ont.
Redmond, Athol A., Dartmouth, N.S.
Sanford, Philip L., Coldbrook, N.S.
Schurman, David C., North Baddeck, P.E.I.
Sutton, R. G., Norwich, Ont.
Van Every, William S., Pelham Corners, Ont.
White, Arthur H., Sardis, B.C.

Fourth Year.

Amos, Loyal, Box 125, Guelph, Ont.
Archibald, John G., Upper Stewiacke, N.S.
Chisholm, W. M., Loch Lomond, C.B.

Course for B.Sc. (Agr.).

(September to December).

Third Year.

Richardson, G. Arthur, R.R. 2, Stirling, Ont.

Special Students.

(September to December).

Mann, Arthur J., Colquitz, B.C.
Perine, Clifford, Doone, Ont.
Murdock, Miss, R.R. 6, Guelph, Ont.

Manual Training.

(September to December).

Arnold, Chas. H., 549 Sherbourne St., Toronto, Ont.
Chrysler, Chas. G., Burford, Ont.
Pomeroy, R. Howard, Fullerton, Ont.
Smyth, Wm. E., Formosa, Ont.

MACDONALD INSTITUTE,

Domestic Science Courses.

Junior Normal Domestic Science Course.

(January to June).

Black, Chryssa L., 64 Glasgow St., Guelph, Ont.
Easton, Helen L., Leamington, Ont.
Hopper, Margaret Eleanor, Cookstown, Ont.
Macdonald, M. Lillian, Sherbrooke, N.S.
Moxon, Mary C., Box 392, Truro, N.S.
Percy, Kate M., Bowmanville, Ont.
Ramage, Minnie G., Clarence, Ont.
Rumball, Mabel E., 166 Main St., Niagara Falls, Ont.
Scott, Annie P., Nottawa, Ont.
Scott, Mary N., Bervie, Ont.
Smith, Eleanor M., Box 95, Truro, N.S.
Watson, M. Beatrice, 50 Ominica St. W., Moose Jaw, Sask.
Whiteside, Lida M., Little Britain, Ont.
Williams, Marjorie H., Jarvis, Ont.

Senior Normal Domestic Science Course.

(January to June).

Black, C. Tena, Hawkestone, Ont.
Bradley, Jean C., 316 Brock St. N., Sarnia, Ont.
Cockburn, M. Lila, 40 Park Ave., Guelph, Ont.
Conover, Grace, Brampton, Ont.
Crews, Jessie, R.R. No. 3, Trenton, Ont.
Cunningham, Katharine, 260 Pleasant St., Halifax, N.S.
Dickinson, Ethel G., 4 Park Row, Rennie's Mill Road, St. John's Nfld.
Dowler, Kathleen, 66 St. James Place, Winnipeg, Man.
Grothier, Lena, Newboro, Ont.
Hanna, Ethel G., 78 Elliott Row, St. John, N.B.
Kelso, Mary L,. 602 Sixteenth St., Brandon, Man.
McDermand, Bessie, Lakeview, Ont.
Manning, Gladys, 156 Mavety St., Toronto, Ont.
Rocher, Renee D., Koster, via Krugersdorp, Transvaal, South Africa.

Junior Associate Course.

(January to June).

Beven, Frances, Ancaster, Ont.
Grenside, E. Frederica, 115 Norfolk St., Guelph, Ont.
Halliday, Florence, 15 Waverley St., Ottawa, Ont.
Mowat, Amy, Suffolk St., Guelph, Ont.
Saxton, Margaret, Lakeview, Ont.
Shannon, Florence, c-o Major Shannon, London, Ont.
Stewart, Marguerite, Abernethy Apts., 6 Howard St., Toronto, Ont.
Wells, Nellie, 368 Victoria St., Toronto, Ont.

Senior Associate Course.

(January to June).

Conrad, Blanche, W., Restholme, Hamilton, Ont.
Davis, Margaret H., New Westminster, B.C.
Dunbar, Miriam J., 99 Quebec St. W., Guelph, Ont.
Gwyn, Clara F., Dundas, Ont.
Murdoch, Maysie S. G., Aldie, Guelph, Ont.

Junior Housekeeper Course.

(January to June).

Allan, Frances, 253 Waterloo Ave., Guelph, Ont.
Byers, M. Dorothea, 188 Grenadier Road, Toronto, Ont.
Hall, Jessie R., R.R. No. 4, Bright, Ont.
Henderson, Henrietta P., Blenheim, Ont.
Hopkins, Edith, R.R. No. 1, Lindsay, Ont.
McIlquham, Jean M., Lanark, Ont.
Murray, Alicia W., 58 Ontario St., Stratford, Ont.
Reek, Florence M., Blenheim, Ont.
Stevenson, Kathleen, Orangeville, Ont.

Senior Housekeeper Course.

(January to June).

Downey, Winifred, 260 Dundas St., Belleville, Ont.
Gray, Pearl M., Eden, Ont.
Hill, Marion S., 68 Liverpool St., Guelph, Ont.
McMillan, Mrs. Anna E., Ceylon, Ont.
Martin, Carrie H., Box 54, Preston, Ont.
Master, Elizabeth, New Dundee, Ont.
Milton, Susan G., R.R. No. 1, Kingston, Ont.
Montgomery, Mary, Lanark, Ont.
Panton, Leonora, Milton West, Ont.
Smith, May, Petrolea, Ont.
Whitehead, May, 17 Hayman Court, London, Ont.

Homemaker Course.

(January to June).

Cochran, Isobel, 225 Spadina Road, Toronto, Ont.
Farrar, Ruth I., 753 Main St. E., Hamilton, Ont.
Hallett, Agnes E., 23 Liverpool St., Guelph, Ont.
Hanna, Margaret, 236 Brock St. N., Sarnia, Ont.
Hornibrook, Marion O., Caledonia, Ont.
Horning, M. Naomi, Ancaster, Ont.
Ingram, Beatrice I., 92 Clapperton St., Barrie, Ont.
Irwin, Florence, Box 204, Galt, Ont.
Kemp, Jean, R.R. No. 6, Owen Sound, Ont.
Lahey, Alice, 124 Alfred St., Brantford, Ont.
Laughlin, Louise E., Caledon, Ont.
Laughlin, R. May, Belfountain, Ont.
Molony, Kathleen, Norval, Ont.
Murphy, Adeline V., Seaforth, Ont.
Murray, Isabel S., 39 Sheldrake Blvd., Toronto, Ont.
Oldham, Emma E., Wallaceburg, Ont.
Pringle, Madeline, 142 William St., Chatham, Ont.
Richards, Edna, 302 Wellington St., Chatham, Ont.
Schneider, Emma, 145 Queen St. S., Berlin, Ont.
Sparrow, Catherine W., 120 Heath St. W., Toronto, Ont.
Toy, Marjorie, 73 Prince Arthur Ave., Toronto, Ont.
Widdifield, Marjorie C., Newmarket, Ont.
Williamson, Mary A., St. Mary's, Ont.

Homemaker Course.

(January to December).

Anderson, Dorothy, 167 Lowther Ave., Toronto, Ont.
Anderson, Marjorie, 167 Lowther Ave., Toronto, Ont.
Crichton, Maria, Arthur, Ont.
Crocker, Harriet, 185 Ossington Ave., Toronto, Ont.
Featherston, Ethel, R.R. No. 2, Milton, Ont.
Hearst, Isabel, 80 Glen Road, Toronto, Ont.
McCarthy, Leah V., 3 Elm Ave., Toronto, Ont.
Mayhew, Edna M., Huntsville, Ont.
Watt, Hattie, 104 Surrey St., Guelph, Ont.
Young, Maggie May, R.R. No. 2, Guelph, Ont.

Homemaker Course.

(January to March).

Brubacher, Olive, 17 Irwin St., Berlin, Ont.
Burling, Vera E., Pickering, Ont.
Cleghorn, Corea, 86 Water St. N., Berlin, Ont.
Fisher, Norma, Huntsville, Ont.
McQueen, Marjorie C., 408 Fourth St., Edmonton, Alta.

Short Course in Domestic Science.

(January to March).

Augustine, Winnifred, Bothwell, Ont.
Barrie, Jean A., R.R. No. 7, Galt, Ont.
Brown, Stella, R.R. No. 1, Lynnville, Ont.
Buchanan, Millicent, Branchton, Ont.
Campbell, Mayme C., R.R. No. 2, Blenheim, Ont.
Dalrymple, A. Grace, R.R. No. 1, Cromarty, Ont.

Short Course in Domestic Science—Continued.

Devereax, Daisy, R.R. No. 1, Lynnville, Ont.
Dougherty, Alice, Pembroke, Ont.
Hewitt, Blanche E., Plattsville, Ont.
Jones, May, Dungannon, Ont.
Kirkpatrick, Nellie, New Flos, Ont.
MacMurray, Naomi E., Dundas, Ont.
Mintern, Ruth, Brantford, Ont.
Nesbitt, Winnifred, Eastwood, Ont.
Newham, Lily, 75 Erie Ave., Brantford, Ont.
Petty, Florence, R.R. No. 2, Hensall, Ont.
Quinlan, Alice M., Barrie, Ont.
Quinlan, Jean M., Barrie, Ont.
Salkeld, E. Irene, R.R. No. 2, Goderich, Ont.
Schwenger, Kate, 1036 Main St. E., Hamilton, Ont.
Scott, Louise, Norwood, Ont.
Weber, Lillian May, R.R. No. 1, Waterloo, Ont.
Wickett, Florence A., Foxboro, Ont.
Wilson, Ethel M., R.R. No. 2, Ayr, Ont.

Optional Students.

(January to March).

Gilchrist, Jean D., Berlin Road, Guelph, Ont.
Hepburn, Helen, 156 Grange St., Guelph, Ont.
Lindsay, Mae A., Acton, Ont.
Story, Janet, O., Crossdoney, Guelph, Ont.
Taylor, Wanda, 111 Cork St., Guelph, Ont.

One Year Normal Household Science Course.

(January to June).

Foote, Muriel I., Fonthill, Ont.
Hanham, Zella E., Port Colborne, Ont.
Hayes, Olive E., Parkhill, Ont.
Isbister, Lilla B., Wingham, Ont.
Jacques, Hazel W., 81 Brunswick Ave., Toronto, Ont.
Kennedy, Catharine A., 269 Brock St., Sarnia, Ont.
Kiteley, Jennie M., R.R. No. 1, Bradford, Ont.
Rogers, E. Jennie, Wardsville, Ont.
Sutton, Verna E., R.R. No. 3, Lambeth, Ont.
Westcott, Winifred, Sault Ste. Marie, Ont.

Homemaker Course.

(April to December).

Baillie, Mary, Simcoe, Ont.
Blake, Margaret, 24 Prince Arthur Ave., Toronto, Ont.
Campbell, Reba A., 124 Robinson St., Hamilton, Ont.
Elliott, Edith, Morrisburg, Ont.
Greene, G. Eardley, 124 Bloor St. W., Toronto, Ont.
Junkin, Janet, C., 165 Crescent Road, Toronto, Ont.
McAllister, Emmeline, 485 Waterloo Ave., Guelph, Ont.
Mulveney, Vera L., 518 West 111th St., New York, U.S.A.
Penharwood, Reita S., Sault Ste. Marie, Ont.
Stewart, Helen M., 585 Main St. E., Hamilton, Ont.
Turner, Helen, Little Current, Ont.
Wilson, I. Doreen, 1048 Queen St., Sault Ste. Marie, Ont.

Short Course in Domestic Science.

(April to June).

Alexander, Ina G., Pinkerton, Ont.
Allen, Margaret, Burlington, Ont.
Cooke, Florence E., 72 Grenville St., Toronto, Ont.
Creelman, Margaret, O.A.C., Guelph, Ont.
Creswicke, Ida M., 190 Bayfield St., Barrie, Ont.
Elliott, Helen M., Fort Erie, Ont.
Grant, Lucy, Hazeldean, Ont.
Kent, Grace A., R.R. No. 1, Sundridge, Ont.
Leslie, Annie, 13 Eramosa Rd., Guelph, Ont.
McKenzie, Winnifred, Murillo, Ont.
Mahood, Bertha, 103 Johnston St., Kingston, Ont.
Milton, Norma E., R.R. No. 1, Kingston, Ont.
Neill, Margaret M., 359 Hunter St., Peterborough, Ont.
Olmstead, Lucia E., 192 Main St., Niagara Falls, Ont.
Stephens, Eliz. A., Aurora, Ont.
Turner, Beatrice M., Millbrook, Ont.
Vance, E. Lois, 116 Collier St., Barrie, Ont.
Wismer, Florence B., Barrie, Ont.

Optional Students.

(April to June).

Hepburn, Helen, 156 Grange St., Guelph, Ont.
Jackson, Mrs. G. B., 220 Dublin St., Guelph, Ont.

Junior Normal Domestic Science Course.

(September to December).

Birdsall, Etta, R.R. No. 1, Guelph, Ont.
Birkett, Mary, Box 231, Niagara Falls, Ont.
Duff, Mary E., Cookstown, Ont.
Geddes, A. Mabel, 16 Pearl St., St. Thomas, Ont.
Grant, B. Jennie, Duthill, Ont.
Lammiman, Aleda, Currie's Crossing, Ont.
McCully, Dorrit L., 30 Botsford St., Moncton, N.B.
MacIntyre, F. Christine, Kemptville, Ont.
Murray, Olive H., Ingersoll, Ont.
Nixon, Laura, St. George, Ont.
Wallace, Eliz., Seagrave, Ont.
Willson, Millie, Marshville, Ont.

Senior Normal Domestic Science Course.

(September to December).

Black, Chryssa L., 84 Glasgow St., Guelph, Ont.
Easton, Helen L., Leamington, Ont.
Hopper, Margaret E., Cookstown, Ont.
Macdonald, M. Lillian, Sherbrooke, Ont.
Moxon, Mary C., Box 392, Truro, N.S.
Moyer, Grace I., Paisley Memorial Parsonage, Guelph, Ont.
Percy, Kate M., Bowmanville, Ont.
Ramage, Minnie, Clarence, Ont.
Rumball, Mabel E., 166 Main St., Niagara Falls, Ont.
Scott, Annie P., Nottawa, Ont.
Scott, Mary N., Bervie, Ont.
Smith, Eleanor M., Box 95, Truro, N.S.
Watson, M. Beatrice, 50 Ominica St., Moose Jaw, Sask.
Williams, Marjorie H., Jarvis, Ont.

Junior Associate Course.

(September to December).

Bright, Doreen, 447 Somerset St., Ottawa, Ont.
Balkwill, Mabel, 146 Wellington St., St. Thomas, Ont.
Chown, Dorothy, Sunnyside, Union St., Kingston, Ont.
Cooke, Florence E., 72 Grenville St., Toronto, Ont.
Creelman, Margaret, O.A.C., Guelph, Ont.
Hodgetts, Gwyneth, 218 McLaren St., Ottawa, Ont.
Hoey, Mary, R.R. No. 5, Campbellford, Ont.
Houghton, Dora A., Heaslip, Ont.
Langford, Elizabeth, Cobourg, Ont.
Miles, Pauline, 396 College St., Toronto, Ont.
Montgomery, Edna W., Suite 7, Hugo Apts., Winnipeg, Man.
Serson, Kathleen R., Elginburg, Ont.
Sheridan, Marie L., 15 Forest Hill Road, Toronto, Ont.
Smith, Verna L., 339 Davis St., Sarnia, Ont.
Wylie, Beatrice, Grimsby Beach, Ont.

Senior Associate Course.

(September to December).

Beven, Frances, Ancaster, Ont.
Grenside, Edith F., 115 Norfolk St., Guelph, Ont.
Saxton, Margaret, Lakeview, Ont.
Shannon, Florence, c-o Major Shannon, London, Ont.
Stewart, Marguerite C., Abernethy Apts., 6 Howard St., Toronto, Ont.
Story, Janet O., Crossdoney, Guelph, Ont.
Wells, Nellie, 368 Victoria St., Toronto, Ont.

Junior Housekeeper Course.

(September to December).

Elliott, Edith, Morrisburg, Ont.
Fraser, Rona W., 135 Rutledge Ave., East Orange, N.J., U.S.A.
Grant, E. Helen, Forbes Ave., Guelph, Ont.
Healey, Mary H., 85 King St., St. Catharines, Ont.
Loynachan, Eva, R.R. No. 1, Williamstown, Ont.
O'Flynn, Edith M., Shelburne, Ont.
Winlow, Helen, 24 Arthur St., Guelph, Ont.
Witner, Mabel A., Sub. P.O. No. 2, Victoria, B.C.

Senior Housekeeper Course.

(September to December).

Allan, Frances, 253 Waterloo Ave., Guelph, Ont.
Hall, Jessie R., R.R. No. 4, Bright, Ont.
Henderson, Henrietta P., Blenheim, Ont.
Hopkins, Edith, R.R. 1, Lindsay, Ont.
McIlquham, Jean C., Lanark, Ont.
Murray, Alicia W., 58 Ontario St., Stratford, Ont.
Reek, Florence M., Blenheim, Ont.
Stevenson, Kathleen, Orangeville, Ont.

Homemaker Course.

(September to December).

Bell, Jean D., Chesley, Ont.
Buck, Phyllis A., 70 Dufferin Ave., Brantford, Ont.
Carscadden, Helen M., Burketon Jct., Ont.
Clemens, May, Hespeler, Ont.
Davis, Marjorie L., Neepawa, Man.
Elder, Grace V., Hensall, Ont.
Fletcher, Annie E., Ostrander, Ont.
Haley, Olive, R.R. No. 1, Springford, Ont.
Hanson, Selma O., Wheatley, Ont.
Harvey, H. Eileen, 297 Prince Arthur St. W., Montreal, Que.
Herteis, Georgina, 221 Victoria St., Berlin, Ont.
Hewson, Edna P., Penetanguishene, Ont.
Houghton, Mary A., Heaslip, Ont.
Keith, Mabel, Granton, Ont.
Kingsboro, Margaret, R.R. No.1, York, Ont.
Krug, Lily, Chesley, Ont.
Lineham, Elizabeth B., 1531 Barclay St., Vancouver, B.C.
Lineham, Elma M., 1531 Barclay St., Vancouver, B.C.
Marsh, Victoria M., Lindsay, Ont.
Monteith, Maude, R.R. No. 2, Stratford, Ont.
Nixon, Mabel J., 112 Albert St., Sault Ste. Marie, Ont.
Pearson, Jewell, 65 Langley Ave., Toronto, Ont.
Shannon, Marian E., 661 Queen St., Sault Ste. Marie, Ont.
Stewart, Jennie C., Chesley, Ont.
Trotter, Kathleen F., North Forest Hill Road, York, Ont.
Tyrrell, Mary, 14 Walmer Rd., Toronto, Ont.
Webster, Isabel, 581 Spadina Ave., Toronto, Ont.
Wells, Adah, 368 Victoria St., Toronto, Ont.
Woodyatt, Doreen S., 140 Alfred St., Brantford, Ont.

Short Course in Domestic Science.

(September to December).

Anderson, Blossom, R.R. No. 3, Exeter, Ont.
Baker, Edithe F., Grimsby, Ont.
Binnington, Elleda M., Cataraqui, Ont.
Burns, Winifred M., 40 Frontenac St., Kingston, Ont.
Bush, Virgina L., Inglebush, Port Hope, Ont.
Clark, Catherine, Lancaster, Ont.
Cornell, Ada H., Port Stanley, Ont.
Crowe, Minnie L., Port Elgin, Ont.
Dolph, Kathleen, Preston, Ont.
Edgar, Frances, R.R. No. 2, Wroxeter, Ont.
Fairclough, Gladys E., 214 George St., Hamilton, Ont.
Faris, Jean A., Bradford, Ont.
Fisher, Evelyn, Ashburn, Ont.
Graybill, C. Olive, Waterloo, Ont.
Johnson, Marjorie, Norwood, Ont.
McLarne, Annie G., 365 Spadina Road, Toronto, Ont.
MacPhail, Katherine L., Cayuga, Ont.
Malcolm, Agnes, R.R. No. 2, Ravenna, Ont.
Musselman, Minerva, 17 York St., Berlin, Ont.

Optional Students.

(September to December).

Day, Dorothy, O.A.C., Guelph, Ont.
Dunbar, Miriam, 99 Quebec St. E., Guelph, Ont.
McIntosh, Mary, Delhi St., Guelph, Ont.

REPORT

OF THE

Ontario Veterinary College

1915

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by A. T. WILGRESS, Printer to the King's Most Excellent Majesty
1916

Printed by
WILLIAM BRIGGS
Corner Queen and John Streets
Toronto

To His Honour, SIR JOHN STRATHEARN HENDRIE, C.V.O., a Lieutenant-Colonel in the Militia of Canada, 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 Ontario Veterinary College, for the year 1915.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

TORONTO, 1916.

Ontario Veterinary College, 110 University Avenue, Toronto, Canada.

THE ONTARIO VETERINARY COLLEGE

COLLEGE STAFF AND SUBJECTS TAUGHT

E. A. A. Grange, V.S., M.Sc., Ontario Veterinary College, Toronto.
Contagious Diseases. Veterinary Hygiene.

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Physiology.

C. G. Saunders, V.S., B.V.Sc., 439 Spadina Avenue, Toronto.
Anatomy, Surgery, Canine and Feline Diseases.

D. R. Caley, V.S.
Assistant in Anatomy and Surgery.

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Sporadic Diseases of Horses and Cattle, Obstetrics, Dentistry, Principles of Horse-shoeing.

D. King Smith, M.B., V.S., 22 Wellesley Street, Toronto.
Pathology, Parasitology, Milk Inspection.

L. T. Addison, B.A., M.D., 431 Broadview Avenue, Toronto.
Biology, Histology, Pathology.

Paul L. Scott, M.B., 19 Avenue Road, Toronto.
Pharmacy.

J. A. Campbell, V.S., 8 Edward Street, Toronto.
Dairy Inspection.

Dyce W. Saunders, K.C., 213 Poplar Plains Road, Toronto.
Veterinary Jurisprudence.

F. B. Kenrick, B.A., Ph.D., University of Toronto, Toronto.
Chemistry.

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Meat Inspection.

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Zootechnics.

H. D. Nelson, V.S., B.V.Sc.
Demonstrator.

H. G. Willson, B.A., M.B., 633½ Spadina Avenue, Toronto.
Demonstrator.

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Demonstrator.

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Demonstrator.

M. D. McKichan, B.A., M.D.
Demonstrator.

A. R. B. Richmond, V.S., B.V.Sc., Toronto.
Demonstrator.

S. A. Cudmore, B.A. (Oxon.), 115 Howland Avenue, Toronto.
Tutorial Instructor.

J. E. Anderson, 37 Salisbury Avenue, Toronto.
Executive Clerk.

Report of the Ontario Veterinary College, 1915

To the Honourable James S. Duff, *Minister of Agriculture, Toronto.*

Sir,—I have the honour to submit the following report of the Ontario Veterinary College for the year ending 30th October, 1915.

The new College building on University Avenue having been completed and equipped the Faculty was enabled to give a full course of lectures and demonstrations in it, except botany, chemistry and physiology which are taught in the capacious and well equipped laboratories of the University.

The present system of heating, lighting and ventilating the new building seems to have had a most salutary effect on the health and comfort of students and teachers, whose duties require them to spend many hours of the day in the class rooms or laboratories of the College.

The construction of the College building as it now stands enables the teachers to darken their class rooms at almost a moment's notice, and they are able to illustrate their remarks with lantern slides, and when it becomes necessary to bring solid or opaque objects before the class, the College has a special instrument for the purpose which projects the object onto a screen where it is magnified many times and large classes can thus see it while the description of it is being made by the instructor.

The present method for illustrating lectures here has made it possible to extend the course of instruction without taking up extra time, as the student is often better able to absorb permanently that which he sees than that which he hears, and do it in less time.

During the session of the College some illustrated lectures were delivered to our classes by Dr. Reid Blair, Veterinarian to the Zoological Park in New York, on the Surgical and Medical treatment of Wild Animals in Captivity; they proved of much interest and value to our students.

Owing to the demand for trained men in the Army Service arrangements were made with the University of Toronto which enabled students of this College to join the Officers Training Corps of the University, and about seventy-five of our students availed themselves of this opportunity to get some preliminary military training.

OPENING EXERCISES OF THE COLLEGE.

At the opening of the College this year the members of the staff and students were addressed by Dr. C. C. James, Dominion Commissioner of Agriculture, and Dr. W. Cowan, of Galt, one of the early graduates of the College, as far back as 1868. The speakers were introduced by a few suitable remarks from Principal Grange and Dr. James proceeded with the following address:

"In the year 1831, before this was the Province of Ontario, when it was known as the Province of Upper Canada, a Scotch 'Advocate' and farmer came out to this country. He made a tour of Lower Canada and Upper Canada and crossed over into New York State by way of the Falls, visiting Buffalo. When he returned to Scotland at the end of the year he wrote a book entitled 'Notes on Canada—practical notes made during a tour of Canada and the United States in 1831, by Adam Fergusson, dedicated by permission to the Highland Society of Scotland.' He gave some advice to his fellow Scotsmen at home, particularly the farmers who were thinking somewhat of leaving the Old Land, where things were not very prosperous. He gave them much good advice on what they would find in this country, and I have no doubt that this book, which I have here in my hand, was the means of bringing out to this country a large number of Scottish farmers. These farmers were breeders of horses, cattle and sheep, and were the means of laying deep and well the foundation of live stock in this Province. He was so well pleased with what he saw of the country that two years later, in 1833, he came out again. A second edition of this book was issued, with additional notes, in 1834. He found that he had persuaded not only others to come out here, but that he himself could not resist the temptation, and the result is that this Scottish farmer, Adam Fergusson, came out to Canada with his family, settled down in this Province and became one of the pioneer live stock farmers of Ontario.*

"It might be interesting to give you a few sentences from his introduction:

If there are those who consider the Sun of Britain about to set, I disclaim all participation in their fears. That our position is critical, I admit; but, with liberality and firmness in our rulers, and with moderation and good sense in the great body of the nation, and, above all, by humble reliance upon Almighty God, the Little Island will float triumphant yet.

The sentiments of a candid and intelligent citizen of the States, lately expressed to me, deserve to be deeply weighed. "Even," says he, "with your present burden of debt, if your Government were to renounce all interference with the affairs of the Continent, and keep no more force, land or naval, than is necessary for your own security; have no more wars, and diminish the expenditure as much as possible, you would grow so rapidly in the next fifty years that your debt would cease to be of any importance. I earnestly hope that the passage of the Reform Bill may be only the prelude to an entire change of system, and that your successors may feel, as we do here, that wars do not promote the prosperity of a nation, and have the good sense to avoid them."

Whether at any, or at what period, our North American Colonies may cast off the Parent State are questions in the womb of time. Let the policy of both be, meanwhile, directed to foster a conciliatory spirit, ready to meet any emergency which may occur, and to prove that the costly experience of time past has not been thrown away, whether the event may terminate in separation or adherence.

"The Allied European countries are passing through the greatest period of stress and storm, but this is not the first time that they have had to face great difficulties. The reference to this period of the '30's will bring back to us this historical fact that there have been periods of trial in the past; and just as those old countries braved the storms and came through stronger than ever, so we feel that if we have come upon a period of greater trial and greater suffering, the three countries of the British Isles will come out of the present trial even stronger and better than ever. The suggestion as to Canada's future is interesting reading in these days when Canadians are fighting in Belgium, France and the Dardanelles.

*An interesting sketch of Hon. Adam Fergusson (with portrait), written by Mr. J. C. Boylen, Secretary of the Ontario Department of Agriculture, will be found in *The Canadian Magazine* for October, 1913.

"What has all this to do with the Ontario Veterinary College? Adam Fergusson is typical of those Old Country farmers who came out here and started the great live stock industry of this country. He afterwards became one of the members of the Legislative Council, and so was entitled to be known as "Honourable." He later became a member of the Board of Agriculture, wherein lies the connection between the writer of the book and this institution. He was one of the founders of the Provincial Agricultural Society which held its first show in Toronto in 1846. It is rather interesting to recall that this College building stands on part of the ground on which some of the early provincial agricultural shows were held. This property along this west side of University Avenue belonged originally to the Powell family, and not far from this spot stood the residence which was named after their old Welsh home, 'Caer Howell.' This was the ground upon which many of the early exhibitions were held, and where the finest live stock of the province was exhibited. This industry Hon. Adam Fergusson continually promoted. The Ontario Veterinary College was established for the purpose of training the farmers of this province in the handling of the live stock they were breeding upon their farms. Hon. Adam Fergusson, more than any other man, as may be found by going back over old records, was really the father of the Ontario Veterinary College. He was one of the pioneers in the development of this province. When you read the histories of Ontario or Canada, you find no mention made of such things. Some day, however, they will be given their proper place, and when the story of that time comes to be fully written, Hon. Adam Fergusson, member of the Legislative Council, member of the Board of Agriculture, and one of the foremost farmers and live stock raisers in the province, will be given due credit for being the father and promoter of the Ontario Veterinary College. It would be most fitting that a portrait of this man, to whom the College owes so much, should be found hanging on these walls.

"Dr. Cowan stated that in his day, 1847, the little class of seven met in one room in a building on the northwest corner of Queen and Yonge Streets. The old building no longer stands. The Board of Agriculture owned the building, which was used for their offices and for a time held the Agricultural and Veterinary classes. Therein they gathered a magnificent agricultural library. The Department of Agriculture when first organized was housed there. Shortly after we moved to our new buildings in the Park the old building, known as the Jamieson Block, was burned and practically everything was destroyed, including the agricultural library. In time the Veterinary classes were moved to a building on Temperance Street. Go down to Temperance Street, west of Yonge, and there you will see on the north side the building in which the Ontario Veterinary College was housed for so many years. It will be very easy to see how the building steadily grew by additions into a larger building. This brings us to the story of the present building. It is the outcome of the taking over of the Ontario Veterinary College by the Government and making it a provincial institution. When the old Board of Agriculture established a course in Veterinary Science, it was entirely controlled by that provincial organization; but in time as the number of students grew and larger quarters were needed, Dr. Smith erected the building on Temperance Street, and assumed the financial responsibility of running the school, the Board meantime assuming the responsibility of the examinations and issuing of the certificates; so that when a few years ago it was decided that the College should become a provincial institution and that the Government should assume full responsibility, it was like an old friend coming back home again. It had been started by the Board of Agriculture, and the Board of Agriculture always had its impress upon the certificates that were issued. It was simply a transfer back to the Government of all the responsibility of the maintenance and housing of the school.

"And now you have come into this building, which is so well planned, so well built and so well equipped. One of the most interesting visits I have ever made was one to the Royal Veterinary College in Copenhagen, Denmark. What impressed me there was not only the fine buildings and the facilities, but the fact that the Royal Veterinary College of Denmark was looked upon as being as important a teaching institution as any other in the country. There it was, planted right in the city itself, with its equipment, its government, its work, all fully recognized as being, in the estimation of the people, as important as any other teaching institution that they had.

"You have here a College that you need not be ashamed of, but, on the other hand, one to be proud of. But, remember, this building is not the Veterinary College. As I walked through the Royal Veterinary College in Copenhagen at holiday time, there were no students there. Finally we located one of the members of the staff. The rest were out of the city. We did not see the real veterinary college; all that we saw were the buildings and the equipment. So also if we should come here during the summer we should not see the Veterinary College; we should see only a building, well equipped and well planned, that housed the Veterinary College. So the question is: What is the Veterinary College? We would answer, first, a staff; the College must have a principal, teachers, instructors and assistants. You cannot have a veterinary college without teachers. You might have a veterinary college without a building, but you must have a staff. Is that all? What would this institution mean if we had a building and a professor in every room, and a man in every laboratory, and several men in the office, and that was all? We still should not have a veterinary college. There is a third element necessary; we must have *students* before we can have a real veterinary college.

"It would be an interesting theme for discussion as to which is the more important, the staff or the students. I am not going to argue that to-night. You cannot have a veterinary college without a staff, and you cannot have a veterinary college without a class of students; the two are necessary; which is the more important I leave to you to discuss. We have the building, we have the staff, and now we are starting out with the students, and the question is, what is going to be the future of this institution? The future of this institution does not depend upon size, dimensions, equipment, etc., important and essential as they are. You know they made veterinary graduates in the olden days in this Province when they had only a table around which seven students sat in that little room. They turned out in those days veterinary practitioners, some of whom made names for themselves. We ought to be able to turn out ever so much better practitioners when we have the equipment that we have here to-day. What I want to bring home to-night, if I can, is that the success of this institution is going to depend, not upon the building, not so much upon the teachers, but upon you men who are in the first, second and third years and who are sitting in this hall. Bring that right home to yourselves that the Veterinary College is not on this platform, but is sitting in this audience. When the day for graduation comes, the college will walk out and spread itself over this country, over all the provinces, across the line to the south, and from the Atlantic to the Pacific, and the status of this College will depend more upon you men, what you take out and what you do after you go out of these halls, than it will depend upon the men sitting on this platform to-night.

"Disraeli, the great British statesman said: 'The public health is the foundation upon which reposes the happiness of the people and the power of the country. The care of the public health is the first duty of the statesman.' I wish we could put this sentence in every newspaper, so that any man who thinks he is a statesman, any man who has anything to do with the government or education of the people, would see that until it would be burned into his memory that the care of the public health is the duty of every statesman. We are just beginning to realize that the prosperity, happiness and progress of the people depend more upon public health and sound morals than upon anything else. Turn that over in your minds and see if there is not a great deal more in it. A healthy people—what does that mean? It means a body of strong, able workers, having sane minds in sound bodies. Public health is absolutely essential to the mental development of the people. Of course you find exceptions, where poor, weak, human bodies carry most brilliant minds; but, as a rule, sound bodies and sound minds go together. There is something else also that can be built upon good health, and that is good sound morals.

"If public health should be the first claim of a statesman, what should be put as second? It has occurred to me that the care of the live stock comes next. That is a pretty big statement to make, that the care of the live stock of the country comes right after the general care of the people. You young men ought to appreciate and ought to realize that. Take the great prosperous countries of the world and you will find that their prosperity, to a great extent, has been based upon the live stock interests of those countries. It is to this in the past that we have looked to a large extent for assistance in our work, and it is to this we have looked for the food of our large population. Beef, mutton, bacon, pork, eggs, milk are the things we live on in this country to a very large extent. If our food has such a close bearing upon the live stock interests in this country, and if the quality has such a close relation to the public health, is it not a matter of extreme importance that statesmen and others that are associated with them shall give clear, and continued attention to the health of the live stock of our country?

"You young men are in training in connection with one of the great fundamental or foundation stones on which the prosperity of this country is building. Do not imagine that you have come here for three years simply to get training so that you can go out and practice and charge Mr. So-and-So for doing such and such a thing, so that you can make a living and have a good time. This is the poorest and shallowest argument that you can make for being here to-day. The man who goes to college simply and solely for the purpose of trying to equip himself so that he can make $2.50 or $10 a day, and measures his education and his experience on that score, is belittling himself away below that for which he is intended. In coming to this institution, however, picture to yourself this—that you are coming here to train yourselves to contribute by your future work something to the building up of the great live stock industry, which ranks second to the great human industry, whether it is in Ontario, Quebec, Manitoba, or in one of the states of the American Union. This being the case, do not be satisfied simply with learning a few things out of your text-books or getting the training which may be imparted in the lecture room. Read, study, think, investigate, and get a grasp of the great field in which you are operating.

"I have stated that the live stock industry has a very important bearing upon the life and activity of the human race. Here for instance are a few facts: In Great Britain the average consumption of meat is about 120 lbs. yearly for every individual in the British Isles. There needs to be provided every year about

120 lbs. of meat. In Germany 113 lbs.; in France, 80 lbs.; in Belgium, 70 lbs.; in Austria-Hungary, 64 lbs., and in Russia only 50 lbs. Compare Russia on the one hand with an average of only 50 lbs. and the British Isles on the other with an average of 120 lbs. The wealth, the strength and development of one country is away in advance of the other. We cross the ocean and come to this continent. The average consumption in Canada is 175 lbs. yearly, and in the United States 186 lbs.; but to find out the real meat-eaters of the world we have to go away off to Australia where the average is about 260 lbs. a year. Now it means something to produce palatable food of the right kind, well preserved and sanitary, to feed the English-speaking peoples. This meat proposition in other words means more to the people of the British Isles, Canada, United States and Australia than it does to countries like Russia and Austria-Hungary, where the people feed to a much larger extent upon the cruder products of the fields. We are living among peoples who are essentially meat-eaters. The probability is that we in Canada eat too much meat. Perhaps our health would be better if we were able to cut out some of this very large allowance of meat and strike a happy medium between the meat consumption of Russia and of Australia.

"When Great Britain and France send their soldiers into the trenches the most important thing these two countries consider is to have an ample supply of meat. British and French soldiers both do their best fighting on beef and bacon, particularly on beef. The ration allowed is from 1 to 1¼ lbs. per day. Multiply this by 365 days and you have this conclusion: That the men in the trenches on the average are being given much more meat than they would be getting at home, which perhaps accounts for their splendid fighting condition. What is the result of all this? There has been going out of Australia and out of the Argentine and out of the United States for the British and French soldiers, and to some extent the Italian soldiers, almost unheard of exports of fresh and canned beef. Let me give you some figures. From the 1st of January to the 31st of July, seven months, in 1914, there was exported from the United States of all kinds of meat, 212,000,000 lbs. For the corresponding seven months of this year, that is, from the 1st of January to the 1st of July, 1915, there was exported not 212,000,000 lbs., but 709,000,000 lbs. How do you explain that? The extra feeding of beef and bacon to the soldiers of France and Belgium. What does that mean? Let me give you some other points and you will see what I am leading up to.

"I have here a table of the relationship between the human population and the number of cattle in the principal countries that we are concerned with in this war. These figures cover a period of about twelve years, up to a few months before the war began. They do not apply to the period since August 1914, but they apply to the period beginning at 1900 down to 1914. We find that in France during that period the population and number of cattle increased exactly alike, 2 per cent.; in Germany the population increased 16 per cent. and the cattle 4 per cent., the population growing in number more rapidly than the beef supplied; in Great Britain 10 per cent. in people and in cattle 4 per cent.; in Austria-Hungary, the population increased 10 per cent. and the cattle 2 per cent.; in European Russia, the increase of people was 14 per cent. and the decrease in the number of cattle was 12 per cent.: in the Argentine, the country which we supposed had an unlimited supply of beef, the population increased 14 per cent., and the cattle decreased 6 per cent.; Australia's population increased 18 per cent. and cattle increased 40 per cent.; New Zealand's population increased 30 per cent. and the cattle decreased 16 per cent.; United States' population increased 25 per cent. and shows a 30 per cent. decrease in the number of cattle; Canada's population shows an increase of 35 per cent. and in cattle 17 per cent. Our cattle during this period in Canada increased by only one-half of the percentage of the people. In the United States the number of cattle raised showed a decrease of 30 per cent., while the population showed an increase of 25 per cent. Was it any wonder that the price of beef was going up in this country, until finally it got so high that the people in Canada began to decrease consumption, consequently during the last two years there has been a decline in the average amount of meat eaten.

"Is there anything in all this worth considering? Before the war the people of all these civilized countries were increasing much more rapidly than their cattle, the result being that beef was growing scarcer and higher in price. At the present time, even the country that was short of beef is being called upon to send its so-called surplus across the water to help feed the British and French soldiers. Suppose the war goes on for another year, what is going to be the situation in regard to our cattle, our sheep and our horses? You say, what have we to do with that? Unless you appreciate the fact that you have some concern in it, you are missing your opportunity here; you are not getting out of this College what you should get out of it, and you are not training yourselves to be the useful citizens that you should be. Here is facing us in Canada a great problem. The papers every day are full of wheat, wheat, wheat, and we have been wondering what this great wheat crop of the West is going to amount to; what we were going to get out of it; whether we should get 70c. or $1.00 per bushel. You would have thought that this country had nothing else to live for than the wheat fields of those Western Provinces. I am not going to minimize that at all. It will make a wonderful difference in this country whether the price will be $1 or only 70c. per bushel, whether we have 10,000,000 acres in wheat or 12,000,000 acres, and whether the average is 20 or 25 bushels to the acre. But do not let us forget that the future of Canada does not depend upon her wheat crop. I will defy you to show me any great country in the world that has built up a permanent prosperity in growing wheat. The greatest wheat country in the world is Russia; they grow wheat in Austria-Hungary, and they also grow wheat in South America and in Australia. They used to depend upon the wheat crop in the United States, but they did not build their prosperity and hopes upon the wheat yield alone. Gradually, in order to maintain true prosperity, a permanent prosperity, they changed over from being wheat growing countries to mixed farming, and to their wheat, they added live stock. In the Province of Ontario in the years gone by, we used to grow crops of wheat such as are seldom grown in the Northwest. This past year, if we had had favourable weather, we should have had wheat yields here in Ontario that would have compared most favorably with those of the Western Provinces. I know one man that had 6,000 bushels of wheat on 117 acres not fit to market, being discolored by rains. This Province was at one time a great wheat-growing province, but when men like Adam Fergusson and those other Scotsmen came here they did not pin their faith to wheat. These were the men who gave the right trend to agriculture in this Province. They did not depend upon wheat. They knew that a time was coming when you would not get $1.00 per bushel for wheat. In 1831 the price of a horse was $50.00, for laboring oxen $60 to $70, milch cows $12 to $20, wheat per bushel 75c. to $1.00. They got their 75c. to $1.00 for wheat, but Adam Fergusson and these other men knew that the ultimate success of this country agriculturally, just as it had been in Scotland, England and Ireland, must be based upon live stock. This is the greatest agricultural problem that we have to face to-day—how we can divert the large bulk of the wheat-growing West to the production of beef, bacon, etc? How we can help to introduce upon the farms of that country a greater amount of live stock? Who is going to do this work? Some say the Government is going to do it of course, as though governments can do everything. In this country the people that depend upon the government to do their work for them are generally disappointed. There is certain aid that can be given, but ultimately the working of it out comes back to the people. All our manufacturing industries depend upon the prosperity of our agriculture, and the permanent prosperity of our agriculture depends upon the economical and thorough extension of the live stock industry, not only in these older provinces but more particularly throughout the provinces of the West. You young men will come into intimate contact with one of the great problems we have got to solve in this country. Do not go out and get a little office, hang out your shingle, "J. Smith, V.S.," and sit down in your office and simply wait for things to turn up. They may be pretty slow in turning up. Go out and take your place as part of the community. You, with your knowledge of live stock and a comprehension of its great importance, can perhaps do more than any other class in the community to encourage the growing of feed and the production of the best kinds of live stock—to induce the farmers to turn away from relying solely upon the product of the fields, but rather to feed their crops to the animals in their stalls, thus helping to build up a good general farming community. If we get that, our manufacturers will prosper, our storekeepers will prosper, our cities will prosper, and thus it will all be reflected back upon the whole community, and in that way can we have general prosperity. What I want to point out is that there is looming up before you a great question and a great responsibility, no matter what part of the continent you may go to. The training you are getting at this institution is for the purpose of fitting you to do your part in building up the great live stock industry of this country.

"You are not going to the front: not yet at least. I am not going to the front; not yet at least. I presume that we feel that it is not our duty as yet to go or we would not be here. If it is not our duty to go, it must be our duty to stay. You cannot get away from that. The question is, if it is our duty to stay, what are we going to do about it? Are we going to fool away our time at the Ontario Veterinary College, or are we going to get right down to business so that at the end of the year we shall walk out of these halls feeling that we have not lost any time, that we have been training ourselves for our life work, that we have been training ourselves for the work of our country. These are serious days. We cannot think as we thought before, we cannot act as we acted before, and we cannot go to college as we went to college before. The whole world is altered: we are in a different atmosphere. The Ontario Veterinary College must mean to you and to these professors something entirely different from what it did before the war. Get this into your mind and into your souls, and if you do not go to the war, remember this, that you have a duty here and that duty is to serve our country. This war has got to take the selfishness out of the people and you, as students here, should realize, just as much as the boys that don the kahki uniform and go to the front realize, that there is a duty and responsibility laid upon you. If you do, the course at the College will mean to you something different than it did before, and you will walk out of this institution feeling that while you did not feel the call to go to the front, you are at least prepared to do your duty at home."

Dr. Cowan spoke in a reminiscent way of the College and its personnel in his under-graduate days.

He described in a most interesting manner the many difficulties which attended the inauguration of the institution which he had the satisfaction of seeing grow from a mere handful to a formidable one of its kind.

He also spoke in a graphic way of the improved facilities for teaching since his student days and, further, of the fine equipment, commodious class rooms and laboratories of the present college building.

TIME TABLE OF LECTURES AND DEMONSTRATIONS

FALL TERM **FIRST YEAR**

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8-9 A.M.	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10 "	Anatomy Room B	Sporadic Diseases of Horse Room B	Chemistry at University	Chemistry at University	Anatomy Room B	Anatomy Room B
10-11 "	Histology Laboratory C	Zoology Laboratory C	Chemistry at University	Chemistry at University	Pharmacy Laboratory A	Parasitology Room B
11-12 "	Histology Laboratory C	Zoology Laboratory C	Chemistry at University	Chemistry at University	Zoology Room B	Materia Medica Room B
1-2 P.M.	Study	Study	Study	Study	Histology Room B	Study
4-5.30 P.M.	Study	2-3.30 P.M. Animal Restraint Room G	Study	Study	Study	Study
1.30-2.30 P.M.	—	—	—	Equine Dentistry Room B	—	—
1.30-3 P.M.			Dentistry or Lameness Room G	Diagnosis 2.30-3.30 Room B		
2-5 P.M.	Botany Laboratory C				Botany 2-3.45 p.m. University	
		Military Drill at University 4-5.30 P.M.	Pharmacy 4-6 p.m Laboratory A	Military Drill at University 4-5.30 p.m.	Military Drill at University 4-5.30 p.m.	

SUBJECT TO CHANGE

FALL TERM

SECOND YEAR

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8-9 A.M.	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10 A.M.	Materia Medica Room D	Anatomy Room D	Pathology Laboratory F	Physiology at University	Pathology Laboratory F	Physiology at University
10.30-11.30 A.M.	—	—	—	—	—	Anatomy Quiz Laboratory F
10-11 A.M.	Anatomy Room D	Sporadic Diseases of Horse Room D	Materia Medica Room D	Anatomy Quiz 10.30-11 Laboratory F	Sporadic Diseases of Horse Room D	
11-12 "	Contagious Diseases Room D	Contagious Diseases Room D	Cattle Diseases Room D	Bacteriology Room D	Bacteriology Room D	
1.5 P.M.	Dissection	Dissection 1-3.45 p.m.	Physiology at University 1.45 to 3.45	Clinic 1-3.45 p.m. Room G	Dissection 1-3.45	
		Military Drill at University 4-5.30 p.m.		Military Drill at University 4-5.30 p.m.	Military Drill at University 4-5.30 p.m.	

SUBJECT TO CHANGE

FALL TERM

THIRD YEAR

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9-10 A.M.	Materia Medica Room D	Veterinary Hygiene Laboratory F	Surgery Room D	Equine Dentistry Room D	Veterinary Jurisprudence Room D	Pathology Room D
10-11 A.M.	Dairy Inspection Laboratory F	Sporadic Diseases of Horse Room D	Materia Medica Room D	Surgery Room D	Sporadic Diseases of Horse Room D	Canine and Feline Diseases Room D
11-12 A.M.	Contagious Diseases Room D	Contagious Diseases Room D	Cattle Diseases Room D	Bacteriology Room D	Bacteriology Room D	Zootechnics Room D
	Obstetrics Clinic Lameness Room D 1-3 p.m	Clinic Surgery Class Room G 1-3.45 p.m.	Microscopic Pathology Laboratory C 1-4 p.m.	Microscopic Pathology Laboratory C 1-3.45 p.m.	Clinic Surgery Class Room G 1-3.45 p.m.	Study
4-6 P.M.	Bacteriology Laboratory E	Military Drill at University 4-5.30 p.m.	Bacteriology Laboratory E	Military Drill at University 4-5.30 p.m.	Military Drill at University 4-5.30 p.m.	Study

SUBJECT TO CHANGE

SPRING TERM FIRST YEAR

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8-9 A.M.	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10	Anatomy Room B	Sporadic Disease of Horse Room B	Chemistry at University	Chemistry at University	Anatomy Room B	Anatomy Room B
10-11	Histology Laboratory C	Histology Laboratory C	Chemistry at University	Chemistry at University	Pharmacy Room B	Parasitology Room B
11-12	Histology Laboratory C	Histology Laboratory C	Chemistry at University	Chemistry at University	Zoology Room B	Materia Medica Room B
			AFTERNOON			
1-4 P.M.	Dissection	Dissection	Dissection	Dissection	Dissection 1-2.30	
			Pharmacy Laboratory A 4-6			
4-5	Dentistry Room B				Clinic Room G 2.30-4	
		Military Drill 4-5.30		Military Drill 4-5.30	Military Drill 4-5.30	

SUBJECT TO CHANGE

SPRING TERM SECOND YEAR

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8.9 A.M.	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10	Materia Medica Room D	Anatomy Room D	Pathology Room F	Physiology at University	Pathology Room F	Physiology at University
10-11	Obstetrics Room D	Sporadic Diseases of Horse Room D	Materia Medica Room D	Anatomy Quiz Room B	Sporadic Diseases of Horse Room D	Anatomy Room F 10.30-11.30
11-12	Anatomy Room D	Contagious Diseases Room D	Contagious Diseases Room D	Bacteriology Room D	Bacteriology Room D	
			AFTERNOON			
1-4 P.M.	Histology Laboratory C	Embryology Laboratory C	Physiology at University 1.45-3.45	Clinic Room G 1-2 and 2-3.45	Pathology Laboratory C 1-3.45	
		Military Drill 4-5.30		Military Drill 4-5.30	Military Drill 4-5.30	

SUBJECT TO CHANGE

SPRING TERM THIRD YEAR

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9-10 A.M.	Materia Medica Room D	Study Hour	Horse Shoeing Room D	Sporadic Diseases Room D	Obstetrics Room D	Pathology or Milk Inspection Room D
10-11	Obstetrics Room D	Sporadic Diseases of Horse Room D	Materia Medica Room D	Regional Anatomy and Surgery Room D	Sporadic Diseases Room D	Canine and Feline Diseases Room D
11-12	Diagnostic Methods Room G	Contagious Diseases Room D	Contagious Diseases Room D	Bacteriology Room D	Bacteriology Room D	Zootechnics Room D
			AFTERNOON			
	Meat Inspection Room D 3-4	Clinic Room G 2-4	Clinic Horse Shoeing Room G 1-2	Bacteriology Laboratory E 2.30-3.45	Bacteriology Laboratory E 1-2.30	
	Bacteriology Laboratory E 4-6		Bacteriology Laboratory E 2-4	Practical Meat Inspection	Practical Meat Inspection	
		Military Drill 4-5.30	Meat Inspection Room D 4-5	Military Drill 4-5.30	Military Drill 4-5.30	—

SUBJECT TO CHANGE

In order that our students might attend the Officers Training Corps at the University it became necessary to modify our former time-table of lectures and demonstrations and the foregoing was adopted to meet the requirement.

PRIZE ESSAYS.

A prize is given by the College to the student who prepares the best report of a case treated by him during the summer vacation of 1915 while under the supervision of a preceptor, the essay to be read and defended before the Science Association of the College.

A separate prize is given to each of the first and second year classes.

The committee in charge of the essays awarded the prize of the first year to B. R. Atmore, and the prize of the second year to F. E. Maxwell.

ESSAY OF THE FIRST YEAR STUDENT.

Pyaemia in a Gelding.

I have the honour to submit the following essay for consideration. During the absence of my preceptor I had the opportunity of treating the case I am about to describe.

On the fourteenth of June I was called to treat a case which had been described by owner as colic.

History: Animal had been working steadily, but had been failing in flesh for some time previous to the above date, having made enquiries as to care and feeding I was assured that no change had been made.

Symptoms: Temperature 101 degrees F., pulse 60, respirations 22. Animal showed intermittent pain, and would make several attempts to lie down before he would leave his feet.

Diagnosis: Spasmodic Colic.

Treatment: I administered the following drench:

Spts. Terebinth	℥i
Spts. Aetheris Nitrosi	℥i
Fl. Ext. Nux Vomica	ʒii
Oleum Lini	℥viii

In the course of half an hour after the above had been given the aggravating symptoms subsided, and I gave the patient an Aloetic ball containing:

Barbadoes Aloes	ʒvi
Powd. Zingiber	℥i

I also left a drench the same as above to be given should the animal become uneasy. The following morning I again made a visit to the patient and was informed that he had been somewhat uneasy at times, but did not show alarming symptoms. On making an examination I found the temperature to be 103 degrees F., pulse 70, respirations 22. His fæces were moderately soft and peristalsis about normal.

I was somewhat surprised to find the temperature elevated, but was satisfied that the animal was suffering from abdominal trouble. I left the following prescription:

Spts. Aetheris Nitrosi	℥iv
Fl. Ext. Nux Vomica	℥i
Aqua Dist.	ad. . . .℥viii

two ounces to be given every three hours in six ounces of water.

The patient was uneasy more or less during the day, and in the evening I was called again to see him. I found the temperature 106 degrees F., pulse 70, respirations 28. The animal looked depressed and had frequent sweats followed by chills.

I again made a careful examination of the patient, not overlooking the thoracic cavity, as I thought the rise of temperature might be an indication of pneumonia even though no other symptoms were presented. I suspected infection in the abdominal cavity and gave an unfavourable prognosis.

Further Treatment: I gave stimulants and a diuretic, and had the patient blanketed. I may say the animal was placed in comfortable quarters on my first visit and hygienic measures were exercised.

The last drench did not have any material effect on the patient, as he gradually became weaker and died about an hour later.

Post Mortem: I removed one side of the abdominal wall by making an incision along the median line from the ensiform cartilage of the sternum to the pubes. Another incision was made in the wall from near the pubes to the lumbar vertebra and the ribs were sawed close to the dorsal vertebra exposing one side of the abdomen when removed.

On examination of the viscera small multiple abscesses were found and were best marked on the peritoneum; also in the region of the kidneys and around the pillars of the diaphragm, although others were found less numerous in the regions of the abdominal cavity.

B. R. Atmore.

ESSAY OF THE SECOND YEAR STUDENT.

Salivary Calculus in Stenon's Duct Removed by Operation.

Subject: An eight year old bay driving horse, the property of a town butcher. This horse weighed about eleven hundred pounds and was being worked daily on the butcher's cart.

History and Symptoms: This horse was brought to me on the 3rd day of May, 1915, for inspection. My attention was directed to a hard, well defined swelling under the skin on the off side of the face, at the inferior border of the Masseter muscle, and about two and one half inches above the free edge of the inferior Maxilla in the course of Stenon's duct. It was quite painless, and appeared to be non-adherent to the surrounding tissues. The owner had informed me that this swelling had existed for some time, and that when it was first noticed it was on the free edge of the jaw, but that quite recently it had moved up onto the face. A soft fluctuating swelling now extended to the right parotid region. This did not appear to cause the horse any inconvenience. The patient's appetite was good, and he was being driven on the butcher cart daily.

I kept the case under my observation for several days before a diagnosis was made. I then diagnosed a calculus in Stenon's duct, and, as the case was not of an urgent nature, I decided to defer any operative interference until the owner could procure another animal to carry on his business. The horse continued to work on the cart up to the fifth of July when he was again brought to me. The hard swelling had now become larger; the parotid edema had also increased, the animal showed symptoms of pain and had difficulty in opening his mouth. I made several attempts to move the calculus along the duct by means of manipulation, but failed.

On the evening of July 6th the swelling of the parotid gland was much larger, Stenon's duct behind the obstruction was distended, and the patient stood with his nose poked out and his head turned to the near side. He had eaten very little food and as I feared an abscess was forming in the gland I decided to operate the following morning. In the meantime the area over the swelling was well washed with warm water and green soap, shaved, and painted with a solution of tincture of iodine. Later in the evening I soaked a pack of sterile absorbent cotton in a solution of bichloride of mercury (1 to 1,000), and tied it over the swollen area by means of a many tailed bandage, and this I let remain until the following morning.

On the morning of the 7th the following instruments were placed in a sterilizer and boiled for one hour.

- 2 operating scalpels.
- 3 pairs of artery forceps.
- 1 pair of separators.
- 3 needles threaded with silk.
- 1 grooved director and probe.

In the meantime the bichloride of mercury pack was removed and the operating area painted at intervals of ten minutes with a ten per cent. solution of cocaine hydrochloride for one hour. When local anæsthesia of the skin was complete the horse was cast, an incision about three inches in length was made through the skin over the centre of the swelling coinciding with the direction of the duct, the skin was dissected away from the underlying tissues for a short distance on either side of the incision and the duct was exposed. Hemorrhage was insignificant, the zygomaticus muscle under cover of which Stenon's duct enters the mouth was separated and held out of the way by means of a pair of separators, the wall of the duct was divided at the posterior proximal end of the obstruction, and the grooved director was pushed up between the calculus and the wall of the duct. On this director the wall was slit up for about an inch and a half. The calculus was now raised by passing the director under it. On removal from its bed there was a copious flow of saliva containing some flakes of mucous. When this ceased the bleeding vessels were pinched with artery forceps and the lining of the duct was examined, it was inflamed and discolored. I ascertained that the duct was pervious on either side of the bed of the calculus, and disturbing it as little as possible I irrigated it with a warm boracic acid solution, and drew the skin firmly together with five interrupted sutures.

After Treatment: The patient was released from the hobbles and placed in a box stall bedded with sawdust, and food was withheld from him for forty-eight hours. On July 9th a small feed of crushed oats was given which I watched the patient eat. There was a flow of saliva from the wound, which ceased to flow several minutes after the food was eaten; on this day I gave him three small feeds. on the tenth day of the month he was fed about the same amount. The amount of saliva which flowed from the wound was seen to be diminishing at each feed. This was wiped away immediately after each feed with absorbent cotton, and on the 19th a feed was eaten after which no saliva escaped. On the 21st I removed the stitches only a slight scar being left.

Frank E. Maxwell.

NUMBER OF STUDENTS.

Following is the total number of students registered from various countries from October, 1914 to November, 1915:

Canada.	United States.	Other Countries.	Total.
211	67	12	290

Registered from Ontario during the same period 115.

During the year 87 students were graduated and granted the degree of Veterinary Surgeon (V.S.) from the College, and at other times of the year at convocations of the University eleven graduates of the College received the degree of Bachelor of Veterinary Science (B.V.Sc.) from that institution.

The graduating class of 1915 was addressed by the Honourable W. R. Riddell. L.H.D., Justice of the Supreme Court of Ontario at the closing exercises of the College. The address has already been published in an appendix to my last report.

During the time between the spring and summer sessions of the College much work was done in painting and finishing minor details of the new building. and the equipment of the College was arranged to make it convenient for class work during the coming session.

The large Museum of the College was also installed so as to make it a valuable aid in the educational work of the class rooms.

Students at work in the Anatomical Laboratory.

BRIEF SYNOPSIS OF METHODS ADOPTED IN TEACHING VARIOUS BRANCHES OF VETERINARY SCIENCE IN THIS COLLEGE.

Contagious Diseases of Animals.

Will be taught by lectures illustrated with diagrams, diseased tissues, and, when possible, with infected animals.

Veterinary Hygiene.

Taught by lectures illustrated with materials used in promoting health; and observations in the Veterinary Infirmary of the College.

Sporadic Diseases of Animals.

Embracing the various diseases which are not regarded as contagious.

Their causes, symptoms and treatment will be thoroughly described in lectures, illustrated with numerous specimens now in the Museum of the College, also with affected animals as they occur from time to time in the practice of the Infirmary.

Veterinary Anatomy.

Is taught first by descriptive lectures in the Class Room, and the applied science by a full course of dissection in the commodious laboratory at the College.

Veterinary Surgery.

Will be taught first in the Class Room by illustrated lectures, and the applied science or practical work of the course will be freely demonstrated in an amphitheatre fitted up for the purpose.

Physiology.

Will include a course of about 60 lectures on the physiology of domestic animals, in which the following subjects will be discussed, viz.: The blood and phenomena of clotting; the circulatory mechanism of the heart and blood vessels; physiology of digestion and absorption of foods; chemical characters of different foods; digestive secretions; digestion in different parts of the alimentary tract; respiration and mechanism of the organs concerned; the physiology of ductless glands; neuro-muscular mechanism; the central nervous system: the production of heat in the body and the regulation of body temperature: the central nervous system and functions of the chief parts of the brain; the physiology of the special senses: the physiology of the kidney and other excretory organs.

Veterinary Materia Medica.

Will embrace a description of the most important drugs and agents used in the cure of disease and the alleviation of pain, including their actions, uses, and doses for the various domestic animals. The practical teaching of this branch of the course will be conducted in a suitable Pharmacy, as well as in the stalls of the infirmary. The lectures for the first year will be largely directed to the actions and uses of medicines.

Veterinary Pathology.

The course in this subject will extend over two years and will include a series of lectures and laboratory demonstrations, both macroscopic and microscopic.

The lectures are divided so that general patholoky is taken up the first year, and the following year is devoted to special pathology.

Gangrene; degeneration; infiltrations; inflammation; tumors; cysts; hypertrophy, atrophy and bone diseases, are some of the subjects which will be discussed.

Veterinary Histology.

Will be taught by illustrated Class Room lectures, all of which will be demonstrated in a spacious room for the purpose, and the student will be required to prepare, mount, stain and examine with the aid of a microscope various tissues in health, including the blood of various domestic animals.

Veterinary Obstetrics.

Will be taught by a full course of lectures, illustrated with large diagrams and numerous instruments used in the practice of this most important art.

Post Mortem Demonstrations.

Will be conducted by descriptive lectures and autopsies, on subjects procured for the purpose, in the amphitheatre of the College.

Bacteriology.

This branch of the College course will receive full consideration through numerous lectures in which special attention will be given to technique in preparing and studying certain micro-organisms or germs, especially those which are believed to cause disease.

The study of toxins, and the preparation of anti-toxins, vaccines and other biological products will be extensively discussed and demonstrated. An extended laboratory course is given in this subject.

Chemistry.

Will be taught by lectures and a course of laboratory instruction.

Zoology.

Will be taught by illustrated Class Room lectures, and by laboratory methods. Much time will be spent in the study of the Protozoa and the like.

Botany.

Will be taught by lectures in the Class Room. The applied science will be taught by laboratory methods and from specimens in the field.

Parasitology.

Will be taught in the Class Room and the practical features of the subject will be illustrated by specimens, drawings and dissections made by the student in a laboratory equipped for that purpose.

Veterinary Dentistry.

This branch of our course will be fully discussed in illustrated lectures in the Class Room, and the practical education of the student in the art will be fully demonstrated in the amphitheatre.

Zootechnics.

Breeds and breeding of domestic animals, feeds and feeding, live stock judging will be taught by lectures illustrated by diagrams in the Class Room, and living animals at famous Stock Farms in the vicinity of Toronto.

Meat Inspection.

Will be fully taught both in the Class Room of the College, and at Abattoirs, in a manner which will be in accord with the laws and regulations of Veterinary Sanitary Science throughout the Dominion.

Horse Shoeing.

Will be fully discussed in the Class Room and practical illustrations of the art will be conducted in the amphitheatre of the College.

Veterinary jurisprudence.

Will consist of a course of lectures, including a number of subjects which are important to the Veterinary Surgeon, such as contracts relating to the purchase and sale of live stock, unsoundness and vice in horses or other animals, the straying and impounding of cattle, laws relating to transportation of live stock, laws relating to the spread of malignant diseases, laws relating to diseased meats, laws of the road, the law of warranty and kindred subjects.

Dairy Inspection.

Will include lectures in the construction of the dairy barn and milk house; the care of utensils; the handling of milk from the time it is drawn from the cow until it is placed upon the market for sale. Dairy cattle in health and disease, especially those which are communicable to the human family through milk, and various other matters relating to dairy inspection.

Pharmacy.

The instruction given in this course is largely of a practical nature and students are directed in the work by an experienced teacher how to prepare as well as to care for numerous articles or drugs used in the cure of disease.

Introductory lectures are also given in this course.

Embryology.

Is taught by a course of lectures in the Class Room and also a laboratory course, including the practical study of prepared sections of Embryos of different ages.

Milk Inspection.

This course consists of twelve lectures. Normal milk is fully considered in the first two lectures. The remaining lectures are taken up with a description of methods of adulteration, tests for butter fat, description of various products of milk.

Wherever possible, the tests for adulterants, etc., are carried out before the class.

The Calendar of the College contains full instructions for students entering and will be mailed to those who apply for it.

I have the honour to be,

Sir,

Your obedient servant,

E. A. A. Grange,

Principal.

Toronto, 30th October, 1915.

Students of the Ontario Veterinary College studying draught horses.

AN ACT RESPECTING THE ONTARIO VETERINARY COLLEGE.

1. This Act may be cited as "The Veterinary College Act."

2. The Ontario Veterinary College heretofore established in the City of Toronto and conducted by the Ontario Veterinary College, Limited, and to which certain powers were given by the former Agriculture and Arts Association, is continued as The Ontario Veterinary College under the direction of the Minister of Agriculture.

3. The College shall be furnished with all such appliances and equipment as may be necessary for theoretical and practical training in the science and art of veterinary medicine, and in such other branches of education as may be requisite for the intelligent and successful performance of the business of a veterinary surgeon.

4. The Lieutenant-Governor in Council may appoint a Principal and such professors, lecturers and instructors as may be deemed necessary for giving instructions in the College and the promotion of its usefulness, and may pass by-laws regulating and prescribing their respective duties.

5. The Lieutenant-Governor in Council may authorize the making of arrangements whereby instruction in any of the subjects prescribed to be taught in the College may be provided by the University of Toronto or by the Ontario Agricultural College, or by any other College affiliated with the University of Toronto.

6. The government of the College shall be under and according to such rules and regulations as the Lieutenant-Governor in Council may from time to time prescribe, and such rules and regulations shall contain provisions for the standard and mode of admission, the course of study, the fees to be charged, the sessions, terms and vacations, and such provisions as may be deemed expedient touching the conduct of students.

7. Every student upon the successful completion of the course of study, upon passing the prescribed examinations, and upon satisfactory compliance with the rules and regulations of the College shall be admitted to the standing of a Veterinary Surgeon and shall have all the privileges and rights accorded by statute to a Veterinary Surgeon, and there shall be issued to every such student a diploma granting him the title, degree and standing of Veterinary Surgeon; and such diploma shall be attested by the signature of the Principal of the College and the Minister of Agriculture.

8. The Lieutenant-Governor in Council may by order make provisions whereby in case of the loss or destruction of any diploma issued by the former Agriculture and Arts Association, the former Ontario Veterinary College, Limited, or by the Minister of Agriculture, a duplicate diploma may be issued to the person entitled to the same.

9. The Lieutenant-Governor in Council on behalf of the Province may accept, hold and enjoy any gifts, bequests or devises of personal or real property or effects which any person or any government may think fit to make for the purpose of the College.

10. The Lieutenant-Governor in Council may, if deemed advisable, appoint an Advisory Board to advise and assist the Minister of Agriculture in the management of the College, and may by Order-in-Council prescribe its duties and powers and the amounts to be allowed for the services and expenses of the members of such Board.

11. The College is affiliated with the University of Toronto to the extent of enabling the students of the said College to obtain at the examination of the University such rewards, honors, standing, scholarships, diplomas and degrees in Veterinary Science as the University has authority to confer.

12. The Principal of the College shall at the close of each year present to the Minister of Agriculture a report upon the work of the College in such form as the Minister may approve, setting forth the staff, the course of instruction, the students in attendance, the examination results, the income and expenditure and such general information as shall show the work being done, and this report shall be laid before the Assembly within the first thirty days of the session next ensuing.

13. The Lieutenant-Governor in Council may purchase or acquire or lease such buildings and premises as may from time to time be required for carrying on the work of the College.

14. The lease of the buildings and premises used by the College from one Andrew Smith to the Minister of Agriculture, as representing His late Majesty King Edward the Seventh, and bearing date the twenty-eighth day of July, one thousand nine hundred and eight, is hereby approved.

15. (1) No person or persons, association, company or organization other than is authorized under this Act shall, by advertisement or otherwise, use the name of the Ontario Veterinary College, and no person or persons, association, company or organization shall, by advertisement or otherwise, use any name similar or analogous to that of the Ontario Veterinary College without first receiving the consent of the Minister of Agriculture in writing.

(2) Any person violating the provisions of this section shall incur a penalty not exceeding $50 and in default of payment thereof shall be liable to imprisonment for not less than thirty days.

AN ACT RESPECTING VETERINARY SURGEONS.

1. This Act may be cited as *The Veterinary Surgeons' Act.*

2. Any veterinary practitioner holding the diploma of the Agriculture and Arts Association or that of the Ontario Veterinary College or any other diploma or certificate declared by the Lieutenant-Governor in Council to entitle the holder thereof to use the title "Veterinary Surgeon," shall be entitled to professional fees in attending any Court as a witness in such cases as relate to the profession.

3. Any person not possessing a diploma or proper certificate from The Ontario Veterinary College or a diploma or certificate of a college whose diplomas or certificates are declared by the Lieutenant-Governor in Council to entitle the holders thereof to use the title of Veterinary Surgeon who appends to his name the term "Veterinary Surgeon," or any abbreviation thereof, and any person who wilfully and falsely pretends to be, or who wilfully and falsely takes or uses any name, title, addition, abbreviation or description implying or calculated to lead people to infer that he is, or is recognized by law as a veterinary surgeon, within the meaning of this Act, or that he possesses a diploma or certificate from any such college, shall incur a penalty not exceeding $100. and not less than $25. recoverable under *The Ontario Summary Convictions Act.*

4. (1) A graduate of a Veterinary College recognized by the Lieutenant-Governor in Council may practise in Ontario upon passing all the examinations of the senior class of the Ontario Veterinary College at the time and place of the annual examinations of the aforesaid Ontario Veterinary College.

(2) The applicant for such examination shall pay a fee of $25. and shall produce a veterinary preceptor's testimonial certifying that he has practised veterinary surgery under said preceptor for at least six months, or in lieu of said testimonial a statutory declaration certifying that the applicant has practised veterinary surgery for at least one year after graduating from such recognized Veterinary College.

Thirty-Seventh Annual Report

OF THE

Ontario Agricultural and Experimental Union

1915

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by A. T. WILGRESS, Printer to the King's Most Excellent Majesty
1 9 1 6

Printed by
WILLIAM BRIGGS
Corner Queen and John Streets
TORONTO

To His Honour Sir John Strathearn Hendrie, C.V.O., a Lieutenant-Colonel in the Militia of Canada, 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 Agricultural and Experimental Union for 1915.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1916.

CONTENTS.

Ontario Agricultural and Experimental Union

OFFICERS FOR 1916

President	J. B. Fairbairn, R. R. No. 1, Beamsville, Ont.
Vice-President	H. Sirett, R. R. No 4, Brighton, Ont.
Secretary and Editor	C. A. Zavitz, Agricultural College, Guelph.
Assistant Secretary	W. J. Squirrell, Agricultural College, Guelph.
Treasurer	A. W. Mason, Agricultural College, Guelph.
Directors	Dr. G. C. Creelman, Hon. Nelson Monteith, H. A. Dorrance, Harvey Webster, J. C. Neale.
Auditors	S. H. Gandier and R. R. Graham.

COMMITTEES ON CO-OPERATIVE EXPERIMENTAL WORK

Agriculture	C. A. Zavitz, (Director), W. J. Squirrell, A. W. Mason, C. R. Klinck and A. E. Whiteside.
Bee-Keeping	Morley Pettit (Director), Geo. F. Kingsmill, and W. B. Angle.
Forestry	E. J. Zavitz (Director), H. A. Dorrance, and J. Laughland.
Agricultural Chemistry	R. Harcourt (Director), J. W. Crow and A. L. Gibson.
Agricultural Botany	J. E. Howitt (Director), T. G. Raynor, W. J. Lennox and Herbert Groh.
Horticulture	J. W. Crow (Director), F. M. Clement and J. B. Fairbairn.

Committee re-appointed to make suggestions as to how the Provincial Weed Act and the Eradication of Weeds and Weed Seeds in Ontario could be made more effectual: J. E. Howitt (*Chairman*), Hon. Nelson Monteith, W. J. Lennox.

TREASURER'S REPORT, 1915

Receipts.

Balance from last year	$411 74
Government grant	2,750 00
Additional grant	1,000 00
Memberships fees 344 @ 50c.	172 00
	$4,333 74

Expenditures.

Agricultural experiments	$1,817 24
Apicultural experiments	468 30
Schools' extension work	127 70
Agricultural chemistry	76 30
Botanical experiments	31 95
Part expenses of annual meeting, 1915	63 50
Part expenses of annual meeting, 1916	228 18
Meeting of Executive	4 90
Total	$2,818 07
Balance on hand	1,515 67
	$4,333 74

We, the undersigned auditors, declare that we have audited the Treasurer's Accounts and found them correct.

R. R. Graham,
S. H. Gandier,
Auditors.

January 8th, 1916.

Ontario Agricultural and Experimental Union

ANNUAL MEETING.

The thirty-seventh annual meeting of the Ontario Agricultural and Experimental Union was held at the Ontario Agricultural College, Guelph, on Monday, Tuesday and Wednesday, January 10th, 11th and 12th, 1916. The annual meeting was opened with a banquet in the new Dining Hall at the College, when about four hundred officers, ex-students and students were seated at the tables. Dr. Creelman, President of the College, Hon. I. B. Lucas, Attorney-General for Ontario, and about a dozen of the ex-students of the College gave short addresses. On Tuesday three sessions, and on Wednesday two sessions of the Experimental Union meeting were held. The day sessions convened in Massey Building, and the evening meeting in the large gymnasium. Some of the day sessions were crowded beyond the seating capacity of the hall. The reports and addresses which were presented, and the most important discussions which took place during the different sessions of the Experimental Union meeting, are embodied in this report.

SECRETARY'S REPORT.

Dr. C. A. Zavitz, Professor of Field Husbandry, O.A.C., Guelph.

It is now thirty-seven years since the organization of the Ontario Agricultural and Experimental Union. The co-operative work has been in progress under the present system for exactly thirty years. In 1886 there were 12 experimenters; in 1887, 60; in 1888, 93 and since that time there has been a gradual and a substantial increase in the work. We have now hundreds of men throughout Ontario who have successfully conducted experiments on their own farms for five years and some of them even up to 12, 14 and 16 years. The co-operative work in agriculture has been conducted from the beginning during which time there have been 81,070 distinct tests made throughout the Province. Each of these experiments in agriculture consisted of from two to ten plots. The increase in the number of experimenters can be seen from the following figures which show the average yearly number actually engaged in the work in each of six periods of five years covering the thirty years during which time this work has been in progress:

Periods.	Years.	Average number of Experimenters per Annum.
1886–1890	5	71
1891–1895	5	1,060
1896–1900	5	2,992
1901–1905	5	3,379
1906–1910	5	4,278
1911–1915	5	4,452

During the past year co-operative work has been conducted throughout Ontario in agriculture, agricultural chemistry, agricultural botany, forestry, beekeeping and in connection with the public schools in elementary agriculture, horticulture and forestry.

The weather conditions of the past year have been somewhat abnormal. September of 1914 gave conditions quite favorable for the sowing of winter wheat at the College and in most places throughout the Province. The weather during the autumn was comparatively fine and the winter crops made a good growth before winter set in. The month of April of the present year was unusually warm and the rain fall was normal. The weather throughout the most of May was cool and the rain fall was somewhat below the average. The weather conditions of June were about normal. The amount of rain fall in July, August and September was exceptionally large being fifty-six per cent. greater than the average for the corresponding months in the last fifteen year period.

There were three meetings of the Board of Control of the Experimental Union held during the year. Two of these were held in January and one in September.

As usual the report of the Experimental Union was published by the Ontario Department of Agriculture and about thirty thousand copies were distributed the latter part of 1914. This distribution of the results of the co-operative work in addition to the principal conclusions of the work published in the public press of Ontario after the annual meeting brings the work of the organization prominently before the farmers of the Province.

The results of the co-operative work for 1915 should be of peculiar interest owing to the abnormal weather conditions and the changing circumstances which have been brought about by the war in Europe. We wish to take this opportunity of thanking the thousands of farmers throughout Ontario who have so willingly and earnestly assisted in carrying forward the experimental work during the year 1915. The results of these co-operative experiments are of decided advantage not only to the men who conduct them but also to the farming community as a whole. These men are doing things which count for much. Each experiment forms a centre of interest and of inspiration. All experiments, if properly done, have their peculiar lessons. The co-operative work furnishes information along agricultural lines which it is impossible to obtain in any other way. We have great faith in the work knowing that it is having a tremendous influence on the agriculture of Ontario and that its influence is of a most wholesome character.

PRESIDENT'S ADDRESS.

HERBERT GROH, PRESTON.

I welcome you all to these sessions of the thirty-seventh annual meeting of the Ontario Agricultural and Experimental Union. We have a programme before us which appears to be about all that could be desired so that we only need your co-operation in the way of attendance, attention, and ready participation in the various discussions, to round out the success of our meeting. Our coming together thus, year after year, is no perfunctory affair, but rather, and chiefly, an occasion of stock-taking, whereby we get at first hand, whatever new there is to glean each year from the comprehensive system of experiments conducted here, and throughout the Province, under the masterly supervision of our Secretary, Professor Zavitz, and the other directors. This being our quest, I feel sure our gathering will not be lacking in the interest and purpose needful to make it profitable. Were there no such purpose actuating us, it might indeed be questioned whether we would do well to follow the time-honored round in a year of such sacrifice and horror as this.

Our nation is passing through a period of crisis, and calls for the loyal service of every citizen. We, who are farmers, may feel at times that our part is a humble one, but even granting it to be so, it is, nevertheless, an essential one, and by no means the least essential in ensuring the stability of our country in the present world-wide upheaval. We serve well by being good farmers—no mere plodders, content with a living and indifferent results, but aggressive men, with an agricultural instinct, and a sense of mission in our calling.

At the outbreak of the war, and after, the business and the financial situation of Ontario was far from satisfactory. Farmers, as the great primary producing class, were urged to redouble their efforts in production with a view, I believe, of warding off still greater disaster. Farmers, east and west, responded with increased acreage, and closer attention to improvement at every point, and under the blessing of a kind Providence brought to the rescue a record crop. Confidence in our national resources has been largely restored, and financiers are giving a good share of the credit to the tillers of the soil, where we think it rightly belongs.

The question now is, can we repeat the achievement? The need remains perhaps as great as ever, and our means of meeting it are almost certainly going to be less than they were a year ago. In the first place unfavorable weather conditions, and other influences, have operated to prevent as large an acreage from being prepared for crop this fall. In the second place, every indication points to a shortage of suitable farm labor even more serious than in past years. If to these handicaps there should be added a season unfavorable for crop production, the output of another year might easily be much reduced. These are things largely beyond our control at present, but we can at least aim to make the best possible use of our resources, remembering that "Heaven helps those who help themselves": and remembering too, that Providence, who knows neither Briton nor German, but only man, may be blessing the proverbial thrift and industry of the German, while our half-hearted efforts go a-begging. "He sendeth rain on the just and on the unjust," and the rest depends on us.

I said a moment ago that other influences besides the weather may have helped to curtail the acreage prepared for crop this fall. I may as well confess that I had in mind the economic question, the same which is at the bottom of every discussion of why the boy leaves the farm, and rural depopulation generally. This is an endless problem, and I do not presume to solve it; but, if you will allow me, I would like to unburden myself of a few observations which seem to me to pertain to this matter. First of all, then, farmers, it should be remembered, are not beasts of burden altogether devoid of minds of their own; in fact, if we observe their actions closely enough, noting how they are influenced by such worldly considerations as adequate remuneration for their labor, and the desire to fit well into the general scheme of life about them, we are drawn irresistibly to the conclusion that they are after all, like other people, almost human. It is not surprising either to learn, when appealing to their finer sentiments, such as patriotism, that they are no more angels, than are some war contractors, and other people. They are just normal individuals, or taking them as a class, I should say a little above the average, in all that goes to make up true worth. If you show them the need for increased production, they will probably respond, as they did a year ago, because they reason that it will pay them to do so. If they find then that the improved demand for their produce has not been sufficient to compensate them for their undue exertions, you will have to depend thenceforth upon what altruism there is in them, for your increased production. I may be entirely mistaken, but I think if we could get at the real psychology of the situation, it would be found that farmers are simply taking a little less interest in the whole matter than they were.

Now, I do not want to be understood as condoning any slackening of interest in so vital an issue as food production is at the present moment. I want to see farmers step forward and set the pace for every other class of the Empire's great home forces; and for that matter, I do not think that they are a whit behind any other in sacrifice and unselfishness. The farmer at any time, leads a life of long working hours and frugality, such as is lived by few in the neighboring town. He does it for an interest on his investment of labor and capital, that the townsman of equal business capacity would scorn to accept. He passes for a prosperous citizen, and so he is in his own plain circle, but let him for one short year take to imitating his city cousin, and he would find that he was living beyond his income. We are glad to see the farmer enjoying more of the conveniences and privileges formerly restricted to city life, and yet I do not think that these in themselves will greatly improve his position as a farmer; at least I have noticed that farmers so situated, or their families, are just as prone to move over, inside Sodom as any other. They are, as might be expected, the first to discover the discrepancy between the material rewards of urban and rural industry, and as we observed a while ago, they are human. It is of no use to try to stem the tide by artificial means, or seek to make water run up hill. If it is necessary to have people on the farms of Canada producing agricultural wealth, it will be necessary first of all, to make them count it worth their while to be there.

What then, can be done? I see I have strayed, after all, into the entertaining "boy" question, and I must find my way out again, I suppose. We have had many really good arguments advanced in support of one remedy or another and some of them are doing their bit to help out at this time. I have considerable faith in self-help. My faith is being constantly strengthened, as I look about, and realize how much of the farmer's acknowledged resourcefulness and stamina is the product of his forced reliance on his own powers. No bonus or tariff wall ever robbed him of his power to stand alone. Rather, his tendency has been to become too individualistic, so that he does not co-operate well with his neighbor. This is a serious obstacle to effective self-help, for I believe organized and co-operative self-help multiplies its effectiveness many fold. However, as the years go by, I see evidence that farmers are learning the needful lesson. As young men with broadened vision and deepened enthusiasm go back from institutions like the Ontario Agricultural College to the rural communities of the Province, we see Farmers' Organizations springing up, groups of farmers getting together in Farmers' Clubs, and thrashing out their views and experiences one with another. We find them discovering presently that they can just as well join forces in business transactions of mutual concern; and they are doing it too. If I had the time I could enlarge upon this, showing how Farmers' Clubs and Associations, some hundreds of them already, in all parts of this Province, have leagued themselves together in the United Farmers' movement, and are now gaining the experience, and reaping the benefits which are fast making of them staunch exponents of co-operative principles. It is a hopeful development, I believe; it may not be a cure-all for every agricultural ill, and no doubt its success will be gauged by its inherent power to bring forth initiative, and raise up leadership for itself. In all times the farm has proven itself a fit nursery for the rearing of men; and if it could provide the leadership for other spheres of activity, for industry, trade, science, art and government I have every confidence that it could do the same for itself. Let us not be content with what has been well enough in the past, but realizing our responsibilities as the heirs of all the ages, be in some measure leaders ourselves, and help to bring about those ideal, social, economic and political conditions between class and class, which we perhaps have been asking others to do for us.

Mr. J. B. Fairbairn: This gathering, to my mind, is a unique one. While the officials of the College have frequently large gatherings at this institution of one kind or another, they are not accustomed to gatherings of so many young men who are living on the farms and who have been taking part in experiments at home, or in competitions of one kind or another, and who have won scholarships which have entitled them to attend this institution at the invitation of the Ontario Government. I am confident that the results obtained in the Acre Profit Competitions have exceeded, in practically every case, what had previously been accomplished on these men's particular farms. The increased results which you have obtained during the last year, 1915, on a small scale, can be utilized as an example which will impress each of you, your parents, and your neighbors with the possibility that in the year which we have just entered, 1916, we should be able in the Province of Ontario to very largely increase our production. This will also increase our credit, and those resources which the Dominion Minister of Finance says are so necessary in that great world wide struggle which is now going on. There are many of us who believe that we at home are playing an important part in this struggle, as well as those who are leaving to do their bit in France or in Belgium. While we have already established in this country an army of 200,000 men, possibly more, we are told that from this Dominion, which is small in population but so large in area, we must expect to send at least 500,000 men. At the same time we will have to consider what it is going to mean to us as individuals to feed these men, to uniform them, and to supply them with ammunition and other essentials. Ontario is one of the oldest, and certainly the largest in point of population of the provinces of the Dominion, and we must expect to bear the larger part of that burden. I can assure you that our share will be considerable and that the resources of this Province will be taxed to their utmost. Thus far we have not felt the taxation which has been levied in order to maintain the armies already equipped; we have not felt the donations and subscriptions which we have made in one form or another, and which in the Province of Ontario has already amounted to $13,000,000. We have not felt that as individuals because it is a small amount per capita, being only about five dollars.

The increased production of our farms during the past season has more than offset the small amount which we have subscribed to various funds. The time is coming when we shall feel this taxation more; that is when we have to maintain the army which it is suggested to organize. What I would like to leave with you is this: Much greater things are expected of us this year than were expected of us last year. We will need a great deal more credit and a great deal more produce to secure that credit, for unless we have this it will be absolutely impossible for us to uniform, equip, and maintain the men who will form that army. To those of you who are, like myself, engaged in actual farming, I say it is for us to do our level best to provide the very maximum of production in 1916.

RESULTS OF CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

Dr. C. A. Zavitz, Professor of Field Husbandry, O.A.C., Guelph.

At the last annual meeting a committee was again appointed on co-operative experiments in agriculture as follows: C. A. Zavitz (Director), W. J. Squirrell, A. W. Mason, C. R. Klinck and A. E. Whiteside. As Director of this branch of the work it again gives me pleasure to state that we have had a successful year in co-operative work in agriculture throughout Ontario. In the autumn of 1914 we arranged for six co-operative experiments with winter crops and in the spring of the present year, for thirty experiments with spring crops. In order to explain the work as clearly as possible, I present the information regarding the proposed work which was sent out in the autumn of 1914 and in the spring of 1915 which is as follows:

Winter Crops, 1914-1915.

Material for any one of the six experiments here mentioned will be sent free to any Ontario farmer applying for it, if he will conduct an experiment with great care and report the results after harvest next year. The seed will be sent out in the order in which applications are received as long as the supply lasts.

	Plots.
1. Testing three leading varieties of Winter Wheat	3
2. Testing one leading variety of Winter Rye and one of Winter Wheat	2
3. Testing Spring Applications of five Fertilizers with Winter Wheat	6
4. Testing Autumn and Spring Applications of Nitrate of Soda and Common Salt with Winter Wheat	5
5. Testing Winter Emmer and Winter Barley	2
6. Testing Hairy Vetches and Winter Rye as Fodder Crops	2

The exact size of each plot is to be one rod wide by two rods long. The material for Experiments Nos. 1, 2, 3, 5, and 6 will be forwarded by mail, and for the other one by express. Each person wishing to conduct one of these experiments should apply as soon as possible, mentioning which test he desires, and the material, with instructions for testing and the blank form on which to report, will be furnished free of cost until the supply of experimental material is exhausted.

Spring Crops, 1915.

The members of the Ontario Agricultural and Experimental Union are pleased to state that for 1915 they are prepared to distribute into every township of Ontario material for experiments with fodder crops, roots, grains, grasses, clovers and fertilizers. Fully 2,500 varieties of farm crops have been tested in the Experimental Department of the Ontario Agricultural College, Guelph, for at least five years. These consist of nearly all the Canadian sorts, and several hundred new varieties and new strains, a few of which have done exceedingly well in the carefully conducted experiments at the College, and will be used for the co-operative experiments throughout Ontario in 1915.

Each person in Ontario who wishes to join in the work may choose any one of the experiments for 1915, fill out the accompanying form of application, and return the same to the Director of the Co-Operative Experiments in Agriculture at as early a date as possible. The material will be furnished in the order in which the applications are received, until the supply is exhausted. A sheet containing the instructions for conducting the chosen experiment, and the blank form on which to report the results of the work, will be sent to each experimenter at the time the fertilizers or seeds are forwarded. All material will be furnished entirely free of charge to each applicant, and the produce of the plots will, of course, become the property of the person who conducts the experiment. In return, the Committee on Agricultural Experiments desires to ask that each experimenter will sow all the plots belonging to the particular experiment which he has chosen for 1915, and that he will be very careful and accurate in his work, and forward to the Director a complete report of the results obtained from the test, as soon as possible after the plots are harvested.

All seeds and fertilizers will be sent in good time for spring seeding, providing the applications are received at an early date. The supply of material being limited, those who apply first will be surest of obtaining the desired outfit. Each applicant should make a second choice, for fear the first could not be granted. The experiment selected should be indicated by using its number as given in the left hand column in the list of experiments. Further information is given on the application form which is enclosed.

List of Experiments for 1915.

Grain Crops.

	Plots.
1. Testing two varieties of Oats	2
2*a*. Testing O. A. C. No. 21 Barley and Emmer	2
2*b*. Testing two varieties of Two-rowed Barley	2
3. Testing two varieties of Hulless Barley	2
4. Testing two varieties of Spring Wheat	2
5. Testing two varieties of Buckwheat	2
6. Testing two varieties of Field Peas	2
7. Testing two varieties of Spring Rye	2
8. Testing two varieties of Soy, Soja, or Japanese Beans	2
9. Testing three varieties of Husking Corn	3

Root Crops.

10. Testing three varieties of Mangels	3
11. Testing two varieties of Sugar Beets for feeding purposes	2
12. Testing three varieties of Swedish Turnips	3
13. Testing two varieties of Fall Turnips	2
14. Testing two varieties of Carrots	2

Forage, Fodder, Silage and Hay Crops.

15. Testing three varieties of Fodder and Silage Corn	3
16. Testing three varieties of Millet	3
17. Testing two varieties of Sorghum	2
18. Testing Grass Peas and two varieties of Vetches	3
19. Testing Rape, Kale and Field Cabbage	3
20. Testing three varieties of Clover	3
21. Testing two varieties of Alfalfa	2
22. Testing four varieties of Grasses	4

Culinary Crops.

23. Testing three varieties of Field Beans	3
24. Testing two varieties of Sweet Corn	2

Fertilizer Experiments.

25. Testing fertilizers with Potatoes	6
26. Testing fertilizers with Mangels	10
27. Testing fertilizers with Rape	5

Miscellaneous Experiments.

28. Testing two varieties of Potatoes	2
29. Testing three grain mixtures for Grain production	3
30. Testing three grain mixtures for Fodder production	3

The size of each plot in each of the first twenty-seven experiments and in Nos. 29 and 30 is to be two rods long by one rod wide; in No. 28 one rod square.

If you wish to conduct one of the thirty agricultural experiments named on the accompanying circular, kindly fill out the blank form, and return it as soon as possible.

The distribution will be confined to the choice varieties included in the various experiments. In filling out the blank form, therefore, it is neither necessary nor advisable to mention any particular variety or varieties.

Material for experiments numbered 25, 26 and 27 will be sent by express and that for each of the others by mail.

Application for Material for an Experiment.

I would like to conduct experiment number ...., but if all the material for that experiment has been applied for before my application is received I select experiment number .... as my second choice. If the material for one of these experiments is forwarded to me, I will endeavor to

1. Carry on the test according to the instructions received with the seed.
2. Exercise care and accuracy in the work, and
3. Report the result of the experiment as soon as possible after harvest, whether successful or not.

The demand for experimental material was good, there being 4,182 experimenters in farm crops during the last season. The number would have been larger had not a restriction been made in a few of the most popular experiments for the sake of economy.

According to the bulletin of the Bureau of Industries for Ontario the months of April, September and October were above the average and the months of May, June, July and August were slightly below the average mean temperature. Owing to April being so very warm, vegetation and growth increased rapidly but fell back owing to coldness in the month of May. The precipitation from the months of January to October inclusive was 27.78 inches or 1.2 inches above average. Five months were above average and five below average, July and August being unusually high. Crops suffered very severely from the excessive rains of these months.

At the Ontario Agricultural College weather conditions in the autumn of 1914 were about normal and the winter crops made a good growth. In 1915 the month of April was unusually warm, the month of May was cool and the month of June about normal. The following information has been secured from the Department of Agricultural Physics at the College and gives the analysis of rain fall for each month from April to September in 1915 and for the average of the past sixteen years:

Months.	1915	Average 16 years.
April	2.23	2.22
May	2.24	2.70
June	2.27	2.39
July	5.87	3.56
August	6.16	2.96
September	3.92	2.42
Total 6 months	22.69	16.25

It will be seen that the amount of rain which fell in the months of July, August and September in 1915 is almost as great as the average amount of rain fall for the six growing months for the past sixteen years. The amount of rain which fell in August in 1915 was more than double the amount of rain fall for that month in the average of the past sixteen years. The months of July, August and September were exceptionally wet both at the College and throughout the greater part of Ontario.

The results of the co-operative work are, therefore, of peculiar interest for the past year. The experimenters conducted the tests according to instructions furnished them and reported the results of their individual experiments on blank forms which were sent along with the seed. The reports of the co-operative experiments for 1915 which we received were submitted to a very critical examination. For the Summary Report which is presented at this time only the summaries of those reports which showed carefulness and reliability throughout, were used. Many of these reports have been furnished by men who have had a large amount of practical experience on the farm, have had the advantage of a good education and have had a careful training in experimental work as they have conducted successful tests on their own farms in each of several years past. It should be remembered that, while only the good reports of carefully conducted experiments have been used for publication, many of those not included in the summary report showed that the individual experimenters must have obtained a considerable amount of valuable information from their work, and in some instances a start with choice seed of varieties particularly suited to their own farms. It occasionally happens that owing to some accident an experiment may have been injured so that the results could not have been used in the summary, but the experiment may have given useful lessons to the farmer conducting it and sometimes to other farmers in the vicinity. Experimenters obtain much more information from the work which they conduct than can be given in the summary report such as the one here submitted.

Each experimenter received instructions for conducting the co-operative work along with a request for him to give his decision as to the relative standing of the different varieties, mixtures, quantities of seed, fertilizers, manures, etc., after everything had been taken into consideration. The report here presented includes a summary of the answers to this line of enquiry and this is presented in the tabulated results under the head of Comparative Value.

Varieties of Grain Crops.

As was stated in the circular which was sent to the experimenters and which is incorporated in the preliminary part of this report, the varieties which were distributed for the co-operative tests were those most likely to give good results throughout Ontario. The number of varieties distributed is kept as low as possible, the object being to enable the farmers to reduce the number of varieties to the minimum and to use only the very best. Every variety which is distributed has been carefully tested at the College before it is included in the co-operative work. The Experimental Union is actively engaged with those crops which are used on about nine-tenths of the cultivated land of the Province. It is pleasing to note that some of the varieties which are now being extensively used in general cultivation are those which were introduced by or originated at the College, and after proving their worth were distributed and used in the co-operative work. Some varieties do particularly well over nearly the whole of Ontario while in other instances the varieties which will do the best on one kind of soil will not do so well on a soil of a different character. The co-operative experiments enable the farmers to glean this information and to use those kinds which are most suitable for their own particular soils. There have been far too many varieties of farm crops grown in Ontario in recent years. We believe there is some improvement in this respect at the present time and that the farmers are concentrating more and more on a few of the superior sorts. The barley crop has become practically uniform throughout the Province as it is now nearly all Mandscheuri or O.A.C. No. 21 barley that is grown with evidently a large preponderance of the latter. We hope that in the near future there will be a very large reduction in the varieties of oats and of potatoes especially. In drawing attention to a few of the best varieties of grain and of other farm crops the results here presented should prove of special value. We are pleased to submit the tabulated results of the different varieties of grain crops tested throughout Ontario in 1915 with confidence that they will be studied with interest and when examined in connection with the comments which follow will prove of much service.

The yield of straw per acre as given in the fourth column of the tabulated results represents the total crop less the amount of grain and, therefore, includes the chaff with the straw. The yield of grain is given in pounds as well as in bushels per acre in order that the results may be very clearly understood, and that certain comparisons may be made between the different classes of crops as well as between the varieties of each class. Definite comparisons can be made between the varieties of each class of farm crops as they were grown on the same farms and under similar conditions. Caution should be exercised, however, in comparing one class of farm crop with another as it should be understood that these have been grown on different farms. In cases where there are a considerable number of tests of each class, however, certain comparisons might be made regarding the yields of different classes. Owing to the great variation in the weight per measured bushel of different crops, it is easier to compare the results in pounds than in bushels per acre. It should be understood that in working out the number of bushels per acre the standard weights per measured bushel have been used for each class of crop. Attention is again called to the fact that the figures in the third column under Comparative Value are made up from the answers received from the experimenters in regard to the varieties after the farmers who conducted the experiments had taken everything into consideration.

Experiments.	Varieties.	Comparative value.	Yield per Acre.		
			Straw (tons.)	Grain (bus.)	Grain (lbs.)
Oats (126 tests)	O. A. C. No. 72	100	1.87	52.94	1,800
	O. A. C. No. 3	74	1.47	49.11	1,670
Six-rowed Barley (23 tests).	O. A. C. No. 21	100	1.57	42.13	2,022
	Common Emmer	65	1.56	34.85	1,673
Two-rowed Barley (5 tests).	Hanna	92	2.83	29.67	1,424
	Two-rowed Canadian	100	2.55	26.83	1,288
Hull-less Barley (19 tests)	Guy Mayle	100	1.52	22.87	1,372
	Black Hull-less	100	1.45	21.19	1,271
Spring Wheat (24 tests)	Wild Goose	93	1.60	20.28	1,217
	Marquis	100	1.52	19.13	1,148
Winter Wheat (38 tests)	Banatka	75	2.05	31.43	1,886
	American Banner	100	1.79	30.29	1,817
	Imperial Amber	95	2.10	29.18	1,751
	Yaroslaf	88	2.09	28.99	1,739
	Crimean Red	58	2.01	25.80	1,548
Buckwheat (5 tests)	Rye	100	1.97	27.67	1,328
	Silver Hull	100	2.35	22.67	1,088
Spring Rye (2 tests)	O. A. C. No. 61	100	1.93	18.21	1,020
	Common	68	1.80	12.50	700
Field Peas (57 tests)	Canadian Beauty	100	1.64	24.33	1,460
	Early Britain	82	1.26	23.12	1,387
Field Beans (16 tests)	Pearce's Improved Tree	92	1.04	34.15	2,049
	Marrowfat	100	.87	28.84	1,730
	Common Pea	83	.60	27.77	1,666
			Whole Crop		
Corn for Grain (8 tests)	Golden Glow	95	9.11	59.01	3,305
	Longfellow	100	8.57	52.14	2,920
	Compton's Early	58	8.62	50.54	2,830

Varieties of Oats.—Of all the cereal crops grown in Ontario, oats have the highest commercial value, reaching at present to about forty million dollars annually. A large amount of experimental work has been conducted at Guelph in testing the best varieties of oats obtained from various parts of the world and improving these best kinds by selection and by hybridization.

Unfortunately there are too large a number of varieties of oats grown in Ontario. In our sheets of inquiry in connection with the co-operative experiments, we have asked each experimenter to name the variety of oats which was grown the most extensively in his county. The answers to these inquiries give us interesting information in regard to the varieties of oats extensively cultivated throughout the Province. In summarizing these answers for 1915, it was found that the varieties of oats named the greatest number of times as being the most extensively grown were as follows, and in the order here given: Banner, Siberian, O.A.C. No. 72, Abundance, Twentieth Century, Ligowa and Mammoth Cluster. In each of the past six years the reports indicated that the most extensively grown varieties in Ontario were the Banner, the Siberian and the Ligowa. The full number of varieties mentioned as being extensively grown were 29 in 1911, 33 in 1912, 31 in 1913, 26 in 1914, and 29 in 1915. It is probably safe to say that the Banner, the Siberian, the O.A.C. No. 72 and the Abundance form about seventy-five per cent. of all the oats grown in Ontario at the present time. The O.A.C. No. 72 variety which was originated at the College and introduced lately is increasing very rapidly indeed, and in another year may come next to the Banner in number of acres under cultivation.

It is interesting to note that at the College in 1915 the O.A.C. No. 72 variety of oats gave a yield at the rate of 103.5 bushels and the American Banner of 92.8 bushels per acre. The following gives the comparative yield in bushels per acre of the O.A.C. No. 72 and of the Banner varieties of oats at the College in each of the past nine years:

Years.	Banner.	O.A.C. No. 72.
1907	65.9	76.4
1908	83.5	86.8
1909	70.4	102.9
1910	73.6	93.6
1911	30.4	44.0
1912	73.4	114.1
1913	74.4	105.7
1914	88.0	88.5
1915	92.8	103.5

The average for the whole period of nine years of the O.A.C. No. 72 was 90.6 bushels and for the Banner 72.5 bushels per acre. At the Provincial Winter Fair held in Guelph last month, there were 137 entries of oats divided as follows: O.A.C. No. 72, 57; Banner, 13; Abundance and Regenerated Banner, each 8; Sensation, 6; Lincoln, Improved Scotch, and Joanette, each 4; Regenerated Abundance, Early Yielder and White Wave, each 3; Siberian and Daubeney, each 2; and 16 other varieties, each 1. Four entries were unnamed. There were, therefore, in all 29 named varieties. It will be seen that the O.A.C. No. 72 had more than four times as many entries as any other variety of oats. It took first prize in the entries in connection with the Field Crop Competition open to all varieties of white oats.

In the spring of 1915, two varieties of oats were used for the co-operative tests, viz., the O.A.C. No. 72 and the O.A.C. No. 3. The aim of the Experimental Union is to introduce as few varieties as possible and only use, in the co-operative work, those which have proved to be highly worthy as indicated by the results of the experiments at the Provincial experiment station at Guelph.

The tabulated report shows that there were 126 complete and carefully conducted experiments with oats in 1915. The average results show that the O.A.C. No. 72 gave 52.9 bushels and the O.A.C. No. 3 40.1 bushels of threshed grain per acre. The O.A.C. No. 72 was the most vigorous grower, producing two-fifths of a ton of straw per acre more than the O.A.C. No. 3. It was also the most popular variety, although ten days later in reaching maturity. In the average of three years, during which time we have tested these two varieties, the O.A.C. No. 72 gave 52.5 and the O.A.C. No. 3, 47.1 bushels per acre or an increase of the former over the latter of practically five and one-third bushels per acre. We believe that the O.A.C. No. 72 variety will be worth millions of dollars to the Province of

Ontario as an oat for general cropping as it is a high yielder of grain and an abundant producer of straw which is comparatively stiff, even though it lodged considerably in the past year owing to the abnormal weather conditions. The O.A.C. No. 3 variety is particularly suitable for those wishing a very early oat to grow by itself or more particularly to grow with barley when it is desired to grow the two grains in combination.

Care is taken each year to distribute seed oats free from smut spores. In an examination of the reports received, it was interesting to note that the crops produced from the seed of the O.A.C. No. 72 and the O.A.C. No. 3 varieties were practically free from smut and in many other cases, where home grown seed of some other variety was used by the experimenters as a basis of comparison, the smut was very bad, being as high as twenty, twenty-five and even thirty-three per cent. As near as could be ascertained, there were forty to fifty times as much smut in the crops grown from seed supplied by the experimenters as in those grown from the seed distributed through the medium of the Experimental Union.

O.A.C. No. 21 Barley and Common Emmer. Extensive experiments at the College have shown that the O.A.C. No. 21 barley has given the most satisfactory results, even surpassing the Mandscheuri variety which was introduced by the College twenty-six years ago and which has done so much in the improvement of barley growing in Ontario. In the co-operative experiments throughout Ontario, the Mandscheuri occupied highest place in each of a number of years and surpassed nearly all other varieties in general cultivation throughout the Province. For four years in succession the Mandscheuri and the O.A.C. No. 21 varieties were used in the co-operative experiments, and the results favored the last named variety. In each of the past three years, the co-operative experiments have been confined to a test of the O.A.C. No. 21 barley and Common Emmer. Emmer is a type of spring wheat somewhat resembling barley.

There is not a clear separation of the grain and the chaff in the process of threshing, and both are ground together for feed. Ground Emmer is somewhat similar in composition to barley meal for feeding purposes. In the co-operative experiments over Ontario, the O.A.C. No. 21 barley surpassed the emmer in yield of grain per acre by 422 pounds in 1913, by 355 pounds in 1914 and by 349 pounds in 1915.

In the barley experiments at the College and throughout Ontario the O.A.C. No. 21 still occupies highest place in yield of grain per acre. This variety has become exceedingly popular throughout the Province and is supplanting nearly all other varieties, even the Mandscheuri. It is now estimated that about 96 per cent. of all the barley which is grown in Ontario belongs to the Mandscheuri or the O.A.C. No. 21 varieties. In some parts of Ontario, however, the Common Six-rowed barley is still grown. According to the reports received from the experimenters, the Common Six-rowed barley is still grown extensively in some of the eastern counties, such as: Glengarry, Lanark and Addington. The Common Six-rowed is also reported as being grown quite extensively in the vicinity of Sudbury.

Of the forty entries of barley at the Provincial Winter Fair held in Guelph last month, not a single name occurred except the O.A.C. No. 21. According to the report of the Bureau of Industries for Ontario, the yield of barley per acre for the past sixteen years as compared with the sixteen years previous has had an increase of about twenty-three per cent. This has undoubtedly been brought about largely by the introduction of the improved varieties and it is estimated that the cash value of the increase to the Province of Ontario has approximated about thirty-five million dollars within the past sixteen years.

Two-rowed Barley.—The amount of two-rowed barley grown in Ontario is very limited. A large number of different varieties of two-rowed barley has been tested at the Ontario Agricultural College and it has been found that the six-rowed varieties give a higher average yield per acre than the very best kinds of two-rowed barley which could be obtained. In the co-operative experiments for 1915 it will be seen that the highest yielding two-rowed barley gave fully twelve bushels per acre less than the O.A.C. No. 21 variety.

Hull-less Barley.—Not nearly so much interest is taken in hull-less barley at the present time as there was a few years ago, although it is grown in some localities considerably. Two varieties were distributed for Co-operative Experiments in the spring of 1915 and nineteen good reports were received. The Guy Mayle gave the highest yield per acre of the two varieties under test, but gave an average of 650 pounds per acre less than the O.A.C. No. 21 which was grown on twenty-three farms.

Spring Wheat.—Increased interest was aroused in spring wheat production the past year owing to the high price of wheat brought about through the war in Europe. In each of three years we have distributed the Marquis variety of spring wheat along with the Wild Goose variety. In the average of three years' results the Wild Goose gave 19.9 bushels and the Marquis 19.2 bushels per acre. The Marquis wheat is a superior variety for flour production and was originated by Dr. Wm. Saunders of Ottawa and was selected and introduced by his son, Dr. C. E. Saunders, Cerealist at the Central Experimental Farm, Ottawa.

Winter Wheat.—Five varieties of winter wheat were distributed for the co-operative experiments in the autumn of 1914. The results of the winter crops were sent to all of the experimenters and to about 350 of the newspapers and agricultural journals of Ontario between the time of harvest and of seeding winter wheat last autumn. The Banatka which has this year given a large yield per acre is an excellent variety of milling wheat. In 1914, the Banatka came fourth on the list in yield per acre and in former years has not been a particularly heavy yielder.

Buckwheat.—Three varieties of buckwheat were again used in the co-operative experiments in 1915. The Rye buckwheat gave an average of five bushels per acre over the Silver Hull variety and in the average of seven years results of these two varieties, the Rye buckwheat gave 25.3 and the Silver Hull 20.5 bushels per acre per annum. It will, therefore, be seen that the Rye buckwheat is a very heavy producer in comparison with the Silver Hull variety. The last named variety is the one most extensively grown throughout Ontario, according to the reports of the experimenters.

Spring Rye.—In each of the past five years the O.A.C. No. 61 variety of spring rye has given the highest yield of grain per acre in the co-operative experiments, the average yield per acre per annum for the five years being 21.7 bushels for the O.A.C. No. 61 and 18.8 bushels for the Common. In 1915, the O.A.C. No. 61 variety surpassed the Common spring rye by an average of 5.7 bushels per acre. Of all the varieties of spring rye which we have grown, the O.A.C. No. 61 has given the best satisfaction at Guelph and has been the most popular and the most productive variety in connection with the co-operative experiments.

Winter Rye and Winter Wheat.—In the autumn of 1914, the Petkus winter rye and the Imperial Amber winter wheat were distributed for the co-operative tests. The average results show that the Petkus rye surpassed the Imperial Amber winter wheat by an average of 380 pounds of grain per acre. In the experiments at the College, the Petkus variety of winter rye has surpassed all other varieties of rye in each of the past four years.

Field Peas.—There was an unusual demand for the experiment with field peas in the spring of 1915. This was brought about undoubtedly by the high price of peas, the demand for concentrated food for home use and for export and by the encouragement given to the growth of field peas as well as field beans in Ontario. For co-operative experiments two varieties, viz., the Canadian Beauty, a large white smooth pea and the Early Britain, a brown dented variety were used. The average results of good reports of fifty-seven successfully conducted experiments show a yield of slightly over one bushel per acre in favor of the Canadian Beauty variety. These two varieties have been used in the co-operative experiments in each of the past fourteen years, during which time they were successfully tested on 440 Ontario farms. In bushels of grain per acre, the yields were: 24.23 for the Early Britain and 24.22 for the Canadian Beauty in the average of the fourteen-year period. It will, therefore, be seen that these two varieties have given exactly the same yield of grain per acre when a whole period of fourteen years is taken into consideration.

Field Beans.—Although the demand for field beans for co-operative experiments was quite large in the spring of the past year, the number of good reports received is not particularly high, being sixteen. This is due partly to the fact that owing to the excessive rains the bean crop was almost a failure in some sections of the Province in 1915. The average results for the experiments conducted on sixteen farms show very good yields per acre. The Pearce's Improved Tree variety headed the list with 34.2 bushels, followed by the Marrowfat with 28.8 bushels and the Common Pea with 27.8 bushels per acre. These three varieties of beans have been tested over Ontario in each of the past three years, the average results in bushels of grain per acre being Pearce's Improved Tree beans 26.5, Marrowfat 24.5 and Common Pea 22.0. In the spring of 1915 a bulletin on "Field Beans" was published by the College, copies of which can be obtained from the Department of Agriculture, Parliament Buildings, Toronto. In that bulletin the results are given of each of ten varieties of field beans for a period of ten years which show that the Pearce's Improved Tree bean stands at the head of the list with 23.4 bushels per acre, being 5.3 bushels per acre per annum higher than the yield of any other variety. The Pearce's Improved Tree bean is a medium sized white bean of excellent quality and requires a fairly long season to ripen.

Soy Beans.—No good reports on Soy beans were received from the experimenters in the past year. The Early Yellow variety of Soy beans has proved to be one of the very best varieties which has been tested at the College. In 1914 this variety gave an average of 30.4 bushels per acre in three co-operative experiments.

Winter Emmer and Winter Barley.—Although there was a small demand in the autumn of 1914 for winter emmer and winter barley for co-operative experiments in grain production, no good reports were received last autumn. The winter emmer at the College has given an average of 2,460 pounds of grain in the results of the past eight years. Winter barley usually gives a large yield per acre when it survives the winter but it is somewhat more tender than winter wheat.

Corn for Grain Production.—It is perfectly true that no one variety of corn would prove to be the most suitable for general cultivation in all parts of Ontario, hence the importance of co-operative experiments to enable the growers to ascertain for themselves which varieties would give the best results upon their own particular farms. The average results should be studied with a good deal of caution as so much depends upon the soil and the locality in which the individual tests are made. In the spring of 1915, seed of three varieties of corn was distributed for grain production. The average results of eight successfully conducted experiments show that the Golden Glow came at the top of the list in yield of grain per acre, surpassing the Longfellow and the Compton's Early varieties. In connection with this, however, it should be noted that the Longfellow was somewhat more popular with the experimenters than the Golden Glow. The Golden Glow is a dent corn and the other two varieties are flints, the Longfellow being an eight rowed and the Compton's Early a twelve rowed corn.

Grains Grown in Combination for Grain Production.

Systematic experimental work has been conducted at our Agricultural College for a number of years in succession in testing out various combinations of grain for green fodder, for hay and for grain production. The results of the College work which have been both interesting and important have been reported in the annual reports of the College. It was found that certain combinations gave practically no advantage while others furnished considerable increases in crop production. A combination of varieties of the same class of grain gave no appreciable advantage in increase in yield per acre. Combinations of certain classes, however, showed decided advantages. One of the most marked results obtained was from a combination of oats and barley grown in the proper proportions and of the right varieties which gave a yield of fully 200 pounds of grain per acre over either grain grown separately in very careful tests extending over a series of years. Varying proportions of oats and barley were also carefully tested at the College and definite results were obtained.

Based on the results of experiments at the College tests were arranged for co-operative work throughout Ontario. From 1905 to 1909 an experiment was conducted with different varieties of oats, barley and spring wheat which were grown in combinations of two and three kinds of grain together. The results of the five years' experiments showed that throughout Ontario one bushel of the Daubeney oats and one bushel of the Mandscheuri barley gave a higher yield of grain per acre than any of the other mixtures used in this experiment. In 1910 a co-operative experiment was conducted for the first time throughout Ontario in testing three different proportions of oats and barley in order to find out which one would give the largest yields on the average and on the different soils throughout the Province. In 1910 the varieties used were the Daubeney oats and the Mandscheuri barley; in 1911, the Alaska oats and the O.A.C. No. 21 barley; in 1912, in 1913, and in 1914, the Daubeney oats and the O.A.C. No. 21 barley; in 1915, the O.A.C. No. 3 oats and the O.A.C. No. 21 barley.

The results of the co-operative experiments in 1912 were not of sufficient value to be reported in tabulated form. The average results of the experiments for each of the five years, during which time this experiment has been conducted, are as follows:

Varieties and Combinations.	Seed per Acre.		Yield per Acre.											
			Tons of Straw.						Pounds of Grain.					
	Bushels.	Pounds.	1910	1911	1913	1914	1915	Ave.	1910	1911	1913	1914	1915	Ave.
Oats......	½	41	1.32	.75	.97	.68	1.28	1.00	1,528	1,420	1,260	1,136	1,880	1,445
Barley....	½													
Oats......	1	82	1.47	.93	1.25	.68	1.72	1.21	2,104	1,820	1,510	1,296	2,270	1,800
Barley....	1													
Oats......	1½	123	1.61	1.29	1.63	.65	1.86	1.41	2,096	1,594	1,700	1,488	1,980	1,772
Barley....	1½													

The average results show that a mixture of one bushel of oats and one bushel of barley or a total of two bushels per acre has given the highest average yield in grain production in 1915 and also in the average of the past five years throughout Ontario. A study of the tabulated results show that in two years a heavier seeding gave the highest yield. These years were fairly dry throughout the growing seasons and in each of the other years there was a greater amount of rainfall. In each year the lightest seeding gave the lowest yield of grain per acre. In the results of more extensive experiments carried on at the College extending for a period of more than ten years the combination of one bushel of oats and one bushel of barley has produced the largest yield of grain.

Field Roots, Fodder Crops, Grasses, Clovers and Alfalfa.

In 1915 co-operative experiments were conducted throughout Ontario with mangels, sugar beets for feeding purposes, swede turnips, fall turnips, field carrots, fodder corn, millet, grass peas, vetches, rape, kale, field cabbage, grasses, clovers and alfalfa. As usual the number of applications for some of these crops was not large, and the reports, especially for fall turnips and millet, were very meagre. In the majority of tests we received a sufficient number of good reports of successfully conducted experiments to enable us to present results which are valuable as a general guide regarding the different varieties grown throughout the Province. We have always found it difficult to get full and satisfactory reports of grasses, clovers and alfalfa in a manner suitable for presentation in the form of a table. These different crops are not ready for cutting at the same time, and the weather conditions sometimes make it very difficult, indeed, to give uniform weights of either the green crops or of the hay. Some of the crops produce one, some two, and some even three cuttings in the one season, hence, the difficulty in presenting definite information. The season of 1915 made it particularly difficult to get full reports of some of the experiments with fodder crops. The following table gives in tabulated form the average results of some of the experiments here referred to:

Experiments.	Varieties.	Comparative Value.	Yield per acre (tons).
Mangels (13 tests)	Sutton's Mammoth Long Red..........	96	33.82
	Yellow Leviathan (Ferry).............	100	33.71
	Ideal (Ontario Seed Co.)...............	74	32.39
Sugar Beets (5 tests) ...	Rennie's Tankard Cream...............	100	23.86
	Bruce's Giant White Feeding...........	100	23.72
Swede Turnips (7 tests).	Steele, Briggs' Good Luck...............	93	26.98
	American Purple Top..................	100	26.82
	Garton's Model.........................	93	25.78
Carrots (10 tests).......	Bruce's Mammoth Intermediate Smooth White............................	100	21.53
	Simmers' Imported Giant Short White...	79	20.84
Fodder Corn (3 tests) ...	Salzer's North Dakota..................	100	13.41
	Wisconsin No. 7.......................	86	12.41
	Smith's White Cap Yellow Dent.........	71	11.15
Grass Peas and Vetches (3 tests)	Hairy Vetches..........................	75	10.80
	Grass Peas	100	9.00
	Common Vetches.......................	50	6.27
Hairy Vetches and Winter Rye (3 tests)	Hairy Vetches	88	11.13
	Common Winter Rye..................	100	8.67
Sorghum (3 tests)	Early Minnesota Sugar Cane............	100	6.37
	Early Amber Sugar Cane...............	100	5.47

Varieties of Mangels.—The general classification of mangels is made according to shape into four distinct types, viz., the long, the intermediate, the globe and the tankard. Varieties of each of these classes have been tested over a series of years at the Ontario Agricultural College. At one time it was thought that the long red mangel was most prolific in root production under practically all circumstances. Within recent years, however, in the majority of experiments at the College and throughout Ontario the highest yields have been obtained from the intermediate and the tankard types. The globe varieties have been in practically all cases low yielders.

In 1915 three varieties of mangels were distributed for co-operative experiments throughout Ontario. The long red class was represented by the Sutton's Mammoth Long Red, the intermediate by the Yellow Leviathan, and the tankard by the Ideal. In the average of thirteen tests made over Ontario in the past year the Sutton's Mammoth Long Red came first, surpassing the Yellow Leviathan by about one-tenth of a ton of roots per acre. These two varieties, however, have been used in the co-operative experiments in each of the past thirteen years during which time the Yellow Leviathan surpassed the Sutton's Mammoth Long Red ten times leaving only three years in which the Sutton's Mammoth Long Red surpassed the Yellow Leviathan, viz., 1903, 1908 and 1915. The seed of the Yellow Leviathan mangel was first obtained by the Ontario Agricultural College from D. M. Ferry & Co., Windsor, Ontario, in the spring of 1893. The name "Yellow Leviathan" was entered in the catalogues of some of the seedsmen as follows: The Steele, Briggs Seed Co., Toronto, in 1896; Jas. Hewer, Guelph, in 1908; the Wm. Rennie Seed Co., Toronto, J. A. Simmers, Toronto, and Jno. A. Bruce, Hamilton in 1909; and Geo. Keith, Toronto, in 1910. We have found that the seed under the name of Yellow Leviathan obtained from different seedsmen in Ontario has varied considerably in germinating power of the seed, and in shape, size and color of the roots in 1915 as well as in other years. As time advances, however, a larger proportion of the seed offered for sale is becoming truer to variety. According to reports from experimenters Yellow Leviathan mangels are now grown more extensively than any other variety in a number of the counties of Ontario.

Sugar Beets for Feeding Purposes.—This class of roots is quite distinct from the sugar beets grown for sugar production, and is frequently spoken of as sugar mangels. As a rule mangels have from 5 to 8 per cent. of sugar, sugar mangels from 8 to 11 per cent. of sugar, and sugar beets from 14 to 16 per cent. of sugar. The sugar mangels grow largely out of the ground and are more easily harvested than the sugar beets which are raised for sugar production.

For co-operative work in Ontario two varieties of sugar mangels have been selected from a large number of different varieties which have been grown at Guelph and tested both for quantity and for percentage of sugar. The Rennie's Tankard Cream and the Bruce's Giant White Feeding varieties have both made good records in the experiments at Guelph and have been used in the co-operative experiments over Ontario in each of eight years during which time the Rennie's Tankard Cream surpassed the Bruce's Giant White Feeding in 1915 and also in the years 1911, 1909 and 1908, and in each of the other four years the Bruce's Giant White Feeding variety gave the highest average yield of roots per acre.

Swede Turnips.—Three varieties of swede turnips were distributed for co-operative experiments in the spring of 1915. There is still a considerable amount of interest taken in this class of roots. The average of seven co-operative experiments shows the Steele, Briggs' Good Luck at the top of the list with practically twenty-seven tons per acre. The Garton's Model occupied lowest place in the co-operative experiments in 1914 as well as in 1915.

Fall Turnips.—But little interest is taken in fall turnips in Ontario and no satisfactory reports of carefully conducted experiments were obtained in 1915. In past years the Red Top White Globe has made a good record, surpassing the White Egg variety in the co-operative experiments in each of four years.

Field Carrots.—The Intermediate White field carrots are probably more extensively grown than any other class. In comparison with the White Belgian variety they give a larger yield per acre, are more easily harvested, and are more conveniently stored. Even in spite of these facts, which are pretty generally known, a report was received showing that in one county at least the White Belgian is still the most extensively grown variety of carrots. In the co-operative experiments throughout Ontario in 1915, two varieties of Intermediate carrots were tested successfully on ten separate farms. The Bruce's Mammoth Intermediate Smooth White headed the list with an average of 21½ tons per acre. The Bruce's Mammoth Intermediate Smooth White surpassed in yield per acre the Steele, Briggs' Improved Short White in the co-operative experiments in 1914 and in 1913.

Fodder Corn.—In recent years fodder or silage corn has been gradually increasing in acreage. As time advances the amount of fodder corn in Ontario will undoubtedly be increased as it is a comparatively sure crop and gives a large yield of valuable stock feed per acre. A well cultivated crop of corn leaves the land in excellent condition for the crop which is to follow.

In 1915 a co-operative experiment was conducted throughout Ontario with three varieties of corn from the standpoint of fodder production. Owing to the peculiar season only three good reports of successfully conducted experiments were received. The average of these three reports shows the Salzer's North Dakota to stand the highest, the Wisconsin No. 7 second, and a late strain of the White Cap Yellow Dent third in fodder production. This may be a surprise to many people. The Salzer's North Dakota being a flint corn does not grow as tall as some of the dent varieties, and usually gives a higher yield than its appearance would indicate. The three co-operative experiments were conducted in Hastings, Parry Sound and Muskoka. The highest yield per acre was produced by the Salzer's North Dakota in each of the three tests. This variety is also earlier than either of the two dent varieties included in the test.

Grass Peas and Vetches.—For seventeen years in succession experiments have been conducted throughout Ontario in the testing of grass peas, hairy vetches and common vetches. This has enabled the farmers to glean valuable information regarding these three leguminous crops, about which a considerable amount has been written in recent years, especially in connection with the hairy vetches. The grass peas have been grown in Ontario as a farm crop, the common vetches for mixing with oats as a green fodder, and the hairy vetches as a fodder crop, more particularly as a cover crop for orchards.

In 1915 the hairy vetches gave an average yield of 10.8 tons of green crop per acre in the co-operative experiments. This variety was not quite as popular as the grass peas with the experimenters in 1915. In the co-operative experiments over Ontario the greatest yield of fodder per acre of these three leguminous crops was produced by the hairy vetches in 1899, 1900, 1901, 1902, 1906, 1907, 1908, 1909, 1911, 1913, 1914 and 1915. In nearly every year the common vetches have occupied lowest place in yield of fodder per acre. The seed of the hairy vetches has been expensive as the most of it has been imported. It is, however, being grown for seed production to a limited extent in the southern part of Ontario, especially in Norfolk County, where it is frequently grown in the autumn with winter rye, and the two crops are harvested together for seed.

Millet.—There were no good reports received in the co-operative experiments with millets in 1915. In past years, however, the Japanese Panicle variety of millet has proven to be a very productive variety of both green fodder and of hay.

Rape, Kale and Field Cabbage.—As in the case of millets no good reports of successfully conducted experiments were received this year of the rape, kale and field cabbage. The Dwarf Essex rape is very well known over Ontario as a crop for pasture and for green fodder. In the experiments at Guelph the field cabbage when sown at the rate of from one to one and one-half pounds of seed per acre has produced a higher yield than either the Dwarf Essex rape or the kale.

Hairy Vetches and Winter Rye.—In the average of three co-operative experiments with hairy vetches and winter rye sown in the autumn it was found that the hairy vetches gave an average of practically two and one-half tons per acre more than the winter rye, although the winter rye was a popular fodder crop according to the reports of the experimenters.

Sorghum.—About thirty varieties of sorghum have been under test at the College. Of these the Early Minnesota and the Early Amber varieties were used in the co-operative experiments in the spring of 1915. The yields per acre were comparatively low in the past year, the Early Minnesota surpassing the Early Amber by nearly one ton per acre.

Grasses, Clovers, and Alfalfa.—As mentioned previously it is difficult to obtain full and accurate information of the experiments with different varieties of grasses or of clovers as the different varieties produce a varying number of crops which are ready for cutting at different dates.

Some exceedingly interesting work is being conducted with alfalfa over Ontario at the present time, both in regard to hardiness of different varieties and in determining the suitability of the row method for seed production. Within the past two years we have had about one hundred and fifty acres of the Grimm and the Ontario Variegated varieties of alfalfa sown in the different counties of Ontario, with seed production as the main object in view. During the past year special attention has been devoted to the row method for seed production. The following instructions were sent to those who conducted acre experiments in growing the Grimm alfalfa in rows for seed production, the results of which will be seen in future years:

1. At least forty rods from any alfalfa field select land which has a good natural underdrainage, and preferably soil of rather a heavy character, elevated and sloping, and which is comparatively free from weeds and from weed seeds.

2. Thoroughly cultivate the soil until the month of July.

3. Sow on the selected acre the three pounds of Grimm alfalfa seed in rows thirty inches apart, at that time in July when the land has sufficient moisture for quick germination.

4. Cultivate between the rows occasionally throughout the season to destroy the weeds and to conserve moisture. Practice level cultivation.

5. In the spring of 1916 again cultivate the land thoroughly and keep the crop free from weeds.

6. On one-half of the land allow the first crop in the season to remain for seed. Cut the crop when the pods have become brown.

7. On the other half of the acre use the first cutting for hay and allow the second crop in the season to produce seed. The crop for hay should be cut when it is starting to bloom or when the young shoots are starting to grow from the crowns of the roots. All crops should be cut from *two to three inches above the crowns* of the roots to prevent the killing of the plants.

For seed production the cultivated row system requires less seed, conserves soil moisture, tends to keep the land free of weeds and insect pests, and favors a large yield of seed of good quality.

It is expected that seed can be produced from this acre for a number of years if the foregoing directions are followed. After 1916 the grower is at liberty to use such methods as he desires. The seed produced each year becomes the property of the grower to be used for sowing on his own farm or to be sold to others for sowing on their farms.

Besides the acre experiment seed of the Grimm alfalfa was used in rows in larger areas in sections where alfalfa seed production had already proved to be specially successful. We believe that a large amount of most valuable information will be obtained from our numerous co-operative experiments which are now being conducted throughout Ontario with varieties of alfalfa, inoculation of seed, the application of lime, and the methods of sowing for seed production.

Varieties of Sweet Corn for Table Use.

In each of the past few years from two to three varieties of sweet corn have been used for the co-operative experiments. Sweet corn is grown in Ontario for table use at home, for supplying the canning factories, and for using as a green or a dry fodder for farm stock. For home use it is important to secure those varieties which are ready for use at different dates and which produce corn of the highest quality for table use. For factory purposes it is important to have good sized ears of white corn of good flavor. As a fodder crop it is important to grow varieties which produce a large amount of stalks and of ears which are most suitable for feeding in the autumn to farm stock. The main object in the co-operative experiments with sweet corn has been to secure the variety for table use at home that will furnish the grain which is sweet, juicy and tender, and ears which are comparatively small and have but few rows, eight being the most desirable number.

Upwards of fifty varieties of sweet corn have been under test at the Ontario Agricultural College. These different varieties have all been studied in the field, and many of them have been tested for table use. In the co-operative experiments the varieties which have been used most extensively have been the Golden Bantam, the Mammoth White Cory, and the Malakhoff. Of these varieties the Golden Bantam proved the best, the Mammoth White Cory the second best, and the Malakhoff came lowest in the list. In each of the past three years only two varieties were selected for distribution one being the kind which has proven most desirable as an early corn, and the other being a standard late variety. The two kinds used were the Golden Bantam of the early, and the Stowell's Evergreen of the late varieties. The following table gives the average results of twenty-three successfully conducted tests of these two varieties under similar conditions in the past year:

Experiment.	Varieties.	Comparative Value.	Number of Ears.	Number of days until ready for table use.	Table quality.	
					Flavor.	Juiciness.
Sweet Corn (23 tests)	Golden Bantam....	100	153	100	100	100
	Stowell's Evergreen	77	137	110	63	84

The results for 1915 show as in each of the two years previous that the Golden Bantam surpassed the Stowell's Evergreen in popularity, in number of ears, in flavor and in juiciness. In 1913 the Golden Bantam was on the average ready for use thirteen days, in 1914 fifteen days, and in 1915 ten days earlier than the Stowell's Evergreen. For home use the Golden Bantam can be planted at different dates so as to give a longer season of usefulness, or the Golden Bantam and the Stowell's Evergreen can be planted at the same time and thus secure a lengthened period in which the corn is available for table use. The Golden Bantam which is a most delicious table corn is increasing in its growth throughout Ontario, and we believe as time advances its cultivation will become more general. This corn might be grown with but little difficulty in practically all of the farm gardens throughout the Province. From a study of the replies received from experimenters in 1915 we learned that the Golden Bantam was mentioned more frequently than any other kind of sweet corn as being the most extensively grown variety in the separate counties. It is, therefore, evident that the work of the Experimental Union has had a marked influence in the great increase in the growth of the Golden Bantam sweet corn over the Province.

Varieties of Potatoes.

Ontario's potato production amounts to about twenty million bushels annually. Over one-quarter of the potatoes of Canada are produced in this Province. The production of potatoes in Ontario is about equal to the combined production of the potatoes in the three Maritime Provinces and somewhat greater than the combined production of potatoes in the four western Provinces. Those counties of the Province which have produced the greatest quantity of potatoes are: Simcoe, Middlesex, York, Grey, Carleton, Hastings, Wellington and Huron in the order here given.

It is probably safe to say that a greater number of experiments have been conducted with potatoes at the Agricultural College than with any other single crop. These results are being incorporated in a bulletin which is now almost ready for the printers.

Co-operative experiments with potatoes have been conducted over Ontario for a number of years. Some of these experiments have been completed. The tests in 1915 consisted in the comparison of varieties and in the application of fertilizers and manures.

In 1915 an inquiry was made from the various experimenters regarding the most extensively grown varieties of potatoes in the separate counties of Ontario. In all, thirty-nine varieties were mentioned one or more times as being the most extensively grown in the different counties. As the result of a similar inquiry fifty-one varieties were mentioned in 1914, fifty-seven in 1913 and fifty-eight varieties in 1912. It is to be hoped that the number of varieties is gradually decreasing in the Province and that within a short time the potato growers will confine themselves largely to a few of the highest yielding varieties of the best quality. The following gives the names and the order of the varieties which were mentioned the greatest number of times in the average of the last three years: Rural New Yorker No. 2, 26; Irish Cobbler and Delaware, each 22; Carman, 20; Green Mountain, 13; Empire State and Early Rose, each 12; Carman No. 1, 9; Extra Early Eureka and American Wonder, each 8: White Elephant, 7; Early Ohio and Dooley, each 6; and Beauty of Hebron, 5. The two varieties which were mentioned the greatest number of times in each of the past four years were as follows: 1915, Irish Cobbler and Rural New Yorker No. 2; 1914, Rural New Yorker No. 2 and Delaware; 1913, Rural New Yorker No. 2 and Carman; and 1912, Rural New Yorker No. 2 and Green Mountain. As some reports mentioned Carman No. 1 and others No. 3 and still others just Carman, it is difficult to classify these varieties. If we take into consideration the answers to inquiries in each of the past five years, we find that the Rural New Yorker No. 2 has been grown more extensively than any other variety.

In the co-operative experiments conducted previous to 1913 it was found that the Davies' Warrior had made the highest record of the late potatoes and the Extra Early Eureka of the early potatoes. It was, therefore, decided in the spring of 1913 to use only these two varieties for co-operative tests. The same two varieties were used in 1914 and again in 1915. The following table gives the average results of the co-operative experiments with two varieties of potatoes successfully tested on forty farms in 1915:

Experiments.	Varieties.	Comparative Value.	Per cent. of small Tubers.	Mealiness when cooked.	Bushels of Whole Crop per acre.
Potatoes (40 tests)....	Davies' Warrior.........	95	18	100	131.95
	Extra Early Eureka.....	100	19	97	126.59

The Davies' Warrior variety of potatoes has given the highest average yield per acre of all the varieties grown at the Ontario Agricultural College in the average of the experiments for the past nine years. It is a late variety and some people object to a particularly late potato. The Extra Early Eureka being an early variety is more popular with some growers, especially if they are anxious to secure early potatoes either for home use or for market. In the co-operative experiments in 1914 the Davies' Warrior gave an average of 153.2 and the Extra Early Eureka of 95.9 bushels per acre and in the co-operative tests in 1913 the Davies' Warrior gave an average of 134.11 bushels and the Extra Early Eureka of 125.76 bushels per acre. It will, therefore, be seen that the varieties occupy the same order in yields per acre in each of the past three years. The yields for 1915 are practically 132 for the Davies' Warrior and 127 bushels per acre for the Extra Early Eureka. It should be remembered that the yield of the potato crop in Ontario in the past year was comparatively low. According to the reports of the Ontario Bureau of Industries, the average yield of potatoes per acre for the Province was only 76 bushels which is the lowest yield for Ontario for the past thirty-four years. Both of the varieties under experiment are of good table quality according to both the experiments at the College and throughout Ontario. Of all the varieties which have been grown at Guelph, the Davies' Warrior and the Extra Early Eureka are amongst the freest from rot, the average for two years being less than one per cent. while that of a few other varieties was over fifty per cent. In the average of all the reports used in the summary here presented the Davies' Warrior had slightly more than one and the Eureka practically two rotten potatoes per plot. In the average of 109 discarded reports of the co-operative experiments for 1915, the Davies' Warrior had an average of 9 and the Extra Early Eureka an average of 7 rotten potatoes per plot. The extra Early Eureka which is apparently a selection from the Irish Cobbler has made uniformly good returns at the College in past years. In the co-operative experiments the Extra Early Eureka was slightly more popular with the experimenters than the Davies' Warrior in each of the past two years owing, no doubt, to its being an early maturer.

Fertilizers and Manures With Farm Crops.

It is practically impossible to conduct the experiments with fertilizers and manures on any one soil which will be a definite and complete guide for farmers under different conditions and on varying soils. The results from fertilizer experiments are influenced by the character and fertility of the soil, the weather conditions, the date of planting, the method of cultivation, the kind of crops grown, etc. Realizing the difficulties in securing all the information desirable from fertilizer experiments, work has been conducted not only at the College but on various farms throughout the Province of Ontario. The work at the College has been carried on in certain sections of the experimental grounds and over Ontario through the medium of the Ontario Agricultural and Experimental Union. We believe that this system gives decidedly better information than if the work were confined entirely to the College. Through our assistance the farmers are thus enabled to ascertain for themselves the amount of influence of certain fertilizers upon the farm crops grown on their own particular soils. The plan adopted furnishes a means by which the farmers will know how to use the fertilizers in an economical way so as to receive the highest returns and prevent the greatest losses. The greatest value of the co-operative work is for the farmers themselves who conduct the tests, and yet the average results give important information in supplying suggestions and in forming a general guide for the Province. The crops used for fertilizer work in the co-operative experiments in 1915 were winter wheat, potatoes, mangels and rape. Owing to the peculiar weather conditions of the past year there were not as many good reports of carefully conducted experiments received as usual.

Within the past twenty-four years a large amount of co-operative experimental work has been conducted throughout Ontario in comparing stable manure and different kinds of commercial fertilizers with a number of farm crops. In the beginning of this branch of the work the experiments were made as simple as possible in order that the people conducting them could furnish complete reports. As experience has been obtained the work has gradually become more complicated and is improving in value from year to year. The results which have been obtained are of general value. A number of the experimenters in connection with the Experimental Union have been carrying on tests successfully for a number of years and are now in a position to conduct fertilizer work with a large amount of satisfaction. In each of five years we have been conducting successfully a test with fertilizers and barley of a similar nature to the co-operative experiments undertaken over twenty years ago in the United States under the direction of Doctor Atwater, and which work proved to be a failure owing, no doubt, to the fact that the experiment proved to be too complicated for the men who had received no previous training in co-operative experimental work.

After some preliminary work had been carried on through the Experimental Union a general plan for co-operative tests with fertilizers was adopted which included experiments with oats, fodder corn and mangels. At a later date the method was revised somewhat for the experiment with winter wheat and still later, to a greater extent with potatoes. The only crop used in 1915 in accordance with the general plan adopted about eighteen years ago was the one with winter wheat. The co-operative experiments with fertilizers on potatoes, mangels, and barley, are all under somewhat similar plans which have been arranged according to experience obtained from the former co-operative experiments conducted by the Union. We believe that the Experimental Union is carrying on co-operative experiments with fertilizers at the present time which are more comprehensive than those conducted at any other place. Information is being obtained which could not possibly be secured in any other way. It is true the work is subject to criticism, but such is the case in connection with any experiments with fertilizers which have been conducted at any time and at any place.

For the co-operative experiments the fertilizers and the seeds have been sent from the College to experimenters each year. In the original plan the nitrate of soda and the muriate of potash were applied at the rate of 160 pounds per acre, and the super-phosphate at the rate of 320 pounds per acre. A mixture of complete fertilizer was composed of one-third the amount of these fertilizers and was, therefore, applied at the rate of 213 1-3 pounds per acre. Both the Royal Canadian and the Potato fertilizer used in each of five years with the potato crop were applied at the rate of 320 pounds each per acre. The nitrate of soda was applied when the plants were about three inches in height, and all the other fertilizers at the time of sowing the seed. Farmyard manure has been used in the experiments for the past twelve years. The advice to each experimenter was to apply 500 pounds of average cow manure per plot, the application being equal to twenty tons per acre. The cow manure was mixed with the soil to a depth of from four to five inches, and the fertilizers were stirred in the soil to a depth of from one to two inches.

The foregoing description applies to all the co-operative experiments with fertilizers conducted previous to 1910, also those conducted in 1911 with winter wheat and with potatoes, and in 1912, in 1913, in 1914 and in 1915, with winter wheat. Another experiment with fertilizers and barley was started in the spring of 1910, another with fertilizers and mangels in 1911, and still another with fertilizers and potatoes in 1912. The table here presented gives the average results of the co-operative experiments with fertilizers as described in the following paragraphs:

Kind of Fertilizer used.	Fertilizer per Acre.		Average Yield per acre.								
			Oats.	Fodder Corn.		Mangels.	Swede Turnips.	Potatoes.	Winter Wheat. Fertilizer applied.	
				Total.	Ears.				Autumn,	Spring
	Exact weight.	Approximate cost.	5 yrs. 74 tests.	8 yrs. 47 tests.	8 yrs. 41 tests.	5 years 41 tests.	5 years 18 tests.	5 yrs. 98 tests.	8 yrs. 22 tests.	2 yrs. 4 tests.
	Lbs.	$ c.	Bush.	Tons.	Tons.	Tons.	Tons.	Bush.	Bush.	Bush.
Nothing	....	....	38.9	8.2	2.7	20.6	19.6	129.2	18.9	17.9
Nitrate of Soda	160	4 80	46.3	9.4	3.1	26.5	22.5	153.4	22.7	22.8
Muriate of Potash	160	4 00	43.8	9.4	3.0	24.6	23.7	160.8	22.3	24.9
Superphosphate	320	3 92	43.6	9.0	3.1	24.2	24.7	156.8	22.4	21.2
Complete Fertilizer	213	4 24	48.7	9.4	3.2	25.4	25.0	166.3	24.1	26.2
Potato Fertilizer	320	5 52	......	......	......	......	....	167.5	....	......
Royal Canadian	320	5 60	......	......	......	......	....	164.5	....	......
Cow Manure	40,000 (20 tons)	6 00	......	......	......	......	26.9	174.7	26.3	23.0

The following statement gives the composition of the different fertilizers used in the experiments as determined by the Chemical Department of the College.

1. Nitrate of Soda, 15.7 per cent. nitrogen.
2. Muriate of Potash, 50.9 per cent. potash.
3. Super-Phosphate, 15.4 per cent. available phosphoric acid.
4. Royal Canadian, 3.83 per cent. nitrogen; 10.15 per cent. available phosphoric acid, and 5.38 per cent. potash.
5. Potato Fertilizer, 3.19 per cent. nitrogen; 9.25 per cent. available phosphoric acid, and 6.30 per cent. potash.

The cost of each fertilizer as given in the table represents approximately under normal conditions the average cost per acre for the fertilizers as used in the co-operative experiments. The quotations were based on the factory prices for quantities of about one ton of each fertilizer. The twenty tons of cow manure would mean about twelve good sized loads per acre, and manure in Guelph has been selling at fifty cents per load, which is probably about the average for the Province. It is exceedingly difficult to place a price on farmyard manure, as in most cases it is not purchased, but is produced on the farm. Each person may place such value on the manure as he deems expedient, and study the results according to his own circumstances. It should be stated that the freight on the fertilizers and the application of both the fertilizers and the manure are not taken into consideration in the foregoing statement, nor yet is there any account made of the influence of the different fertilizers and the manure upon the land after the first season, except in the later experiments.

If we take into consideration the increases in the yields per acre from the different fertilizers and the average prices of the fertilizers per acre, as indicated in the foregoing table, we find that the increases in the different crops were secured most economically by the fertilizers, as follows:

Complete fertilizer with oats gave an increase of 9.8 bushels per acre at a cost of 43 cents per bushel.

Muriate of Potash with corn gave an increase of 1.2 tons per acre at a cost of $3.33 per ton.

Nitrate of Soda with mangels gave an increase of 5.9 tons of roots per acre at a cost of 81.4 cents per ton or 2.5 cents per bushel.

Complete fertilizer with swede turnips gave an increase of 5.4 tons per acre at a cost of 78.5 cents per ton or 2.4 cents per bushel.

Complete fertilizer with potatoes gave an increase of 37.1 bushels per acre at a cost of 11.4 cents per bushel.

Complete fertilizer with winter wheat gave an increase of 5.2 bushels per acre at a cost of 82 cents per bushel when applied in the autumn and an increase of 8.3 bushels per acre at a cost of 51 cents per bushel when applied in the spring.

Each experimenter was asked to conduct his fertilizer test on the average soil of his farm. The results here presented are, therefore, for the average soils of Ontario. On some farms the fertilizers paid much better than they did on others. Every farmer who uses fertilizers should know as much as possible regarding the requirements of his own particular farm. The results here presented speak in a general way regarding the use of these fertilizers under the varying conditions of the farm lands of the Province and should furnish valuable suggestions.

Ten-Plot Experiment With Fertilizers and Barley.

In 1910 arrangements were made for conducting an experiment with fertilizers and barley throughout Ontario. The experiment consisted of ten plots, seven of which received commercial fertilizers, one lime, one cow manure, and one was left unfertilized. For the seven plots which received commercial fertilizers, nitrate of soda, superphosphate and muriate of potash were used singly and in combination of two and three together. The number of pounds per acre of each fertilizer used was 100 for both the nitrate of soda and the muriate of potash and 200 for the superphosphate, whether these were sown separately or in combination. The lime was used at the rate of 1,400 pounds per acre and in the form of freshly slaked in 1910 and of hydrated in each of the other four years. The cow manure was used at the rate of twenty tons per acre throughout. As in the case of the other fertilizer experiments, the nitrate of soda was applied in every instance when the plants were about three inches in height, and all the others were applied at the time of seeding. All the other applications for the fertilizer experiments with barley were the same as those for the fertilizer experiments previously reported. The average results of the twenty-six separate tests conducted in five years are here presented:

Fertilizer.	Individual Fertilizer per Acre.	Total Fertilizer per Acre.		Yield per Acre.	
				Straw (tons.)	Grain (bus.)
	Pounds.	Pounds.	Approximate Cost. $	Average 5 yrs.	Average 5 yrs. 26 tests.
1. Nothing				1.20	31.49
2. Nitrate of Soda	100	100	3 00	1.33	34.99
3. Muriate of Potash	100	100	2 50	1.40	36.20
4. Superphosphate	200	200	2 45	1.41	35.73
5. Nitrate of Soda Muriate of Potash	100 100	200	5 50	1.43	38.75
6. Nitrate of Soda Superphosphate.	100 200	300	5 45	1.41	38.89
7. Muriate of Potash Superphosphate	100 200	300	4 95	1.48	39.56
8. Nitrate of Soda Muriate of Potash Superphosphate	100 100 200	400	7 95	1.46	41.14
9. Lime	1,400	1,400	4 60	1.38	36.72
10. Cow Manure	40.000 (20 tons)	40,000 (20 tons)	6 00	1.55	40.48

This experiment has now been conducted throughout Ontario in each of five years in succession. The yield of barley per acre was the highest from the cow manure in 1910, 1911 and 1912, and second highest in 1914. The average yield from the complete fertilizer was the highest in 1914, second highest in 1910, 1911 and 1912 and third highest in 1913. The unfertilized land was the lowest in each year. The highest average yield per acre was produced from the complete fertilizer and the second highest from the farmyard manure. According to the increases in the yield of barley per acre and the prices of the fertilizers given in the table it appears that the increase was made at the smallest cost by the use of muriate of potash at the rate of one hundred pounds per acre. This application caused an average increase of 4.7 bushels of barley per acre per annum and the cost of the fertilizer was $2.50 or an average cost of about 53 cents for each bushel of increase. The most marked results from the fertilizers in 1914 were obtained on a sandy soil in Algoma, the increase being as high as 50 per cent. in one instance.

Nitrate of Soda and Common Salt With Mangels.

An experiment was conducted throughout Ontario for five years in succession in the testing of different fertilizers with mangels. The results were very interesting and showed that an application of 160 pounds of nitrate of soda per acre applied to the land when the mangels were about three inches in height increased the yield of roots per acre by fully six tons, according to the average of the 41 separate tests conducted within the five years.

In the spring of 1911 another experiment was started with fertilizers and mangels. For this experiment nitrate of soda was applied to the mangels at the rate of 100, 160 and 200 pounds per acre at the same time as the seed was sown and also on separate plots when the mangel plants were about three inches in height. In comparison with the six plots with nitrate of soda, common salt was applied at the rate of 200 pounds and of 400 pounds per acre at the time of sowing the mangel seed. Two plots were left unfertilized in each experiment. In 1911 the first year of this experiment no really satisfactory results which could be used in a tabulated form were received. In 1912 four, in 1913, two, in 1914, three, and in 1915, two complete reports were obtained.

Fertilizers.				Yields of Mangels per acre (tons).
When applied.	Kinds.	Quantity per acre.	Approximate cost per acre.	Average four years. 11 tests.
		Lbs.	$ c.	
When Plants are three inches tall	1. Nothing			26.1
	2. Nitrate of Soda.	100	3 00	29.1
	3. " "	160	4 80	30.8
	4. " "	200	6 00	33.4
At the time Seed is sown	5. " "	100	3 00	29.8
	6. " "	160	4 80	31.2
	7. " "	200	6 00	33.2
	8. Common Salt..	200	....	29.8
	9. " "	400	....	29.3

In the former experiment which was conducted throughout Ontario for a period of five years, and of which we obtained forty-one good reports, it will be remembered that the mangel crop was increased six tons per acre by an application of 160 pounds of nitrate of soda. In the results here presented it will be seen that 160 lbs. nitrate of soda applied when the plants were three inches tall increased the yield of mangels 4.7 tons per acre and that the same quantity of nitrate of soda applied at the time that the seed was sown increased the yield of mangels 5.1 tons per acre. It will, therefore, be seen that the application of 160 pounds of nitrate of soda per acre has given very satisfactory results in all the experiments in which it has been tried. The results presented in tabulated form furnish information regarding the increases from the other applications of nitrate of soda which are worthy of careful study. The yield of mangels per acre has been increased or decreased according to the amount of nitrate of soda which has been applied. The highest average yield of roots per acre in the average of the past four years was produced from 200 pounds of nitrate of soda per acre applied when the plants were about three inches in height. This increased yield of 7.3 tons at a cost of $6 for the fertilizer would amount to 82 cents per ton or 2.5 cents per bushel. It will, therefore, be seen that the result of the co-operative experiments conducted throughout Ontario in each of nine years has shown that the application of nitrate of soda has been quite economical in the production of the mangel crop.

A Six-Plot Experiment With Fertilizers and Potatoes.

As the result of an experiment conducted at the Ontario Agricultural College in each of five years it was found that the Potato Fertilizer and the Royal Canadian Fertilizer gave the highest yield of potatoes per acre of the different fertilizers used in the five year experiment. In another experiment extending over a period of five years, in which several fertilizers were used, the highest yield per acre was obtained from a mixed fertilizer similar to the one used in our co-operative experiments, and which was composed of nitrate of soda, muriate of potash and superphosphate in the proportion by weight of one, one and two, and which was applied at the rate of 213 pounds per acre. This was followed by the Potato Fertilizer and the Royal Canadian Fertilizer, each of which was applied at the rate of 320 pounds per acre. Based on those and other results, a co-operative experiment was conducted in each of five years previous to 1912, in which six different fertilizers were compared with each other, with farmyard manure, and with no fertilizer with potatoes the results of which are given in the earlier part of this report.

Based on the results of past experiments it was thought wise to start a co-operative experiment in testing different quantities of fertilizers per acre in comparison with each other, with farmyard manure alone, with farmyard manure and fertilizer and with unfertilized land. We, therefore, placed on our list in the spring of 1912 an experiment with fertilizers, cow manure, and no fertilizer with potatoes. In 1912, and in each year since, this experiment has been conducted in 120 places throughout the Province except in 1915 when the test was conducted on 80 farms. In each of three years we divided the tests into four groups of equal numbers, and used the Potato Fertilizer for group "A," the Royal Canadian Fertilizer for group "B," a fertilizer composed of nitrate of soda, muriate of potash and superphosphate, in the proportion by weight of seven, nine and sixteen for group "C" and a fertilizer composed of nitrate of soda, muriate of potash and superphosphate in the proportion of one, one and two for group "D." Each of the first three fertilizers was applied alone at the rate of 320, 640 and 960 pounds per acre and 320 pounds in combination with ten tons of cow manure per acre. In comparison with these, another plot received cow manure at the rate of twenty tons per acre, and one plot was left unfertilized. For group D the fertilizer was used in the same proportion, with the exception that the minimum amount was 213 instead of 320 pounds per acre. Owing to the unusual weather conditions in 1912 the potato rot was very prevalent, and many of the results of the fertilizer experiments obtained could not be used on that account. There were, however, nineteen good reports of successfully conducted experiments with fertilizers and potatoes obtained in which the rot did not prove troublesome, and which represented fairly well the four different kinds of fertilizers distributed. In 1913 we received in all thirty-one good reports, there being from six to ten good reports for each group. In 1914 twenty-eight good reports of successfully conducted experiments were received, there being exactly seven good reports for each separate test. We, therefore, have for the three years seventy-eight good reports of successfully conducted experiments.

In 1915 the tests were interrupted considerably owing to the abnormal weather conditions and to the prevalence of the potato rot. The results obtained are interesting and show the highest average yields of potatoes per acre from the cow manure alone in each of groups A, B, and C, and from the combination of cow manure and commercial fertilizer in group D. The yields for the past year are not included in the tabulated results here presented.

The following table gives the average results of the various tests of each of the four fertilizers, and also the average results of the four fertilizers comprising in all seventy-eight separate tests conducted during the three years:

Fertilizers and manures.	Fertilizer per acre.		Yield of potatoes per acre (bushels.)				
	Weight Pounds.	Cost $ c.	A. Potato Fertilizer 3 years (17 tests).	B. Royal Canadian Fertilizer 3 years (19 tests).	C. Home Mixture 3 years (22 tests).	D. Home Mixture 3 years (20 tests).	A. B. C. D. Av. Four Fertilizers 3 years (78 tests).
1. No Fertilizer	....	....	158.8	119.5	106.7	142.3	131.8
2. Fertilizer........	320	6 31	179.5	139.9	130.8	*165.9	154.0
3. Fertilizer........	640	12 62	187.3	152.6	143.7	180.4	166.0
4. Fertilizer........	960	18 93	196.0	169.0	160.0	190.4	178.9
5. Fertilizer........ Cow manure	320 10 tons	9 31	198.0	166.5	160.8	194.1	179.9
6. Cow manure	20 tons	6 00	203.0	166.0	163.8	194.3	181.8

*Fertilizer D was used at the rate of 213 instead of 320 pounds and at a cost of $4.24 instead of $6.31 per acre.

It should be understood that the different fertilizers were tested on different farms. It is, therefore, not fair to make a close comparison of one fertilizer with another. The results are valuable in showing the yields from the different amounts of fertilizer in comparison with the yield from no fertilizer, from cow manure and from a combination of cow manure and fertilizer. It will be seen that on the average there was an increase in the yield of potatoes per acre of 22.2 bushels at a cost of 28 cents per bushel from 320 pounds of fertilizer; of 34.2 bushels at a cost of 37 cents per bushel from 640 pounds of fertilizer; and of 47.1 bushels at a cost of 40 cents per bushel from 960 pounds of fertilizer. The yield of potatoes per acre increased as the amount of fertilizer used became greater. From a study of these results it would seem as though the first 320 pounds of fertilizer increased the yield 22.2 bushels, the second 320 pounds 12 bushels. and the third 320 pounds 12.9 bushels per acre. It will also be observed that the twenty tons of cow manure per acre increased the yield of potatoes exactly 50 bushels or 1.9 bushels per acre more than the combination of ten tons of cow manure and 320 pounds of fertilizer per acre. The amount of fertilizer for Plot 2 in Group D consisted of 213 instead of 320 pounds per acre and was identical with the Home Mixed Fertilizer used for five years throughout Ontario in experiments conducted on ninety-eight farms, the results of which have already been presented. This fertilizer increased the yield of potatoes 23.6 bushels at an average cost of 18 cents per bushel.

Each experimenter was asked to conduct his fertilizer test on the average soil of his farm. The results here presented are, therefore, for the average soils of Ontario. On some farms the fertilizers paid better than they did on others.

Every farmer who wishes to use fertilizers should become as familiar as possible with the requirements of his own particular farm. The results here given show in a general way the use of these fertilizers under the varying conditions of the farm lands of the Province, and should furnish valuable suggestions.

In each of the past two years some of the experimenters with fertilizers and potatoes have continued the test by sowing barley on the plots the second year without the application of additional fertilizers. The second year's test is also being carried out at the College. We hope to obtain good results within the next few years from the longer test. It might be stated here that in each of four tests the plots which received farmyard manure and a combination of farmyard manure and commercial fertilizer gave a larger yield per acre than any of the plots which received commercial fertilizer alone. In three out of the four tests the plots which had received twenty tons of farmyard manure per acre before planting the potatoes the year previous gave a higher yield than that which had received ten tons of farmyard manure and 320 pounds of fertilizer in addition. The average results show the larger quantity of farmyard manure used alone to give the highest yield of barley.

Nitrate of Soda With Dwarf Essex Rape.

In experiments conducted at the Ontario Agricultural College with different fertilizers and pasture rape it was found that nitrate of soda gave the highest and the most economical returns. A co-operative experiment with nitrate of soda and rape was conducted over Ontario in 1915 as well as in each of five years previous. Owing to the peculiar weather conditions of the past season no satisfactory results of fully conducted experiments were obtained. In the average of the five years previous, nitrate of soda applied broadcast at the rate of 80 pounds per acre gave an average yield of 15 tons of rape in comparison with 12.9 tons per acre on land on which no fertilizer was used. The 80 pounds of nitrate of soda would cost about $2.40 and the increase in the yield of rape was 2.1 tons. It would, therefore, cost approximately $1.14 for the fertilizer used in the production of each additional ton of rape.

It is to be hoped that the results presented in this report will prove of real service in giving a better understanding of the influence of certain fertilizers and manures when applied to a few of the farm crops and on the average soils of the Province. The Ontario Agricultural and Experimental Union with its corps of trained men is in an excellent position to conduct even better work in the future than it has carried out in the past. We invite the co-operation of farmers in the further study of fertilizers and manures on the farms of Ontario.

A Member: Does the variety make any difference in a mixture?

Prof. Zavitz: Yes, the varieties of either oats or barley make a difference. We have found that we get the best results from using the O.A.C. No. 21 barley and an oat like the Daubeney or the O.A.C. No. 3, at the rate of one bushel of each per acre. The Daubeney is a very early oat as is also the O.A.C. No. 3. The latter is just a little thinner in the hull than the former, somewhat stronger in the straw, and yields more per acre.

A Member: When grain is immersed in formalin to kill smut is it not a little hard to get it to dry thoroughly?

Prof. Zavitz: Yes, but with the proper equipment there should be no trouble.

A MEMBER: Is it not equally good to spray or sprinkle?

PROF. ZAVITZ: No, I do not think it is equally good. The formalin sprinkling treatment gives good results but it is difficult to make it as thorough as the immersion treatment. After the grain is immersed it should be spread out and left a couple of inches thick until it dries, which will not be very long.

A MEMBER: Do you think if grain is immersed in 1915 it would be worth while to sprinkle it again in 1916?

PROF. ZAVITZ: If it were treated in 1915 there would not likely be as much smut in the crop of 1916 as if it had been untreated. The safest plan is to treat seed each year.

A MEMBER: Is the grain dipped in sacks?

PROF. ZAVITZ: Yes, the right way is to put the grain in jute sacks, and raise and lower it with a rope sling. Use a two bushel sack, putting in a bushel and one-half of grain, and work the sack up and down in the solution until it has soaked right through the bag and grain. The immersion should last twenty minutes, and the grain is then spread out to dry.

A MEMBER: What about the O.A.C. No. 21 barley?

PROF. ZAVITZ: I will give you one man's experience with this variety. He received a pound of seed and carried on experiments with it along with other varieties, and found that the O.A.C. No. 21 gave the best results. He saved all the seed he obtained the first year and sowed it, and at the end of three years he had over 900 bushels of grain. This he had no trouble in selling for seed at $1.50 per bushel. Another farmer had somewhat the same experience with the O.A.C. No. 72 oats. He and his son started with the experimental lots of O.A.C. No. 72 oats, two pounds of seed in all, and from this amount had in the third year from 3,000 to 4,000 bushels of oats, the greater part of which was sold for seed at $2.15 per bushel.

A MEMBER: Did they sell the whole crop at this rate?

PROF. ZAVITZ: Well, I don't know that they sold quite all of it. We have here good evidence of direct benefits received from experiments.

PROF. MACOUN: Have you tried any experiments in connection with potato scab? As a rule the amount of farmyard manure increases the scab. I was wondering if you had any results of experiments in connection with that point?

PROF. ZAVITZ: The relative amount of scab has been small, not nearly so much as one would think. We have made no summary of the amount of scab although that question is asked on the report form in connection with these experiments.

A MEMBER: It is difficult to get a complete fertilizer now?

PROF. ZAVITZ: Yes, it is; you see the principal source of potash is in Germany. It would be well to use plenty of wood ashes if you have them, and to be careful not to waste your farmyard manure. The more feed you grow of some kinds of crops the more you are going to increase your manure pile. Grow alfalfa, beans and other legumes as much as possible. The necessity for using home fertilizers, and substitutes for some of the most common commercial fertilizers used hitherto, has been impressed upon us more than ever before since we have realized that the supply of commercial fertilizers is so limited and that the prices are so very high.

A MEMBER: What does potash cost?

PROF. ZAVITZ: It has gone up to about $100 per ton. The amount of potash that can be economically applied at that price would be very small.

A MEMBER: Have you used sulphuric acid on an extensive scale?

PROF. ZAVITZ: No, not on an extensive scale, but we are using superphosphate. Basic slag is a good fertilizer and a very good source of sulphuric acid.

A MEMBER: Have you had any fertilizer experiments with field beans?

PROF. ZAVITZ: No, I think I am safe in saying we have not used as much fertilizer with legume crops as we have with some others. Barley, winter wheat, corn, mangels, turnips, potatoes and rape are the crops upon which we have used fertilizers.

A MEMBER: Have you any doubts as to the value of the use of clover as a manure for potatoes?

PROF. ZAVITZ: No, potatoes give excellent results on clover sod.

A MEMBER: On some places where people have no barnyard manure it is very necessary to secure a reliable substitute, and if anyone can show that clover will increase the crop of potatoes it would be very valuable.

PROF. ZAVITZ: Could you not give us some information in regard to experiments you have carried on with potatoes, Prof. Macoun?

PROF. MACOUN: I am in another branch of the work, and I am afraid I cannot give you anything of value in regard to fertilizers for potatoes.

PROF. HOWITT: Have you had an experiment in ploughing in clover; does it tend to reduce the scab?

PROF. MACOUN: As far as I can remember we have had very little scab where potatoes were planted after clover. I would not say that clover would reduce the amount of scab. We have had very good results at the Experimental Farm from the use of barnyard manure. I thing it is a good plan to put your barnyard manure on the land in the fall, or the latter part of the summer, on a clover sod and then plough it that fall or in the spring. As a result of our work on the farm we had three or four fields of good potatoes this year. For a long time we have paid particular attention to the source of seed supply. In Ottawa we have been growing stock potatoes year after year, for thirteen years, and we are getting better results every year. This is due in part to our own improvement of seed and partly due to the introduction of seed potatoes from other sources. We have found a tremendous difference in the yield of potatoes by getting seed from some other cooler part of Canada, and our conclusion is that if you can get seed from any source where the stalks of the potatoes grow right up to frost, you are pretty sure to have fine seed potatoes; but if you get seed from a source where the stalks are dried up in the middle of the summer the chances are the crop of potatoes will be poor. This is an observation which we have made. and I think you will find it to work out in practice. We usually find there is more vigor in the potatoes. Then we find, too, that half grown potatoes give better results than potato buds. Supposing you plant one lot of potatoes on the 15th of May, and another lot on the 15th of June and harvest these crops in September, you will get better results from the potatoes planted on the 15th of June than you will from those planted on the 15th of May. I think it is a fact that with the later planting the crops keep on growing right up to the coming of frost, and if not checked attain their full vigor. If potatoes grow vigorously and are then checked by frost your sets in the spring will not have that essentiality of vigor.

There is another interesting experiment being carried on in Nebraska. The summers there are a good deal drier than they are in Ontario. They found their seed to be no good at all. They imported seed from the north or cooler districts and obtained splendid results. They carried on other experiments to find out if it paid to grow potatoes under straw. These potatoes were hid from the hot sun and kept cool under the straw and they attained their full vigor, the result being an increased crop. Potato growers found that out in the Old Country a great many years ago. In Ireland I found them getting just about double the crop from sprouted seed over what they could from the ordinary seed. The potatoes seem to get a good send off in the spring and make a great development before the dry weather comes. Another theory is that if you get short sprouts about two inches long you get a great many more knobs from the joints. The long sprouts have very few knobs. If these knobs are buried in the ground the chances are you will get four tubers instead of three. I do not know whether you have tried that experiment here or not, but if you have I would like to know with what result?

Prof. Zavitz: Our experiments have turned out practically the same as yours, whether the potatoes were early or late varieties. We put two lots of each of two varieties in the root cellar, two lots of each of two varieties on the barn floor, two lots exposed in the greenhouse, and two lots out of doors. This was in the month of May. We repeated this experiment for five years, and obtained the largest yield per acre where the potatoes were sprouted on the barn floor. This exposure produced the largest yield in four out of five years. Those in the root cellar grew long white sprouts. In some cases we removed the sprouts and in other cases we left them on, the result being that when the sprouts were removed the yield was decreased.

A Member: As to the sprouts, do you leave one or two?

Prof. Macoun: Leave them all on. Sometimes we cut the potatoes. The practice in the Old Country is to use medium sized potatoes. I know my brother-in-law in Ireland has one hundred shallow boxes for sprouting potatoes and piles these up in a light room where they form green sprouts. Each of these boxes holds fifteen or twenty pounds. This method is very popular there in growing both early and late varieties, and the best farmers use it.

A Member: Do you think removing all but one sprout will hasten maturity?

Prof. Macoun: If they are strong I do not think it will make much difference. Another interesting point about our experiments is in connection with Old Country varieties of potatoes. The Davies' Warrior is one of the few Old Country kinds that has done well in Ontario. We have tested one hundred different Old Country varieties at Ottawa but have found that there are only a very few of them that can beat our American varieties. When they do outyield them, however, it is usually at a large increase. The chief thing is to get them free from rot, because they are troubled much more with rot over there than we are here. Nearly all the varieties of Old Country potatoes are blight resistant, but we find in growing them here that nine out of ten will not set their tubers well. The reason for that is that they have been developed in a more moist climate than ours. If we get varieties which do well then we find that they are freer from rot than the American varieties. The Davies' Warrior imported from Scotland, which we secured from Prof. Zavitz, is one of the best, and of the four or five Old Country varieties which we now have at Ottawa it has taken the lead in the last few years in yield of crop.

Prof. Zavitz: I am very glad, indeed, that Prof. Macoun has given us these results on potato work. We have received seed from different sources in Ontario and New Brunswick, but we have had the best results from seed obtained in the

Muskoka Lake district. Prof Macoun obtained the best results from seed he secured at Indian Head and Kamloops. When in Scotland I noticed they were using that little trick of planting the small potatoes. I said: "What are you doing with those small potatoes?" "Oh," they said, "that is our second crop. These are not matured, but we plant them for seed the next year and bring them to maturity." We commenced experiments along this line at the College and found that we obtained large yields from the potatoes that were dug before they were fully ripe. The secret of the whole thing is immaturity. If potatoes are grown in the north they are not well matured; if you plant on land at a high elevation, they are not so well matured; if you plant them late in the year, they are not so well matured; if you dig them before they are ripe they are not so well matured; and if you go south where it is hot, dry and sandy and mulch them with straw for protection from the heat, they are later in maturing. Growing them in the shade or growing them on heavy soil also tends to check maturity.

A Member: How would it be to dig a trench?

Prof. Zavitz: I do not know that it would be better. Plant them early and dig them early, before seed is matured.

Prof. Zavitz: I would like to ask Prof. Macoun what he advises as to planting of the whole potato for seed?

Prof. Macoun: We carried on your experiments, Prof. Zavitz, to find out the most economical sized seed and in our experiments we found pieces with three eyes to give the best results.

A Member: How many eyes should you have in a set?

Prof. Zavitz: We have obtained the largest yield from two ounce sets containing from two to four eyes.

A Member: Do you get the same number of sprouts from every eye?

Prof. Zavitz: You can put in a half ounce piece that will sprout two eyes, but if you were to average five eyes to the piece you would only have one and one-half times as many sprouts as eyes.

A Member: I do not find that all the eyes will grow two stems, but if you plant potato sets with only one eye that will grow two stems.

Prof. Zavitz: The whole thing is to build up more tubers. The more you cut potatoes the greater percentage of eyes will grow. If you divide them all up you will find you can get practically all the eyes to grow, but if you put in the whole potato only some of the eyes will grow.

Mr. Angle: Regarding the application of nitrogen, should we use it in liquid form, or quite dry as we usually get it?

Prof. Zavitz: I am not acquainted with any experiments where nitrogen has been applied in the liquid form. We apply our nitrate of soda in two or three dressings.

Mr. Angle: I asked the question in order to get some information. I have used nitrate of soda in liquid form. We used it with water and it seemed to answer a double purpose. We used the spray outfit and took the nozzle from the end of the pipe, being careful not to allow the liquid to come in contact with the knobs or eyes. Put on at a time when you have had a week or ten days' dry weather, the nitrate of soda in liquid form, to my mind, stimulates the plant when it most requires it. By applying it dry you do not get as good results as you do by putting it on with a little water. The process is not slow as you can get over a pretty good sized potato patch in a short time. I don't know whether it is the general custom to operate just that way, but that is what we have found to give excellent results.

A MEMBER: Early or late varieties?

MR. ANGLE: We used the liquid with both early and late potatoes.

RESULTS OF CO-OPERATIVE EXPERIMENTS IN APICULTURE.

MORLEY PETTIT, PROVINCIAL APIARIST, GUELPH.

In 1914 experimental material was sent to 541 beekeepers keeping 15,490 colonies of bees. The honey crop was a failure and many of the experimenters were unable to follow the instructions, and when reporting their results expressed a desire to further test the methods the following season. For this reason the same experiments were offered this past season.

In the spring of 1915 a list of the experiments and application forms were sent to our mailing list. Soon applications from all parts of the Province began coming in. Beekeepers of every class, professional and amateur, large and small, keeping bees in a variety of hives under an even greater variety of conditions, applied for instructions and material. It is not surprising, therefore, to find a great variation in the replies or results.

Generally speaking, this past season has been favorable for beekeeping. In districts east of Toronto the honey crop was light, but in very few cases were failures reported. To the west of Toronto the yield was from fair to good. In some few sections almost record yields have been reported.

Four hundred and twenty-one applications for material and instructions were filled. Experiment Nos. 1, 2 and 3, were on Swarm Control; No. 4, on Spring Management; Nos. 6 and 7, on Introducing Queens; No. 8, Combless Packages for Transporting Bees; No. 9, Wire-cloth bee escape board for clearing extracting supers of bees; No. 10, Wintering, and a Special Experiment for districts affected by European Foul Brood for testing a strain of bees to prove their resistance to it.

The 421 experimenters were owners of 14,808 colonies of bees, an average of 35 colonies each.

EXPERIMENT NO. 1.

Prevention of Natural Swarming in Extracted Honey Production by Holding the Colony Together.

This method was described in the annual report for 1910, page 49. It was tested by forty experimenters and nine reported. In every case the experimenter stated that the experimental method was preferable to his own. These experiments were tried under a variety of conditions by beekeepers of all descriptions, yet in their opinions the experimental method gave better results than their own.

EXPERIMENT NO. 2.

Prevention of Natural Swarming in Comb Honey Production by Artificial Shaken Swarming.

For detailed description of this method see Experimental Union Report 1911, page 51. Four reports were received from the sixteen experimenters. The first report was from Mr. Frank M. Powell, St. Catharines, with fourteen colonies fighting American Foul Brood. He harvested 1,350 sections of white honey and made six colonies increase. "More honey, less work," is his comment on the benefits derived from the experiment. A second experimenter, Mr. Garfield Stewart, Glasgow Station, reported doubling his apiary of eight colonies and obtaining 366 sections. He was handicapped by a lack of supers and drawn combs. Only one swarm issued from colonies managed by this method and the experimenter "knows better how to work with them."

The other replies were equally satisfactory. It is regrettable that when such benefits are being derived from these experiments, more are not availing themselves of their opportunities.

Experiment No. 3.

Prevention of Natural Swarming by Manipulation of Hives Instead of Combs.

(Details given in Experimental Union Report 1914, page 42.)

The nineteen applications for this experiment were followed by nine reports. These, too, were from widely scattered places with varied honey flows so a great difference in the results is shown. Generally speaking, the experimenters reported in favor of the method, although one man stated that directions had been followed and more swarming than ever resulted. Probably he overlooked some little detail of the experiment which caused his failure.

A Brant experimenter, Mr. Geo. Humphrey, St. George, managing fifty-three colonies had eight per cent. swarming in his apiary, but no swarms in his Lot A of the experimental group, which averaged ten pounds light honey more than his other colonies.

Experiment No. 4.

Method of Spring Management to Get Colonies Strong for the Honey Flow.

(Described on page 44, 1914 Experimental Union Report.)

The hives were to be packed as soon as set on the summer stands and the colonies fed every evening one pint sugar syrup (1:1), during the period from fruit bloom to the yielding of the clover. The feeding would stimulate the queen to heavier egg production and the workers to feed the larvæ better, so that the colony would be strong when the clover started to yield.

Seventy-nine applied for this experiment and twenty-seven replies were received. About half the reports were incomplete and the remainder were by no means unanimous in their decisions. One experimenter in Oxford County, Mr. Herbert Woltz, Springford, had 23 colonies in the spring and harvested a crop of 2,500 lbs. white honey and 1,900 lbs. dark. He started feeding on April 14th, and continued till May 7th, when the dandelions started to yield. His group A, averaged him 13 lbs. more white and 20 lbs. more dark honey per colony and drew out 35 more frames of foundation than group B. He concludes: "Am convinced that it pays to practice stimulative feeding. I have enjoyed the work very much and am going to try for a heavier yield another year. Was bothered very little with swarming."

J. C. Davidson, Oakwood, writes: "I find by feeding the queens will continue to lay right along steadily until clover flow and the bees will also commence to store honey in super as soon as the clover is ready."

R. L. Wilby, Locust Hill, writes: "Taking everything into consideration the experiment has proved a most successful one with me, and another season after equalizing the stores I shall certainly practice stimulative feeding with all the colonies. While those in the early summer of "B" stock were just becoming well populated, those of A were practically full of bees and consequently prepared to take advantage of each honey flow."

Other reports tend to show that the difference in seasons makes a difference in the value of the experiment. When the honey flow is early or even at a normal time it is an advantage to stimulate, but when the flow is late, as it was this past season, it may not pay to feed, as the weaker colonies had time to build up into good condition before the flow opened.

Where strong colonies are needed to clean up European Foul Brood this early feeding is to be recommended, and if resisting strains of bees in strong colonies are kept, the disease may be controlled.

Experiment No. 6.

Fasting Method of Introducing Queens.

Introducing queens to full colonies is one of the important and difficult operations of the apiary. The usual plan recommended by those who sell queens is a good one, but is not always successful.

The Method: About noon the old queen is removed from the colony and all queen cells destroyed. An introducing cage is made of a small piece of wire-cloth—about three inches square, rolled into a cylinder and tied, the ends stopped by corks. At sundown, place the queen alone in this cage and place the cage away from all workers—in a place where she cannot obtain food. Leave her "to starve" for three-quarters of an hour. Partly lift the cover of the hive and gently smoke the bees to control them. Remove the cork from the cage and allow the queen to run down between the combs. Follow her with a puff of smoke and immediately close the hive. Do not disturb for a week.

The old queen must be removed, all cells cut, the young queen mated and the hive left undisturbed for a week after introducing, for the introduction to be successful.

Experiment No. 7.

Smoke Method of Introducing Queens.

(Described in Experimental Union Report 1914, page 44.)

The results for these two experiments may be considered together. A number applied for the experiment, but very few reported. The reports vary from the one extreme to the other. If the details of the methods are closely observed, success generally follows, but where the experimenter overlooks some apparently minor detail, his work is useless. Either of these methods liberate the queen immediately, and thus shorten the time of the introducing at least two days, which may mean considerable to the colony.

Experiment No. 8.

Shipping and Introducing Combless Packages of Bees.

This method of transporting bees is well past the experimental stage. A wire-cloth case and the following instructions were sent to each experimenter:

Directions.

In this mail I am sending you a two pound combless package for shipping bees. It consists of a wire-cloth cage fitted with slats to act as frames to which the bees will cluster. Immediately upon receiving it, examine thoroughly to see that the wire-cloth is not damaged. The small can under the printed piece of wood is the water can. The lower end is removed to permit the can being filled with water. This is for the bees during their journey. The tins which are fastened to the top contain hard candy made of pulverized sugar and honey.

To facilitate filling the package, make a funnel of glazed wrapping paper, having it 1¾ inches at the bottom and large enough to shake a comb into at the top.

Weigh the combless package and the funnel. Now shake the bees from the frames into the funnel till you have *two pounds of bees* in the combless package. Do not send the queen. Fill the can with water and place in the combless package. Fasten the printed piece of wood in place by pressing the small nails into the package. Striking them with a hammer may spill the water in the water can. Address the package to Morley Pettit, Ontario Agricultural College, Guelph, Ontario, and *express* at once. Mark on the package your name and address. Do not attempt to send by parcel post, as any mishap while in the mail may have serious results. If the colony is much weakened contract the entrance to prevent the possibility of robbing.

In about one week you will receive a package of bees in return from me. Full particulars will accompany the second package.

These combless packages have the following advantages:

1. Low express charges. The express rate for live bees is quite high. When sent on the combs in a hive, this high rate must be paid for the combs, stores, and hive, as well as for the few bees. A fair sized colony only weighs from five to ten pounds, but a colony and hive would weigh thirty to forty pounds.

2. No danger of combs breaking or weeping and causing the bees to be mussed with honey, fall to the floor board, block the entrance and cause suffocation.

3. No danger of carrying disease. The disease is carried in the combs. This is a very important advantage, especially when shipping bees into a new or uninfected territory, such as New Ontario.

4. A pound of bees added to a weak colony early in the season may so strengthen it that it will be in good shape for the clover flow, whereas it might not otherwise be strong until the end of the season.

Contrary to expectations very few applied for these packages. In every case where the bees were sent they arrived in good condition.

Experiment No. 9.

Wire-Cloth Bee Escape Board for Removing Bees From Supers.

The board is made in two halves—making it an easy matter to place in position on the hive. The escape consists of the tin box containing two springs which allow the bees to pass down, but do not permit them returning.

When your super is ready to take off, lift one end of it and insert half the escape board, placing it in its exact position. Be very careful to place it right side up. Now lift the opposite end of the super and place the other end in place having the central edges tight without leaving a crack. Leave for three hours and note if bees have left the super. Arrange the escape board in different positions, i.e., with both escapes to the centre, one at centre and one at end, and both at ends, and note the difference. Leave escape boards on for different lengths of time, placing them in position in the morning, at noon, in the afternoon and in the evening; in damp weather, in fine warm weather, etc., in each case carefully recording the time left, strength of colony, and the time required for the bees to leave the super.

Note.—Bees will not leave if brood is in the supers so that supers for this experiment must not contain brood or eggs.

The limited supply of material prevented filling all applications. The reports are very emphatic as to the value of the wire-cloth escape board. Every report was favorable and the following extracts are a few of the many comments:

"The wire-cloth escape which you sent me has worked nearly perfectly in every case. Have tried it in all positions and it clears the bees out of the supers every time. It requires about twenty-four hours as a rule to do this, though most bees would be out in twelve hours." O. B. Griffin, Caribou, Me.

"I found your bee escape better under all conditions than anything I had ever seen before. Bees could pass out freely and the honey was kept warm for extracting. Also being in two parts makes it handy to use." Thos. W. Frood, Renfrew, Ontario.

Another extensive beekeeper (150 colonies) states: "I find it the best I have ever used."

Many other similar comments might be cited. This board not only clears the supers of the bees, but also keeps the honey warm for extracting. The use of the escape eliminates largely the trouble from the disturbed bees after they have been brushed or shaken from their combs.

Experiment No. 10.

Wintering Bees in Four-Hive Boxes Outdoors.

Very keen interest was shown in this experiment. Seventy-six applied for it and sixteen replies from all parts of the Province were received. Instructions were sent in a well illustrated eleven-page booklet, which told how to make the case. Many materials, such as chaff, pea straw, saw-dust, cork, leaves and shavings were used for packing. The case held four hives, with three inches of packing on all sides and space for twelve inches of packing and air space above. The box must be placed in a sheltered position. A bridge over the entrance left a small contracted entrance open at all times. The instructions also stated to feed the colonies as much sugar syrup as they would take down.

The bees in these cases wintered well in all parts of the Province. A few failures were reported, due to lack of stores, weak colonies, or to the box being left in an exposed position. This box permits the bees to be packed early in the fall and left till late spring, thereby giving them protection till the settled warm weather comes.

A special experiment for European Foul Brood districts was offered. A queen bee was sent to all who applied, to test the resistance of her progeny to the disease. This experiment has been conducted for a number of years and similar results were obtained this year, namely: that some strains of Italian bees are more resistant to the disease than others.

Mr. Alex. Bradley of Carp, writes: "The queen you sent me in 1914 cleaned up foul brood in 1914, and is clean this year. Gave me 2¾ eight-frame supers of honey this year and weighs sixty-two pounds now. She is of a yellow color."

Mr. Burger, Bridgeway states: "That queen bee you sent me in 1914 was the only one that wintered, although other colonies were requeened. She is now free from foul brood."

Mr. Bears, Ridgeway, says: "The queen you sent me in 1914 was successfully introduced and wintered well. Her bees have done reasonably well, but the season in these parts was worse even than last. There seems to be no honey in the flowers or blossoms. As honey gatherers they are very active and nice to handle, but so far have gathered but very little surplus. I think they will resist foul brood, as I have found none so far and only a little among my others."

These strains are not only proving to be good resisters of European Foul Brood, but they are also as good or even better workers than the ordinary bees.

The following chart shows the number of colonies of bees, applications and reports for each experiment.

Experiment Number	Applications.	No. Colonies of Bees.	Reports.
1	40	1,380	9
2	16	188	4
3	19	583	9
4	79	2,441	27
6	9	330	1
7	44	1,518	7
8	5	276	2
9	47	2,495	25
10	76	2,830	16
Special	86	2,767	49

Interest has never lagged in these experiments. While many of the reports were incomplete, sufficient has been stated to show a few of their benefits.

Better bees, better beekeeping, more honey with less work, and a greater interest in apiculture has followed these co-operative experiments.

On account of the war Canada is piling up an enormous national debt. The only way this can be paid is by the development of our natural resources. A valuable natural resource is the honey which is produced every summer by the many millions of flowers blooming on the farms of Ontario. This honey not only satisfies the human craving for sweet, but it has a very real food value, so it cannot be in any sense considered a luxury. At present, many tons are wasted for want of bees, and many bees are kept under unprofitable conditions for lack of skillful management.

There is no way by which production of a valuable article of diet can be increased more rapidly than by improved methods of beekeeping and increased holdings of bees. I might illustrate this by citing two cases: That of a present under-graduate of this College whose bees during the summer vacation produced $1,000 worth of honey, and of a woman who produced over $2,000 worth of honey during the season of 1915.

I should with this mention crop failures, disease, winter losses, etc., but every one of these can be overcome to a large extent by a careful study of business management, efficiency, and more particularly, bee behavior.

Mr. G. Robertson: I am in the fruit industry and I have found out that there are certain varieties of fruit which are almost entirely dependent on bees for a good crop. Perhaps one year in twenty the weather conditions have been unfavorable for the bees and in that year there has been a crop failure. It is only necessary to have one or two hours sunshine to enable the bees to reach the pistils of the flowers and proper fertilization takes place and ensures a good crop.

Prof. Macoun: I may say that we have done a great deal in cross-breeding of fruits and budding and we have had opportunities of seeing how quickly the bees work upon the flowers. In order to cross-fertilize flowers properly so that you will be sure to get the proper pollen applied it is necessary to operate on the flowers before the buds open, and before the bees come. We have found in our experience when the honey bees are there that just as soon as the buds are sufficiently open for the bees to get in their work the mischief is done, so far as cross-breeding is concerned. But looking at it from the viewpoint of the fruit grower we know that bees do pollenize the flowers as Mr. Robertson pointed out, and this pollenization ensures a better yield of fruit. In the case of apples, when the weather is very hot and dry, and the bees are there to pollenize the flowers, we are sure of a good crop.

REPORT OF THE SCHOOLS' DIVISION OF THE EXPERIMENTAL UNION.

Prof. S. B. McCready, Guelph.

The report for 1915 is a Valedictory, at least so far as I am concerned. The Schools' Division, commenced in 1909, now comes to a close after seven seasons' efforts. A general survey of its origin, its purposes and its accomplishments might be of interest as an incident in the history of agricultural education in Ontario.

The Schools' Division was an outgrowth on the one hand of the Nature Study Department organized as a part of Macdonald Institute in 1904, and on the other hand of the older established Agricultural and Experimental Union. The Nature Study Department was founded to encourage school gardening, elementary agriculture and nature study in the schools of the Province through the training of teachers, the publication of bulletins and the answering of inquiries from schools.

Shortly after assuming charge of the Department in 1905, and preparatory to issuing a bulletin on school gardening, I carried on an inquiry amongst the inspectors of the Province to find out how much and what manner of work was being done in the schools. From the large number of replies received the difficulties of the situation at large were learned, and suggestions received as to how the Nature Study Department could best help teachers in their efforts to introduce gardening and agriculture into their schools.

At the College I found the Experimental Union well organized, well established, well supplied with money, and willing to help. For several years through its main division it had carried on valuable educational work with grown-ups in the distribution of selected grains, potatoes, etc., and in its Horticultural Division, had distributed small fruits. Under the Forestry Department, distributions of forest tree seedlings for the improvement of bush lots were being made also under Experimental Union plans.

It seemed the part of wisdom to me to try to get the schools joined up to an organization that was well equipped to help them and also willing to do so. The work the Union was doing could readily be adapted to children's work. And indeed in some cases children had taken part in the experiments, though this came from home encouragement rather than the school's.

Accordingly a bulletin, *Gardening for Schools,* was prepared and printed in 1906 as No. 152 by the Ontario Department of Agriculture. In this, after setting forth the place of gardening in education, the work of the Experimental Union was explained in some detail and teachers urged to make use of its distributions not only for garden plots at school but also for pupils' home plots. Plans for making educational exhibits of the children's work at fairs were also given.

The results from the bulletin were meagre; not because the plan was not feasible, but partly because teachers in the country were not ready for such work, and partly, I suppose, because the bulletin (like many others) was not read. Only a few schools responded to the suggestion.

Following this effort to interest the schools, the Horticultural Division under Professor Hutt's direction, commenced in 1907, I think it was, to send choice selections of vegetable seeds for variety testing to school children as well as to the adults who as a rule had been hitherto the recipients of supplies. Many took advantage of the offer and in 1908 the number increased greatly. From a strictly *horticultural* standpoint this plan was quite successful, but it was felt that from an *educational* standpoint it was desirable to have teachers brought into the scheme more directly. For it must not be forgotten that gardening for children as carried on by the schools and designated as "school gardening" is rightly speaking more educational than horticultural. The important word in the phrase is "school" and not "gardening." While it is very desirable that good vegetables and fine flowers be grown and the children led to a real liking for all phases of plant life, the chief value in school gardening comes from the vitalizing co-relations that the teacher brings into operation in arithmetic, drawing, nature study, composition and other school subjects.

Accordingly it was felt that there was need for a special branch of the Union to direct the work in connection with children and teachers. This was organized in 1909 as the Schools' Division. It was a practical co-operative educational organization from the beginning. Every department of the College carrying on work adaptable to school children's gardening work was represented on the special Committee: Prof. C. A. Zavitz as adviser about field crops; Prof. Hutt on school-ground improvement; Prof. Graham on poultry; Mr. Hunt on flower growing; Prof. Crow on fruit growing; Mr. McLennan on vegetable growing; Prof. Edwards on legume inoculation; Prof. Harcourt on fertilizers; Prof. E. J. Zavitz on forestry. My work as director was to carry out plans for the distribution of planting material to the schools, the preparation of leaflets for children and instruction sheets for teachers.

From year to year changes were made as experience taught. Additional services to the schools were undertaken as interest increased. Our aim throughout was to draw the country schools into close touch with the Agricultural College. There was the vision of every boy and girl in rural Ontario brought into vital relationship with the Farmers' University as the College has been called. There was, too, the hope of putting such things into the work of the "little red school house" that it might escape the charge of educating boys and girls off the farm. The vision was not realized and the hope was not satisfied, though not a little "worth while" was accomplished in the seven years.

When I was made Director of Agricultural Education under the Department of Education in 1911 and commenced the publication of the so called Agricultural Education Bulletins, the work received a great impetus through the distribution of Bulletin No. 3 to all the schools. Previously our offers of material had a limited circulation. This Bulletin went to all the schools and, as it was practically an annual announcement of the Schools' Division, many new schools were led to take an interest in some of the offers made. Afterwards it was not possible to continue this plan and with the removal of my office from the Agricultural College to Toronto, the difficulties of carrying on this part of my work were increased. With Mr. Hiddleston's good assistance, however, the work was carried through for the past season.

An account of the number of schools that co-operated can be only estimated at this distance. For the past few years about five or six hundred schools took part in the work each year. Perhaps about four hundred schools on an average participated each year of the seven. In all, it may be safely said, more than twelve hundred schools were reached. Many schools took up some phase or other of the work each year. Other schools, generally on account of the teacher leaving, dropped the work after one year's trial. How many children were reached it is impossible to estimate with any exactness. Allowing twenty to a school about ten or twelve thousand would be partners in the work during the later years, and during the seven years it is not improbable that forty thousand school children took part in the work. If it is hard to fix on numbers it is more difficult to estimate results. Evidence is not lacking that hundreds and hundreds of teachers have been helped into a better and more useful kind of teaching, and through them thousands and thousands of country boys and girls better educated, and in a better way.

A bare enumeration of the most important lines of work carried on may be of interest in showing how many avenues there are (and possibly too how much need there is) for extension work with the country schools.

A picture of the Agricultural College for framing was sent to several hundred schools with instructions for making it of educational use.

Mounted collections of weed seeds were distributed for a number of years to enable teachers to identify specimens found locally.

Many schools received selections of Ontario Agricultural Bulletins suitable for school use.

Arrangements were made for sending Dominion agricultural publications also, and many schools were introduced to this source of help for giving agricultural instruction.

Through arrangements made with publishers, and latterly with the Students' Co-operative Association, many schools were provided with selected agricultural books at reduced prices.

A Loaning Bureau was organized and correspondents provided with special bulletins and selected printed matter on such topics as consolidation, rural surveys, play for country school, etc.

Two wall charts for the schools were distributed, one dealing with Alfalfa, and the other on The Best Time to Sow Spring Grains. Our plans were to continue a series of these charts but they could not be carried out owing to change in our work.

Instruction sheets were prepared for the guidance of pupils in growing vegetables and flowers. An illustrated gardening booklet was distributed to be used as a supplementary reader in the schools in connection with the making of their garden journals.

Other Instruction Sheets were prepared dealing with the organization of Corn Clubs and School Progress Clubs. The work of the School Progress Clubs that came into existence under the auspices of the Experimental Union has given particular satisfaction. In scores of schools through the well directed work of the children, marvels have been accomplished in school betterments. If the Schools' Division has done nothing else, the School Progress Clubs will have justified its existence.

Varied material was sent free for experiments and demonstrations in school gardens or home plots. With this were sent instruction sheets explaining how to carry out the practical work, and others showing how to apply this in class-room instruction. Such things as the following were sent: legume inoculation cultures provided by the Bacteriological Department; commercial fertilizers from the Chemical Department; currant and gooseberry cuttings from the Horticultural Department as well as onion seedlings; collections of forest-tree seedlings from the Provincial Forestry Nursery; seeds of trees; selected grains such as O.A.C. No. 21 barley and No. 72 oats, potatoes secured from members of the Canadian Seed Growers' Association, seed to demonstrate the Annual Pasture Mixture recommended by the Experimental Department, seed for variety tests of beets, onions, lettuce, carrots, beans; seed to demonstrate the different kinds of millets. and sorghums; imported and home grown seed of sugar beets for comparison, seed of different kinds of clover as well as variegated alfalfa, etc., etc.

For making flower beds about schools and beautifying school premises liberal supplies of choice flower seeds were sent to hundreds of schools free and brought great good to the school and the community.

Vegetable and flower seeds to be used for home plots apart from experimental work or the beautifying of the school grounds were sold in large quantities in two cent packages. In 1915 over 20,000 packets were distributed amongst school children in this way.

Distributions of vines, tulip bulbs, gladioli and dahlias were made to hundreds of schools at special rates. Seed mixtures for lawns were also sold. Much school ground improvement resulted from this arrangement.

For the use of the members of the School Progress Clubs large quantities of material were furnished. Potatoes and eggs were sold and other supplies were furnished free. In some schools the club would specialize on potatoes: another club would be a Corn Club or a Poultry Club: many groups of girls grew beets or corn for canning. The eggs were from the O.A.C. Barred Rock strain and in the two years that this was carried on about 1,000 dozen eggs were sent throughout the whole Province. The eggs were sold at 60c. a dozen, which was the cost price. the Schools' Division met the charges for express and packing.

Space does not permit many details about these different things undertaken. In reporting at previous annual meetings I have read extracts from teachers' reports showing what they and their pupils had been able to do through the assistance received from the Schools' Division. Appended to this a summary from reports sent in this year will show as in previous years the character and the value of the work. Illustrations are included to show more clearly the nature of the work and the scheme used for reporting.

I cannot close this valedictory without a word of thanks and another of suggestion. As I said previously the Schools' Division was a Co-operative Association in Education. For all the kindnesses and help so willingly extended by the different members of the College staff, I offer my warmest thanks. Ten years of the best of my life have been spent as the head of one of the College departments. It was a great ten years for me! I shall always look upon those years as amongst the happiest of my life—and I trust too that they haven't been without some little profit and happiness for others.

It is to be hoped that some means of continuing the work of the Schools' Division may be found. As it was in reality the Extension Work of the Nature Study Department and this Department has been practically abandoned except for Summer School work with teachers, it will be necessary, if the work is to be continued, to attach it to some other department of the College. Of the value of the work there can be no doubt. There is a great service to be performed by the College for the six thousand rural school teachers and 250,000 rural school children of the Province.

Good Use of Material.

"The pupils planted the seed of the Golden Bantam Sweet Corn at home this year and preferred it to any other they had had; also the White Rice Popcorn. The pupils who received the Empire State and Early Eureka Potatoes each have one and a half bushels of seed and are keeping it to plant another year."—A. Cassidy, S.S. 12, Mountain Tp., Dundas Co.

"Our popcorn grew fine but was frozen in a rather severe frost the second last week of August. We would like to try it again with an earlier planting. The Swiss Chard was an entirely new vegetable for the people here. Many were desirous of trying it. Our oats were better than any in the neighborhood of our school. The pasture mixture did fairly well. Several have spoken about trying it next year."—O. Waite, S.S. 3, Korah Tp., Algoma District.

"An experiment with oats was tried by an ex-pupil and turned out fine. A similar experiment a few years ago with barley was quite successful in stirring up an interest in the neighborhood in good seed."—Mrs. K. A. McPhee, S.S. No. 5, West Williams, Middlesex Co.

Schools' Division, Ontario Experimental Union

ORGANIZED 1909

Ontario Agricultural College, Guelph, Canada

TEACHER'S REPORT, 1915

In accordance with the promise made in my application, I herewith submit a report on the uses made of the planting material furnished me by the Schools' Division of the Experimental Union and on the school or educational experiences connected therewith.

	Number of Pupils Taking Work	Number who made a success of it
Form I.	5	1
Form II.	7	6
Form III.	7	6
Form IV.	6	6

Teacher Sara Hamilton

School No 13 Otonabee (No and Township)

P. O. Address R. R. No 6 Peterboro

County Peterboro

Inspector Richard Leese

Was work carried out in Home or School Gardens, or both? Both. *Was this the first year for the work?* No Second

If not, how long has the work been carried on? 1914-1915 *Is the School entered in Agricultural work for special grants?* Yes

Material Furnished

FOR EXPERIMENTS AND DEMONSTRATIONS.

(1) FLOWERS, etc.
- Annuals
- Perennials
- Climbers
- Bulbs
  - Daffodils
  - Tulips
  - Gladioli
  - Dahlia
- Cotton
- Flax

(2) TREES.
- Nursery Seedlings
- Tree Seeds

(3) VEGETABLE EXPTS.
- Lettuce
- Onions
- Radish
- Carrots
- Beets
- Beans
- Cabbage
- Corn
- Herbs
- New Vegetables
  - Kohl Rabi
  - Swiss Chard
  - New Zealand Spinach
- Small Fruit Cuttings
- Onion Seedlings

(4) FIELD CROP EXPTS.
- Alfalfa
- Alfalfa Culture
- Oats
- Barley
- Corn
- Sugar Beets
- Mangels
- Potatoes
- Pasture Mixture
- Fertilizers
- Sorghums
- Millets
- Legumes
- Grasses
- Buckwheat
- Rye

(5) For Progress Club.
- Eggs
- Potatoes
- Corn
- Oats
- Barley
- Beets

From the material furnished in 1914, we saved seed, so did not ask for more supplies but with part of our grant we bought more bulbs, and a variety of seed. Everything seemed to turn out pretty well.

I used a fertilizer for experiment and it was easy to observe the difference where it was applied

Where it was used with potatoes there was no rot but in the other plot they were about half rotten.

Our Alfalfa that we planted last year with culture showed up the difference better

OVER)

Schools' Division, Experimental Union 1915.

Miss O. W. White
S.S. No 3. West Korah Tp.
Algoma.

TEACHER'S REPORT (Continued)

School or Educational Experiences.

(1) Public interest in enterprise.

Very good. Everyone for miles around has heard something of West Korah school and its School Fair and show their interest by visiting the garden

(2) General effect on pupils and discipline.

It aids in discipline. They have something in common to be interested in and to discuss together

(3) General effect on school patrons or their homes.

The school patrons seem to take more pride in their school and children

(4) Practical benefits accruing to the neighborhood.

As three other schools unite with ours in our Fall Fair, it becomes a social centre and enables farmers and women of different sections to meet. It thus brings about a better community spirit

(5) Difficulties encountered and how overcome

The greatest difficulty was a lack of tools. Those nearest brought some; others borrowed from neighbors near the school who did not have children attending. They liked to help and took an interest

(6) How gardening experiences were put to educational uses.

The ratepayers were told about our O.A.C. No 72 oat experimental plot and the Annual Pasture Mixture plot and advised to see it. We compared our plots as to yields with fields in the neighborhood

(7) How School Progress Club carried out its work and helped.

A club meeting was held every two weeks. The Club had a booth on Fair Day. It also entered several things at the Soo Fall Fair and won 8.50 in prizes. The Club also gave a Patriotic Concert All money raised was used for patriotic and educational purposes

(8) If a School Fair was held, how it was conducted and benefits from it.

A School Fair was held on October 5th. Three other schools united with ours. Our Fair is becoming widely known and people from Sault Ste Marie as well as from the surrounding country plan to visit us that day. All displays showed a great improvement over last year's exhibits

(9) Whether instruction sheets were useful; how they might be improved.

(10) Suggestions for improvement or enlargement of the scheme.

A circular might be mailed to each school section showing the benefits of Agriculture in schools where it is tried and encouraging all sections to introduce it. This demand would lead more teachers to take an agricultural training of some kind

(11) Distributions made of garden material in the community.

Flowers and vegetables were distributed to people who didn't have what we were growing or who wished to compare varieties

Experiments Worth While.

"The children were very much interested in the treatment of oats with formalin to prevent smut. The contrast between plots treated and those not treated was very marked. In some places in the section smut was very bad—about one-quarter being affected in some fields. The work in the school reached the homes and was emphasized by the contrast seen in local fields between oats grown from seed treated and from that not treated."—J. W. Hogarth, S.S. No. 1, Fenelon Tp., Victoria Co.

"The boys who received the samples of oats found the variety sent much superior to what was usually grown. In the potato experiment the Early Eureka proved best in our case. The annual pasture mixture proved a great success. It was cut weekly and the children were much interested."—Sister M. Eugenia, S.S. No. 2, Ashfield, Huron Co.

"We tried treating potatoes with formaldehyde to prevent scab. The hills where the potatoes had been treated were free from scab. The other hills were not."—A Cassidy, S.S. No. 12, Mountain Tp., Dundas Co.

School Progress Clubs.

"The Progress Club kept the weather record; grew things at home; read the agricultural papers to find out interesting and helpful articles; and appointed committees to keep the tool house in order, look after the library, clean the yard, etc."—C. Wright, S.S. No. 11, Malahide, Elgin Co.

"Our School Progress Club had charge of the experimental work in the garden. Plots of some varieties of oats which were grown in the section were sown beside a plot of O.A.C. No. 72 oats and comparisons noted. They tried an experiment with sowing Spanish onions indoors and transplanting into the garden. It was successful. The Progress Club cared for the garden in the holidays and it was well cared for."—M. Smith, S.S. No. 8, Wilberforce Tp., Renfrew Co.

"Early in September we formed a Progress Club. The pupils had been eager to do so since the visit of the field agent. Our club name is 'Busy Bees' and we have our colours and a school yell. We hope to get tiny club pins this Christmas. Every other Friday from 2.30 we hold our meetings and never once has anyone refused to do his share. It was owing to the work and co-operation of this club that our school was able to make the highest standing in the reports at our fair."—M. O. Howard, S.S. No. 7, Bastard Tp., Leeds Co.

"We secured oats (O.A.C. No. 72) from a farmer of the section and twelve pupils took part in our Progress Club work."—H. Kirk, S.S. No. 5, Fullarton Tp., Perth Co.

"Each girl in the Progress Club had a package of beet seed to take home. She grew the beets and then in the fall learned to can them and nearly every girl herself canned her beets. The boys in the club chose to grow popcorn, so each had a package of seed. This autumn each one reported on his crop and brought samples to our corn exhibition."—N. Auckland, S.S. No. 12, Westminster, Middlesex Co.

The School a Beauty Spot.

"This year we got ten pounds of lawn mixture which the Progress Club sowed and from which they got a good lawn. The lawn had previously been red sand. We sowed the mixture thickly and everyone in the section felt very much pleased. The day of our School Fair many nice compliments were paid the Club on their success. The trustees are going to do the whole grounds in 1916. It is said that they got their impetus from the Club's work. During the summer holidays the Club looked carefully after the lawn, cutting it as directed and pulling stray weeds here and there."—B. M. Waters, S.S. No. 12, Southwold Tp., Elgin Co.

"We grew tulips and daffodils in the school and they certainly made our room cheerful on a dull day. Some of the annuals did not grow but the nasturtiums, morning glories and zinnias flowered beautifully. In the spring everyone who passed turned to look at our tulip bed. We sent bouquets to the people who were ill in the section."—E. A. Duffin, S.S. No. 11, W. Nissouri, Middlesex Co.

"The flower seeds were planted about the school yard, and, together with the bulbs planted, made our school yard a beauty spot. Our school is near a cemetery and there was such a contrast between the well kept yard with its flowers and the ill-kept cemetery that the people of the neighborhood became ashamed of the cemetery and in consequence had a "bee" to clean things up a bit. We are getting a lawn mower and intend to have our yard even more beautiful next year. As yet we have not many tools but the children are always willing to bring the necessary articles from their homes. They are deeply interested in the work, even the primary pupils doing their share in planting and caring for their flowers. So far our work has received the co-operation of all the district. Everyone is proud of the school and what it is trying to do."—M. O. Howard, S.S. No. 7, Bastard Tp., Leeds Co.

"Frequent comments were heard on clean, tidy appearance of yard and roadside all summer."—C. E. Neelands, S.S. No. 6, Waterloo Tp., Waterloo Co.

Co-Relation With the School Fair.

"Our school joined in the Malahide Township Fair. Nearly all the pupils took exhibits. Two of the parents took loads. It was a very pleasant day for all and our school had a little picnic dinner by itself. The Progress Club made badges for the children. They all entered into the spirit of the day and took first prize for the school securing the greatest number of prizes. I think wherever the teacher is trying to teach agriculture there should be a fair. The parents see what their children are doing. The children are encouraged to do their very best work. They learn from their own mistakes and from the work of others. It encourages a community spirit in the rural school."—C. Wright, S.S. No. 11, Malahide Tp., Elgin Co.

"We held a fair this year in September. I gave the seed, bulbs and so forth in spring and the pupils brought what they grew to the fair. We had over twenty dollars donated by the section for prizes. These were not given in money, but in books, pictures and bulbs. Every child this year had some little thing to exhibit. The fair helped to interest each child in his garden plot. The parents were interested and in fact the whole section. A great many children are more interested in school since agriculture is taught. They look forward to the lesson."—Mrs. E. M. McDougall, S.S. 15, Caradoc Tp., Middlesex Co.

New Community Spirit.

"This is the first year that agriculture has been taught here with special grants. It was voted for unanimously at the last annual meeting. The pupils seem very much interested in the work. One benefit to the neighbourhood is that the section seems more united. In 1911 parts were taken from three neighbouring sections to form a new section and an up-to-date school house was built. There was some difference of opinion about the project but in the four years since much of it has passed away, and I am convinced that the agricultural work has been a potent factor in creating pride in the school and a good community spirit."—E. McLachlan, S.S. No. 12, Mosa Tp., Middlesex Co.

"The people of the section are interested in our school garden. They are proud of it and every one comes to look at it occasionally. The School Fair here brings the whole section together, and gives them greater interest in the work of their children and greater pride in their school."—M. Smith, S.S. No. 8, Wilberforce Tp., Renfrew Co.

Opposition and Indifference.

"One trustee is not in favour but does not actually oppose the work. He says he never saw a successful farmer turned out of a college. He is hard to convince but does not object to his son doing some garden work."—Elgin Co.

"One trustee was opposed and this made it rather difficult to start. We called on that trustee to help us in a difficulty and it must have won him over because this year he said we had better continue the garden. The parents have mostly been won over also, at least I do not know of anyone who is really against it. Many thought that it would take up too much school time, but most of the work was done in the noon hour and at recess. The children spent most of their spare time in the garden and, as it was right beside the road, everyone driving along could see them. Some thought, too, that it would be neglected during the summer vacation, but it was very well cared for indeed by the children themselves. A group of four took charge each week and the leader in each group reported the work and progress of the garden to the teacher. The garden was in splendid condition at school opening and everyone was talking about it."—Grenville Co.

Community Benefits.

"The home gardens have been a great aid in arousing the interest of the parents and the growing of flowers is leading to the beautifying of home grounds. People were much interested in the success of the pasture mixture. Kohl Rabi was introduced into the neighbourhood. Good seeds, both of flowers and vegetables, were distributed."—Sister M. Eugenia, S.S. No. 2, Ashfield, Huron Co.

TRAINING FOR CITIZENSHIP.

"Our School Progress Club is made up of school children. They carry on the business of the school and now want to be like a little 'legislative body,' making the school laws. They hold meetings twice a month and have debates, speeches and music. The people of the section are invited to attend these meetings."—A. MATHEWS, S.S. No. 10, Blanshard Tp., Perth Co.

"I find that the general effect on the pupils is good. Discipline and management are easier, attendance is more regular, pupils like school better, and there is a *spirit of co-operation among them.*"

RELATION OF THE SCHOOL GARDEN TO THE TEACHING OF AGRICULTURE.

"The chief educational use of the garden experience is its teaching the children to observe more closely, to experiment for themselves and to try and find out for themselves the 'why' of things."—M. SULLIVAN, S.S. No. 1, Nichol Tp., Wellington Co.

"We had over twenty tests of experiments in our garden and, where practical, we used these to illustrate what we were teaching in Agriculture; for example, we used the roots of peas from the garden to illustrate the teaching of the usefulness of leguminous plants in nitrogen gathering."—J. W. HOGARTH, S.S. No. 1, Fenelon Tp., Victoria Co.

DR. DANDENO: The work Prof. McCready has carried on in connection with the Experimental Union has already borne fruit in many lines. The teachers and pupils in the Province are taking up the matter of the School Fairs movement and other organizations of a similar nature. The High Schools now have over five hundred students, young men and women, actually engaged in studying agricultural work in these schools under specially qualified teachers. This means that those who are now being trained in the high schools will eventually go into the public schools as teachers of agriculture. Formerly, too, much of what I might call mathematical and literary work was carried on in the schools, and in consequence the important subject of agriculture was largely neglected. Some people have called my attention to the fact of girls learning agriculture and they say, "How can girls learn agriculture?" Why, in many country homes the women folk are the leaders in agriculture. You see a particularly prosperous-looking homestead and you will often find it is being farmed from the house. Many questions taken up by high school pupils cannot well be taken up by older people.

I have spoken to a number of men in small towns on the subject of agricultural teaching in public schools. In one small town the mayor talked of the fallacy of agricultural education. That sort of thing rouses my ire. The mayor said: "What is all this talk about the potato rot: they tell me if the people knew what was the cause of it they could have saved the Province $1,000,000 this year. What is the cause of it? Why, do you know?" I said, "I think I do." He said, "It was the wet weather, and you people at the College, how are you going to control wet weather, I would like to know." There was not very much use arguing with that man. Let me get a number of high school pupils, however, who have not twenty-five years prejudice behind them, but who are willing to listen to what is meant by spraying; what is meant by breeding new varieties of potatoes, fruits or cereals; what is meant by the Bordeaux Mixture and other preventive solutions; they can be taught. The farmers say these pupils are growing up and this agricultural education is unsettling them and taking them off the farm. It is not taking them off the farm. I can say, without fear or favour, that with the high school agricultural education which the pupils receive, they are going to make the country a better place to live in. They are going to make the farm more beautiful and farming life so attractive that they won't want to leave home at all. The Normal School pupils are getting more agriculture in their course than ever before. A special nature study course is now being taught. This movement is bound to grow to great success when we can get teachers properly qualified to teach and who are imbued with the right ideas of the country's needs.

CO-OPERATIVE EXPERIMENTS IN WEED ERADICATION.

Prof. J. E. Howitt, O.A.C., Guelph.

These experiments have now been conducted for four successive years. The weeds experimented with are Perennial Sow Thistle, Twitch Grass, Mustard, Bladder Campion and Ox-eye Daisy. Five experiments in all have been tried, viz.: The use of rape in the destruction of Perennial Sow Thistle; The use of rape in the destruction of Twitch Grass; a method of cultivation for the eradication of Bladder Campion or Cow Bell; spraying with iron sulphate to destroy Mustard in cereal crops; a method of cultivation for the destruction of Ox-eye Daisy. Some fifty-eight farmers have co-operated in this work during the past four years. These experiments have not been as successful this year as in former years, but this is due to the exceedingly wet weather of the past summer preventing the carrying out of the experiments according to directions. Those experimenters, however, who in spite of the bad weather were able to give the experiments a fair trial, report results which confirm those of the past three years. The results of the four years' co-operative weed experiments show:

1. That good cultivation, followed by rape sown in drills, provides a means of eradicating both Perennial Sow Thistle and Twitch Grass.

2. That rape is a more satisfactory crop to use in the destruction of Twitch Grass than buckwheat.

3. That rape gives much better results in the eradication of Twitch Grass and Perennial Sow Thistle when sown in drills and cultivated than it does when sown broadcast.

4. That thorough, deep cultivation, in fall and spring, followed by a well cared for, hoed crop, will destroy Bladder Campion.

5. That Mustard may be prevented from seeding in oats, wheat and barley by spraying with a twenty per cent. solution of iron sulphate without any serious injury to the standing crop or to the fresh seedings of clover.

A Member: What about Bindweed?

Prof. Howitt: Since this question first came up we have been conducting experiments with Bindweed, and while not successful in totally eradicating it, we find it can be held in check and kept under control with a short rotation of crops by growing hoed crops where cultivators and harrows can be used.

A MEMBER: But cultivation seems to be positively good for some weeds. Then there are places which cannot be cultivated—rocky parts and waste land pastures.

PROF. HOWITT: That is asking a difficult question, how to cultivate a field that cannot be cultivated. Even in rocky places it is often possible to break up the land and to cultivate it.

A MEMBER: This is rough pasture land.

PROF. HOWITT: Why not break up that field by ploughing, bring it into cultivation, and then re-seed it. I think if that were done and it were given a thorough cultivation there would not be much trouble from Bindweed, and on the rocky portion where it would not be possible to plough it, sheep might be pastured.

REPORT OF THE COMMITTEE APPOINTED TO MAKE A STUDY OF THE WEED ACTS OF CANADA.

PROF. J. E. HOWITT, CHAIRMAN, O.A.C., GUELPH.

The Committee appointed to make suggestions as to how the Provincial Weed Act and the eradication of weeds in Ontario could be made more effectual brought forward the following suggestions as to how the present Ontario Act to Prevent the Spread of Noxious Weeds might be made more effective:

1. By an organized effort upon the part of the Ontario Department of Agriculture, through the agency of Farmers' Clubs, Farmers' Institutes and the District Representatives of the Department of Agriculture, to make the farmers of Ontario acquainted with the provisions and regulations of the Ontario Act to Prevent the Spread of Noxious Weeds.

2. By amending the present Act so as to make it compulsory for every township council to appoint an inspector whose duty it shall be to see that the provisions of the Act relating to the destruction of weeds are carried out.

3. By the Ontario Government appointing county or district inspectors who shall supervise the work of the township inspectors, and report to the Government any neglect of duty upon the part of the said inspectors.

4. By extending the present Act so as to prevent the following weeds maturing and ripening their seeds:

1. Wild Oats (*Avena fatua*).
2. Curled Dock (*Rumex crispus*).
3. Clustered Dock (*Rumex conglomeratus*).
4. Purple Cockle (*Agrostemma githago*).
5. False Flax (*Camelina sativa*).
6. Wild Mustard (*Brassica arvensis*).
7. Wild Carrot (*Daucus carota*).
8. Field Bindweed (*Convolvulus arvensis*).
9. Ribgrass (*Plantago lanceolata*).
10. Common Ragweed (*Ambrosia artemisiifolia*).
11. Ox-eye Daisy (*Chrysanthemum leucanthemum*).
12. Canada Thistle (*Cirsium arvense*).
13. Chicory (*Cichorium intybus*).
14. Perennial or Field Sow Thistle (*Sonchus arvensis*).
15. Burdock (*Arctium minus*).
16. Wild Barley or Squirrel-tail (*Hordeum jubatum*).

And all other weeds which, upon the consent of the Minister of Agriculture, the council of any city, town, township or village may by by-law bring under the operation of this Act.

Mr. Clark: The question which Prof. Howitt has brought up is one that we have had occasion at Ottawa, in the Seed Branch, to carefully study. Ten years ago I was inclined to get very impatient with the township councils because they were not as keen as I was on the matter of appointing weed inspectors. As time went on I came to the conclusion that the members of the township councils were not so much to blame; they are the same as all other men, inclined to follow the route of least resistance. The appointment of a weed inspector in a township brings all sorts of trouble to the members of a township council who appoint him. I know from my observations that unless the farmers within the township, fifty of them, under the present act, sign a petition asking for the appointment of a weed inspector, it is not very likely that any township council will appoint one. The difficulty is with the farmers themselves who are not disposed to take action. I believe a very good thing in the Province of Ontario would be the appointment, for educational purposes to commence with, of an officer who would give at least fifty per cent. of his time to this work. The Provincial Department of Agriculture would nominate an officer who would be charged with the duties of making known the benefits of this noxious weed law, perhaps bringing to the attention of the people its necessity during present conditions. It would make clear to farmers in a township their opportunity to have conditions improved by community forces. If information of this kind were kept before the people for two or three years I believe that they would then indicate a more wholesome desire to have more drastic action taken. We have an unwritten law that any number of people who want to govern their affairs must be given the right to do so, and this applies to the principles of the Noxious Weed Law of Ontario. It is there for the people to make use of if they will.

A Member: I think it is not so much lack of interest as it is lack of funds. In the county in which I live, I question if we have on the average more than one hundred acres per man, and we have great difficulty in carrying out the work which is necessary.

A Member: There is one thing certain, and that is, that the Government ought to do something to protect the farmer who wishes to keep his farm clean. There should be some action taken to prevent the spread of noxious weeds such as Perennial Sow Thistle. I believe that this is not a local question but it is one which the Provincial Government will certainly have to take in hand.

A Member: The Guelph township has a by-law to compel the cutting of weeds along the roadside in front of a farmer's place, and I have sometimes seen when weeds were cut along the roadside that they were not cut in the adjoining fields.

A Member: Is it possible to get rid of Mustard?

Prof. Howitt: Mustard may be prevented from seeding by spraying with iron sulphate. We have shown by our experiments here at the College, that there is no reason why mustard should be allowed to seed in a grain field.

A Member: I am from New Ontario and we have had very few weeds to contend with during the last few years. One of the great difficulties in that country is to prevent weed seeds blowing from the waste land to cultivated fields. We can get no one to look after that.

A MEMBER: I think that what Mr. Clark has said in regard to education in the matter is correct. This legislation in regard to roadside weeds should, I think, be made larger, to include weeds in the adjoining farms.

PROF. HOWITT: In reply to that I may say the Ontario Act not only covers the weeds on the roadside, but in the fields also; but as you say the fields may be under crop, and the inspector cannot order the weeds to be cut away in a neighbor's field to the destruction of any grain crop.

REPORT OF COMMITTEE ON THE PREVENTION OF THE IMPORTATION AND THE DISTRIBUTION OF NOXIOUS WEED SEEDS IN GRAINS AND SCREENINGS.

G. H. CLARK, DOMINION SEED COMMISSIONER, OTTAWA.

The purpose of this committee has been to study the weed seed content of the feed grain, screenings and mill feeds from grain coming to Ontario from the west of Canada. The weed seed content of grain produced in Ontario is bad enough and the careless practices in handling it are worse, but these are not to be compared to the curse of the weed seeds that have been pouring into the Province from the grain growing districts of the West. It seems clear, too, that the importation and distribution of feed grain, elevator screenings and mill feeds, all more or less contaminated with vital weed seeds, will tend to increase. It is an exceedingly complicated problem.

Under the present conditions of international grain trade, it is not to the advantage of the grower whose land is foul with weed seeds to clean his oats or barley before sending it to market. To clean his feed oats would entail a dockage of from 10 per cent. to 20 per cent., and since Ontario feeders will pay not more than 5 per cent. to 10 per cent. extra for the recleaned oats, it is to the advantage of the grower to ship his weed seeds to the Ontario feeder. These feeders have not yet learned that 10 per cent. or 15 per cent. of mustard and other weed seeds mixed with feed oats or chop feed are not only useless but are actually harmful to the health of livery horses or dairy cattle. The common spread in price between No. 2 Canadian Western oats and the lower grades of feed oats available in the market is about one-half of the difference between the actual feeding value of these grades, and this because of the unwholesome nature of the weed seed content of the lower grades. Efforts have been and will continue to be directed toward securing better methods of cleaning the grain in the Prairie Provinces at time of threshing; but progress in that direction will be slow so long as Ontario feeders and feed manufacturers continue to buy grain badly contaminated with noxious weed seeds.

It is important that Ontario feeders should more clearly understand the actual value of the recleaned grain as compared with the lower grades polluted with weed seeds of all kinds. When the demand for this grain makes a sharp discrimination in price between the clean and the unclean, then it will be unprofitable for the western grower to ship his weed seeds to Ontario.

The two last annual reports of this committee dealt almost exclusively with the screenings problem. Mention was made of the need for actual feeding experiments to determine the value of these screenings. A representative carload was obtained by the Seed Branch and used at the Experimental Farm at Ottawa for feeding experiments. The results have been published in bulletin form, copies of which I have for distribution. The experiments show that in the process of separating screenings, the finer weed seeds capable of passing through a 1-14 inch perforated zinc screen were not only useless but were deleterious to the health of all kinds of stock except perhaps sheep. After the fine weed seeds have been removed the balance of the screenings, when ground, makes a wholesome feed for all kinds of stock, equal to and for some purposes better than bran or chop feeds made from coarse grain.

Following these experiments and the recommendations made as a result of them, the government terminal elevators have adopted the plan of separating and destroying all that part of their screenings which would pass through a 1-14 inch perforated zinc screen. The balance of the screenings, consisting largely of wild buckwheat and small broken grains of wheat, is ground in simplex grinders to destroy the vitality of all seeds. The feed so manufactured is now available for the public. It is the property of the government terminal elevators and the revenue from it is used for the maintenance and operation of the elevators. It is the cheapest food I know of in the market to-day. Private elevator interests are carefully watching the operations of the government elevators in handling their screenings. If results indicate that larger returns are to be obtained from elevator offal by following these methods, then I have no doubt the practice will become more general. This year probably 150,000 tons of grain screenings will accumulate at the terminal elevators at the lake front, and while the great bulk of this is exported to the United States, considerable shipments are coming to Ontario feed manufacturers.

If it be the legal right of Ontario to declare it unlawful to distribute within the Province feed grain or screenings which contain more than a small per cent. of weed seeds that would pass through a 1-14 inch perforated zinc screeen, then I think the district representatives of the Department of Agriculture will find plenty of opportunity for service in trying to locate and give publicity to the manufacturers and others who have found it profitable heretofore to deal in feed grain and screenings of inferior quality, much to the detriment of feeders in general and to the great danger of agriculture.

Prof. Howitt: In this discussion Mr. Clark has told us in effect that Ontario is a dumping ground for much of this low-grade feed grain and screenings, and it is for us to find out why. I think the reason may be found in the fact that Saskatchewan, Alberta and Manitoba have Provincial Acts to prevent the sale of feed grain or screenings which contain more than ten noxious weed seeds per ounce. Our Ontario Act contains no such provision and hence, as Mr. Clark has pointed out, Ontario is the dumping ground for this material. The question is, should not this Experimental Union do something to bring this fact before the Ontario Government? Would it not be advisable to suggest that ground feed, grain and screenings must contain not more than a low per cent. of small seeds which will pass through a 1-14 inch perforated zinc screen before they may be legally sold in Ontario?

Mr. Clark: Four years ago, at a meeting of this Union, I suggested that the problem would have to be dealt with before success could be achieved with the Noxious Weed Law of Ontario and I also suggested that regulations be made to compel the cleaning of feed grain. If the Ontario Noxious Weed Law contained a clause requiring that all feed grain or screenings, before they could be lawfully sold and distributed within the Province, must contain not more than 2 per cent. of weed seeds that would pass through a 1-14 inch perforated zinc screen, then you would have something in Ontario commensurate with the regulations in the Prairie Provinces where your main difficulties arise.

PROF. ZAVITZ: A committee was appointed in connection with the work of Prof. Howitt, of which he was chairman. My proposition would be to retain that committee and change the wording of the resolution just a little by adding another clause, "Weed seeds as well as weeds," and have that committee bring something definite before the Experimental Union. I, therefore, move that the committee be re-appointed to make suggestions how the Provincial Weed Act and the eradication of weeds and weed seeds in Ontario would be made more effectual.

PROF. ZAVITZ: I may say to the members of this Experimental Union that the committee, of which Mr. Clark is chairman, deserves great credit for the excellent work which has been done in connection with weed screenings.

A MEMBER: That resolution affects the labor question mentioned earlier in this discussion. Could not restrictions be placed on these elevators to compel them to clean this seed at their plants, where they have the proper facilities, before it is shipped over Ontario? A resolution of that nature would do a great deal to prevent unnecessary labor by keeping these noxious weeds within certain bounds.

PROF. HOWITT: It seems to me that the distribution of seeds from Port Arthur and other elevators, in cheap and low-grade feed stuffs, is a matter which rests entirely with the Ontario Government. It is out of the hands of the Dominion Government and Ontario will have to take some action which will not involve additional labor to the farmers. It seems a pity that another year should go by with these cheap feeds and low-grade screenings still pouring into Ontario, and the Province still the dumping ground for this low-grade stuff.

PROF. ZAVITZ: The committee is appointed and perhaps it will be able to do some work during the year and bring it before the Ontario Government.

A MEMBER: As a member I move that the Experimental Union address a memorandum to the Minister of Agriculture of the Province of Ontario, suggesting that he take into consideration the advisability of making an amendment to the Noxious Weed Act, to declare unlawful the distribution of feed grain or screenings within the Province of Ontario containing more than 2 per cent. of weed seeds which are capable of passing through a 1-14 inch perforated zinc screen.

THE CHAIRMAN: You have heard the resolution? Carried. I am glad we have been able to take some definite action on such an important question as this.

DISCUSSION ON SWEET CLOVER.

PROF. ZAVITZ: A great deal of discussion has taken place recently in regard to the value of sweet clover as a farm crop and as a honey producer in Ontario. Some of the discussion is well founded and some of it I fear is misleading.

The common white sweet clover is a biennial leguminous plant having an erect branching stemmy growth. The plant has a strong fragrant odor and a bitter taste. The growth is rather slow at first and is not very large during the first year. In the second year, however, the growth is rapid and abundant, the stems become woody, the leaves easily drop from the plants on drying, and the seed matures unevenly and readily shatters on ripening but generally yields well per acre. The seeds are formed singly in pods and closely resemble in shape, color, and size, those of alfalfa. The plants of the sweet clover die after they produce seed at the end of from fifteen to eighteen months from the time the seed is sown.

Sweet clover thrives on a variety of soils but seems to require an abundance of lime. It grows readily on road sides and waste places where the seeds reach the ground annually. Its eradication is rather difficult in uncultivated land but not very difficult in cultivated fields. In past years seed has been harvested for market from the wild crops growing in waste places, and even at the present time seed offered for sale frequently contains many impurities. The quality of the seed obtainable, however, seems to be gradually improving.

Experiments with sweet clover at the Ontario Agricultural College extend over a period of nearly twenty-five years. The crop was grown for hay production in comparison with Common Red and other varieties of clover in the years 1892, 1895, 1897 and 1899, and the yield of hay per acre of the sweet clover was not very different from the yield of hay of alfalfa for its first year's crop. Sweet clover was compared with eight varieties of clover, sainfoin, and alfalfa from the standpoint of pasture production in the years 1902 and 1904. Various tests were made also in cutting the sweet clover at different stages of growth for feeding to different classes of farm animals, but in all instances the animals refused to eat the crop although in some cases it was cut when quite young and tender. The bitter flavor of the crop seemed distasteful to the animals and apparently they were not starved long enough to force them to develop the acquired taste. If the crop is to be used for hay production it seems essential to cut it before any blooms appear. At this stage of development the growth is not as abundant but the plants are less woody, and the leaves are more easily saved than when the crop is cut at a later period. There seems to be rather more difficulty in curing hay from sweet clover than from red clover or from alfalfa.

In each of two years an experiment was conducted at the College in comparing the amount of pasture crop produced by sweet clover, by alsike clover and by common red clover. The yields per acre were determined at each of six cuttings in each of the two years. Three weeks were allowed between each two cuttings. The results are very interesting in furnishing definite information regarding these three crops in the production of green clover which would correspond pretty closely to the relative amounts of pasture produced. The following table gives the average of the two years' experiments in tons per acre of pasture crop:

Periods of Cutting.	Variety of Clover. Tons of Pasture per Acre.		
	Common Red.	Alsike.	Sweet.
First Cutting	13.5	11.0	11.0
Second "	1.4	.2	1.5
Third "	2.9	4.0	2.5
Fourth "	4.6	1.7	3.0
Fifth "	2.0	3.4	1.9
Sixth "	1.6	1.1	.9
Total	26.0	21.4	20.8

The results show that, with one exception, in the average of the two years the Common Red surpassed the sweet clover in yield of pasture crop per acre at each of the cuttings. In the total amount of pasture per acre per annum the Common Red clover surpassed the sweet clover by fully five tons or by about twenty-five per cent., and the alsike surpassed the sweet clover by about one-half ton.

Interesting experiments are in progress at the Ontario Agricultural College at the present time. In one section of the trial grounds an acre is devoted to a careful examination of sweet clover of seven different species, the seed of which was obtained from five countries in Europe, Asia and Africa, from nine States of the American Union, from four localities in Ontario, and from three Ontario seedsmen. There is a marked variation in the plants growing from the seed obtained from different sources and selections. The most of the strains produce coarse stems with small scattering leaves, but the plants grown from seed obtained from Spain, and from Tompkins County, New York State, have a decidedly prominent leaf development and appear to be quite superior to the ordinary strains of sweet clover. We expect to continue the selection work in the hope of obtaining a more desirable type of plant and possibly one which will be more appetizing to farm animals than the ordinary wild sweet clover, and which will have fewer of the other objectionable features as well.

Morley Pettit: I have had very little personal experience with this plant. At different times I have kept bees where it was fairly plentiful on roadsides, but could never see that they derived any particular benefit from it.

The following extract from "The ABC of Bee Culture," published by the A. I. Root Co., will be of interest:

> This is one of the most important honey plants in the world. Widely distributed all over the United States, it is becoming more and more abundant. While it does not yield any surplus in the east, except in limited areas, the bees are always busy on it when in bloom, which is from the close of white clover up to fall. It is, therefore, invaluable for brood rearing, particularly as the beekeeper can depend on it every year, wet or dry. In the west carloads of almost pure sweet clover honey are produced. We say "almost pure," because there are other plants usually in bloom at the same time. This very fact makes it more saleable, because a strictly pure sweet clover honey is a little too strong, and a slight mixture of other honey improves it very much. Conversely, a little sweet clover in any other honey adds a quality or flavor that is very delightful. For that reason bottlers of honey like to get it to mix with other honey. Taking it all in all, sweet clover honey will always have good demand as a blender. This will be better understood when it is stated that cumarin, a substitute for vanilla, is extracted from the sweet clover plant. It is this vanilla flavor in sweet clover honey that makes it so desirable for blending purposes."

The subject of sweet clover as a honey plant was quite freely discussed at the Annual Meeting of the Ontario Beekeepers' Association in November, 1914. Mr. John Newton of Thamesford, Oxford County, mentioned the flavor as being very objectionable to the average customer of honey. He said, "It is of a greenish color and very thin and decidedly poor flavor. As far as I can find out it is not a good honey for winter stores." Mr. W. A. Chrysler, of Chatham, also spoke of sweet clover in his neighborhood as being a curse, stating that it came at a time in the fall when bees should be settling down for winter unless they are storing surplus, and that a large percentage of water in the nectar made the loss sustained by the wear and tear of evaporating it, greater than any benefit derived from the nectar stored.

On the other hand I have had reports from Welland County of seventy pounds gathered by some individual colonies mostly from sweet clover. It would seem that on the whole the importance attached to sweet clover as a honey plant by beekeepers in Ontario is much less than the general public suppose.

A Member: Do animals eat sweet clover readily?

Prof. Zavitz: Some animals will, while others have to be starved before they will eat it.

A Member: How much seed do you sow?

Prof. Zavitz: About twenty pounds to the acre.

A Member: In the instance you have cited, was any fertilizer used on the ground?

Prof. Zavitz: No fertilizer was used. I might say that when Prof. E. J. Zavitz took over the land in Norfolk County for nursery work we talked over the crops which might be grown on that land as a green manure, or a cover crop and green manure combined, and we considered that sweet clover would be one of the very best for use on that soil. We planted sweet clover for two years on that light sandy soil with poor success, but there was not much lime in the soil.

Prof. Howitt: Just a word or two in regard to the complaints which are made of sweet clover as a weed. You will find in some farming districts the farmers are very much in favor of it, and then again others very much opposed to it. A great deal depends on where you are trying to grow it. It will grow on very indifferent soils where other crops will not. But while this clover will give us large yields of hay and will grow where alfalfa will not, I do not think anybody would care to say that this clover should supplant alfalfa and some other crops in sections where they do well.

A Member: A little while ago I was told by a farmer that if sweet clover once got on your land you would never be able to get rid of it. I found, however, it was very easy to kill. I have a neighbor in South Grey who is a beekeeper and has grown sweet clover for years, and he is most enthusiastic about it. He said, "If you grow sweet clover you will always have honey." We should investigate this legume thoroughly before we turn it down altogether.

A Member: I sowed three-quarters of an acre with sweet clover at the rate of twenty pounds of seed to the acre. I have found no difficulty, whatever, in getting stock to eat it. We fed it to cows and we also cut it with a scythe and gave it to young calves when they were pasturing on good red clover, and they ate it greedily, even though they were fed skim milk and meal besides.

A Member: I know of a man in Middlesex County who thinks a great deal of sweet clover and who has had a field in this crop for about fifteen years. He pastures his cattle in this field from about the first of June until the autumn, when they go into the stable. He claims to be able to run two steers to the acre on that field which is more than can be pastured on any other clover that I have seen.

The Chairman: In our neighborhood it is known as a field weed.

A Member: It cannot be called a field weed in good agricultural practice unless you allow it to overrun your farm. If you are going to work your farm in rotation of crops, or sow it as a pasture or a fodder crop it will only last a couple of years.

Prof. Zavitz: We have not had very much trouble in eradicating sweet clover on cultivated land.

THE POTATO ROT AS AFFECTING SEED POTATOES.

Prof. J. E. Howitt, O.A.C., Guelph.

A glance at the figures compiled by the Ontario Bureau of Industries regarding the potato crop of the past year makes us realize more clearly and forcibly the fact recognized by every farmer and every householder in Ontario that the potato crop for 1915 was far below the average in regard to quantity. These figures show us that the average yield per acre of potatoes in Ontario for the last thirty-four years was 116 bushels, while the past year (1915) the average yield per acre throughout Ontario was 76 bushels—40 bushels per acre below the yearly average; and that the potato crop in 1915 was over 5,000,000 bushels below the average yearly crop for the last thirty-four years in Ontario, notwithstanding the fact that the acreage devoted to potatoes was much above the average for Ontario.

What caused this shortage in the potato crop? It was to some extent due to the fact that climatic conditions were such that stem and leaf development were stimulated at the expense of tuber formation, so that the potatoes tended to run to tops. The chief cause, however, was an epidemic throughout western Ontario of the fungus disease known as Late Blight and Rot. It is a conservative estimate, I think, to place the reduction of the potato crop in Ontario caused by this disease at 3,000,000 bushels, which at 40c. per bushel would be worth $1,200,000.

It is not, however, the loss caused by this epidemic of potato rot that is to be discussed in this address, but how the rot affects seed potatoes. In order to understand this it is necessary to have some knowledge concerning the cause and nature of this rot.

Late Blight and Rot of potatoes is a fungus disease which attacks both the leaves and the tubers. It causes a blighting of the tops and a rotting of the tubers. On the lower surfaces of the diseased leaves during wet weather large numbers of spores are produced. Some of these are washed down through the soil and infect the tubers. The disease is carried over from year to year by means of infected tubers. Many of these show some signs of rot and are thus readily recognized, but some of them appear sound and cannot be detected. It is thus clear that in a year following an epidemic of potato rot many of the seed potatoes will be infected. It will be a very difficult matter this coming season to secure seed potatoes which are not infected with the potato rot fungus. This does not necessarily mean that we will have an epidemic of potato rot in 1916. This will depend upon climatic conditions; if we have a comparatively dry summer, there will be, it is safe to say, little or no potato rot; if, however, we have another wet summer, the potato rot will in all probability be worse than it was in 1915. It is thus seen that epidemics of potato rot are brought about by a combination of infected seed potatoes and wet seasons.

The question is, how are we going to avoid using infected seed? At first thought one would be inclined to answer, by securing seed from localities where the rot was not serious the previous year. Those who are familiar, however, with the potato rot fungus know that it may be present in a field year after year without causing any epidemic of rot, and, therefore, that seed from fields which were almost entirely free from rot the previous year may to some extent be infected, and that the use of such seed may give rise to an epidemic of rot if weather conditions are favorable.

There is, however, one way by means of which seed potatoes comparatively free from infection can be secured. It is by growing varieties of potatoes which are not subject to Late Blight and Rot. Varieties of potatoes differ very much in regard to their susceptibility to this disease. Many excellent and extensively grown varieties, are decidedly susceptible to rot, while others are markedly rot resisting. The results of the experiments conducted by the Department of Field Husbandry in regard to the comparative susceptibility of different varieties of potatoes to rot are in this connection extremely interesting. "In 1915 two varieties had less than one per cent. each of rot, and two varieties had upwards of fifty per cent. of rot under similar conditions. Taking the average of experiments for five years it has been ascertained that those varieties which were the freest of rot were the Davies' Warrior, the Extra Early Eureka, the Stray Beauty and the Holborn Abundance, and those most subject to rot were the Early Rose and the Beauty of Hebron."

In conclusion I strongly advise those who are anxious to avoid loss from potato rot to select varieties which experiments have shown to be the least susceptible to the disease, and in addition to this to spray thoroughly every year. When the potato beetle and rot are both taken into account, there is not a question but that thorough spraying will pay well. Potatoes should be sprayed with Bordeaux mixture (4-4-40 formula) to prevent the Blight and Rot, and to this Paris green (1 lb. to each 40 gallons liquid spray) or arsenate of lead (3½ lbs. to each 40 gallons liquid spray) should be added to destroy potato beetles. Spraying should be commenced when the plants are from 6 to 8 inches high, and care taken to keep the foliage covered with Bordeaux mixture throughout the season until danger from rot is past. Special care should be taken to see that the spraying is very thoroughly done, if the weather is at all wet, about the middle of July. It is at this time that epidemics of Blight and Rot usually begin.

PROF. ZAVITZ: The potato rot has been very serious throughout Ontario this year. In a season like the past it has been difficult to obtain full advantage from the spraying materials owing to the fact that the rains were so incessant. The yields per acre of potatoes were exceedingly variable during this period. This was owing to different causes, one of which was the injury caused by the rot. In the experiments at the College, for instance, one variety gave as low as 13 and another variety as high as 366 bushels per acre. The Extra Early Eureka, a medium early variety, gave an average of 326 bushels per acre in 1915 and an average of 232 bushels per acre for the past five years. In the average results for the past nine years the Davies' Warrior stands first with 235 and the Extra Early Eureka second with 230 bushels per acre per annum.

In the co-operative experiments throughout Ontario in 1915 each experimenter was asked to give the number of rotten potatoes in the crop produced of each of the varieties under test. In more than one-half of the experiments there was not a trace of rot in either the Extra Early Eureka or the Davies' Warrior varieties. In those experiments in which rot occurred it was very slight. In the results used in the summary the percentage of rotten potatoes was only one per cent. in the Extra Early Eureka, and only one-half of one per cent. in the Davies' Warrior variety.

The experiments at the Ontario Agricultural College emphasize the importance of planting potatoes which are the least susceptible to the rot. We now have much evidence to show that some varieties are comparatively free from rot every year, while others have a large amount of rot in those seasons in which the conditions are favorable for the development of rot, and are unfavorable for obtaining the best satisfaction from the spraying materials.

A MEMBER: Were these varieties grown side by side?

PROF. ZAVITZ: Yes.

A MEMBER: How long will the fungus stay in the soil?

PROF. ZAVITZ: The fungus does not stay in the soil; it is carried over in the seed from year to year.

A MEMBER: I have had a little experience with the Davies' Warrior potato during the last five or six years. I grew them this year and out of possibly fifty bushels I am sure that I did not have a peck of rotten potatoes, and in my neighborhood there was considerable rot.

A MEMBER: Were they sprayed?

A MEMBER: Yes. I cannot give you the exact dates but they were sprayed three different times during the season.

PROF. ZAVITZ: I might say in connection with the co-operative experiments that there was one experiment in which both the Davies' Warrior and the Extra Early Eureka were about half rotten. These potatoes were sprayed. We had a few cases where possibly eight or ten per cent. were rotten, but in many cases there was no rot at all.

PROF. HOWITT: I do not wish it to be understood that I am recommending the selection of a rot resisting variety alone as the only method of prevention, but in connection with various treatments I think that is the way to avoid loss from potato rot.

A MEMBER: Does soaking the potato in any solution prevent the rot?

PROF. HOWITT: In reply to that I may say that soaking the seed in formalin will prevent the scab and other diseases of a like nature, but it has no effect on potato rot. This is a fungus that does not live on the outside of the seed, but inside in the diseased eye of the seed potato.

MATURE vs. IMMATURE CORN FOR SILAGE.

PROF. G. E. DAY, O.A.C., GUELPH.

There is considerable difference of opinion among farmers as to whether it is advisable to sacrifice something in quantity in order to secure maturity in corn grown for silage purposes.

During the summer of 1915 preparation was made to conduct a test with early maturing and late maturing corn. Longfellow was selected for the early maturing variety, and Mammoth Southern Sweet for the late maturing. We also planted two intermediate varieties, namely, White Cap Yellow Dent and Wisconsin No. 7. The four varieties were planted on May 31st, in the same field and all had the same cultivation. The season was somewhat backward until August so that none of the varieties reached as full a stage of maturity as would probably have been reached in a normal season. The corn was all in the silos by September 26th.

At the time of cutting the grain of the Longfellow was glazed and in the firm dough stage. That of the two medium varieties was in the milk stage, and in the case of the Mammoth Southern Sweet, the ears were just forming. The Mammoth

Southern Sweet was put in a separate silo so that comparisons could be made of this variety with the others. Up to the present, only one comparison has been practicable, namely, that of the Mammoth Southern Sweet silage with the silage from the Longfellow variety. A little later we will be able to secure comparisons of Mammoth Southern Sweet with the two medium varieties.

Whether it was owing to the season or to some other cause germination was only fairly satisfactory, but there did not seem to be much difference among the varieties in this respect. The yields per acre of green material were as follows:

Mammoth Southern Sweet............	11 tons— 414 lbs.
Wisconsin No. 7	10 tons—1,840 lbs.
White Cap Yellow Dent	10 tons—1,685 lbs.
Longfellow	9 tons— 470 lbs.

The corn lay in the sheaf for two days before it was put into the silos, and no doubt lost considerable in weight during this period.

It will be seen, therefore, that the Mammoth Southern Sweet yielded nearly two tons per acre more than the Longfellow. This of course was the weight of the green corn, and we cannot tell how much silage was produced per acre by the different varieties until all the silage has been fed. The silage from the Southern Sweet has a decidedly more acid smell and taste than that from the Longfellow.

Feeding Tests.

As stated before, we have as yet been able to conduct tests with only two varieties, namely, Longfellow and Mammoth Southern Sweet. With these varieties two tests have been made with dairy cows.

In test number one, three cows were fed for two weeks on Mammoth Southern Sweet silage, followed by two weeks on Longfellow silage. Three other cows were fed two weeks on Longfellow silage followed by two weeks on Southern Sweet. All other kinds of feed were kept as nearly the same throughout the four weeks as it was possible. In making the comparison, we are using only the second week of each period, the first week being omitted to allow the cows time to become accustomed to the change in feed.

The results in milk production are as follows:

6 cows on Longfellow silage produced 1.585.2 lbs. milk in 1 week.
6 cows on Southern Sweet silage produced 1,510.3 lbs. milk in 1 week.

This gives a difference of 74.9 lbs. milk in favor of the Longfellow silage. During each week the six cows consumed 1,512 lbs. of silage, and, since the other feed was the same throughout the test, the only conclusion open to us is that the difference in milk production was due to the difference in quality of the silage, which may or may not be correct, because in any feeding test the individuality of the animals always enters into the problem.

If we assume that 1,512 pounds of Longfellow silage produced 74.9 lbs. of milk more than the same quantity of Southern Sweet Silage, and if we value milk at $1.60 per hundred (which is the price we are receiving for it) then a little mathematical operation shows that one ton of Longfellow silage, in this test, was worth to us $1.58 more than one ton of Southern Sweet. This looks extremely high, and in the light of the following test it is probably a good deal higher than we are warranted in expecting in all cases.

Test number two was conducted in a different manner. Eight cows were fed the Southern Sweet silage for two weeks, then they were fed Longfellow silage for two weeks, followed by another two weeks period of Southern Sweet.

In reckoning results, the average milk production during the two periods on Southern Sweet was compared with the middle period on Longfellow silage. As in the previous test, only the second week of each period was considered, for reasons previously given, and throughout the six weeks all other feeds consumed by the cows were exactly the same from day to day.

In test number two 8 cows produced 1,931.3 lbs. milk in one week on Longfellow silage; also, 8 cows produced an average of 1,887.9 lbs. milk in one week on Southern Sweet silage.

In this test, therefore, we have a difference of 43.4 lbs. milk in favor of the Longfellow silage. The 8 cows consumed 1,778 lbs. of silage during each week, and, therefore, on the assumption used in the previous test, 1,778 lbs. of Longfellow silage was worth 43.4 lbs. milk more than the same quantity of Southern Sweet silage. Valuing milk as in the previous test, we find that Longfellow silage, in test No. 2, would be worth 78c. per ton more than Southern Sweet silage. This difference, in favor of Longfellow, is barely half the difference shown in the previous test, and there is no way of explaining the variation in results, except that the individuality of the cows has had an influence in bringing about this discrepancy.

It is interesting to note, however, that in each test there was a pronounced difference in favor of the silage from the more matured corn, although it would be unsafe to make any positive statement as to just how great this difference was, with the meagre evidence before us. It will be necessary to do considerably more work along this line before we feel safe in drawing anything but the most general conclusions.

Difference in Value Per Acre.

A rather interesting comparison can be made on the basis of the yield per acre.

The Longfellow yielded nine tons four hundred and seventy pounds per acre of green material.

According to test No. 2, and assuming that the weight of silage is the same as the weight of green material, the 9 tons 470 lbs. of Longfellow silage grown upon one acre would be worth $7.20 more than the same weight of Southern Sweet silage. Thus, the $7.20 additional value of the Longfellow silage on the one acre, must be set off against the extra two tons of Southern Sweet silage produced per acre, so that in test No. 2 no particular advantage is shown in favor of either variety, when it comes to value of product per acre.

Using the same process in test No. 1, we would have $14.59 to set against the extra two tons of Southern Sweet silage, so that we may safely say that test No. 1 shows a marked advantage in favor of the early maturing but lighter yielding variety.

The figures just given are not entirely satisfactory, because they should be based upon the yield of silage per acre and not upon the green material, but, as previously stated, we cannot ascertain the actual yield of silage until all the silage has been fed.

Though incomplete, the figures given are interesting and suggestive, and indicate the necessity for further work along this line.

THIN AND THICK SEEDING OF CORN.

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

We have not made a chemical study of the influence of thin and thick seeding of corn on the composition and digestibility of the fodder produced, consequently, I have very little to add to this discussion.

At the outset I think it is essential that we get clearly in our minds the fact that the point under discussion is the relative value of thin and thick seeded corn both equally well matured. Many of us may have in mind the thickly seeded corn that is sometimes cut in the immature form during the summer as a supplemental feed for the stock. Such material, naturally, has only a small supply of nutrients. If, however, this corn was allowed to grow as long as the thinly seeded cultivated corn that may be in the same field, would it be equally well matured? It is possible that it would dry off and cease growing in a shorter time, without maturing grain, but will it have all the food nutrients developed to an equally valuable form? This is, of course, an extreme case, but it serves to make plain my meaning. If thin corn be grown in rows forty-four inches apart with a stalk every three inches in the row, will it produce as much digestible food nutrients per acre as corn grown in rows the same distance apart, but with stalks twelve inches apart in the row, or if the corn is grown in hills?

Dean Henry, in "Feeds and Feeding," gives the following data bearing on this point: "At the Illinois Station, Morrow and Hunt, studying the results of thick and thin seeding on the yield of nutrients, reached conclusions at the end of three years' study which are summarized in the following table. In these trials dent corn was planted at varying rates, from one kernel every three inches to one every twenty-four inches, the corn rows being three feet, eight inches apart.

Results of Planting Corn Kernels at Various Distances Apart in Rows. Average of Three Years' Trials—Illinois Station.

Thickness of Planting.		Yield.		Digestible substance per acre.			Stover per acre.	Stover for each lb. of Corn.
Distance between kernels in row.	Kernels per acre.	Good ears.	Poor ears.	Stover.	Grain.	Total.		
		bus.	bus.	lbs.	lbs.	lbs.	tons.	lbs.
3 inches...........	47,520	13	46	3,968	2,250	6,218	4.8	3.6
6 "	23,760	37	39	3,058	2,922	5,980	3.7	1.9
9 "	15,840	55	22	2,562	2,977	5,539	3.1	1.5
12 "	11,880	73	16	2,480	3,113	5,593	3.0	1.3
15 "	9,504	63	11	2,398	2,782	5,180	2.9	1.4
24 "	5,940	49	6	2,066	2,141	4,207	2.5	1.5

Poor as are these returns from the standpoint of grain production, we gather the interesting and exceedingly important fact that with thick planting there were the largest returns in total digestible nutrients per acre. Over 6,000 pounds of digestible dry matter were secured in nearly five tons of stover and corn harvested. With this thickness of seeding there were 3.6 pounds of stover for each pound of grain. The largest yield of sound ear corn was returned from planting the kernels twelve inches apart in the rows, or about 12,000 per acre, from which the returns were seventy-three bushels of sound ears and sixteen bushels of poor ears per acre, with only about 600 pounds less digestible matter than was returned from planting the kernels four times as thick."

Dean Henry reaches the following conclusions: "The lesson from the above table is confirmed by the work of other stations, and teaches that when the stockman is seeking the greatest amount of nutrients possible from the corn crop he will plant the seed so thickly as to choke the ears to about half their natural size. If, on the other hand, his aim is to produce grain, with stover secondary, then he will plant the seed grains at such distances one from the other as will allow each individual plant to produce one or more full-sized ears of corn. No rule can be given which is applicable to all cases for guidance as to the amount of seed corn to be planted per acre. This varies greatly and is determined by local conditions."

In most fodder plants the amount of crude fiber increases so rapidly as maturity advances that the percentage amount of all other constituents is reduced. In the corn plant it is the valuable soluble carbohydrates that increase at such a rate as to decrease the percentage of other substances. Consequently, corn must be fully matured to get the maximum amount of digestible food. Quoting again from "Feeds and Feeding," we present the following table showing the total nutrients in the crop at different stages of maturity.

WATER AND NUTRIENTS IN AN ACRE OF CORN AT DIFFERENT STAGES OF MATURITY NEW YORK (GENEVA) STATION.

Per Acre.	Tasseled July 30th.	Silked Aug. 9th.	Milk Aug. 21st.	Glazed Sept. 7th.	Ripe Sept. 23rd.
	lbs.	lbs.	lbs.	lbs.	lbs.
Yield	18,045.0	25,745.0	32,600.0	32,295.0	28,460.0
Water	16,426.0	22,666.0	27,937.0	25,093.0	20,542.0
Dry matter	1,619.0	3,078.0	4,643.0	7,202.0	7,918.0
Ash	138.9	201.3	232.2	302.5	346.2
Albuminoids	239.8	436.8	478.7	643.9	677.8
Crude fiber	514.2	872.9	1,262.0	1,765.9	1,934.0
Nitrogen free extract	653.9	1,399.3	2,441.3	4,239.8	4,827.6
Ether extract	72.2	167.8	228.9	260.0	314.3

From the above we learn that the crop increased about 10,000 pounds in weight between tasseling and maturing. Of this increase about 4,000 pounds was water, the remainder being dry matter. The dry matter in the crop, which amounted to only 1,600 pounds at tasseling time, increased to 7,900 pounds when the corn was ripe. The analyses show that between the milk and the glazing stages and on to the final period of ripening there is a constant and remarkable increase in the nutrients stored by this plant."

PROF. ZAVITZ: The question of thick and thin seeding of corn is again being discussed to a limited extent in Ontario. This subject received a considerable amount of attention upwards of twenty years ago, and I had thought that the evidence was conclusively in favor of moderately thin seeding and of cultivation. The old method was to sow corn broadcast or in close drills at the rate of from 2½ to 3 bushels per acre. This method, however, gave way largely to the planting in rows or in hills from 36 to 42 inches apart which permitted of cultivation in either one or two directions.

An experiment in methods of planting corn was conducted through the medium of the Experimental Union in Middlesex, Grey, Bruce, Peel and Wellington Counties in the years 1889 and 1890. The average results of the tests for two years were as follows:

Seed Cultivation.	Yield of Crop per Acre. (tons).
Wide Drills (12 grains per foot)	9.7
Broadcast or Close Drills (3 bus. per acre)	9.4
Wide Drills (2 grains per foot)	8.6
Broadcast or Close Drills (½ bus. per acre)	6.8

The experiments were conducted in plots one-tenth acre in size. The results show that the corn which was cultivated gave an average of 9.4 tons per acre and that which was sown in close drills, gave an average of 8.6 tons per acre. The difference is four-fifths of a ton per acre in favor of the cultivated as against the uncultivated method. The thick seeding gave a somewhat larger yield per acre in the case of both the close and the wide drills. When the grains were six inches apart in the drills, an average of fifty-two per cent. of the stalks had ears and, when the plants were one inch apart in the drills, less than two per cent. of the stalks had ears. The percentage of ears from stalks in close drills sown at one-half bushel per acre was fourteen and the crop produced from the seeding of three bushels per acre contained no ears.

Experiments in close and wide drills were conducted at the same time both in the Field Husbandry and in the Dairy Departments at the College. At that time Dr. C. C. James was Professor of Chemistry at the College and I was his chief analyst and in the winter of 1890 we analysed eighty-four samples of corn. Dr. C. C. James gave an address at the annual meeting of the Experimental Union in February, 1890, referring to results of different experiment stations regarding the comparative value of thick and thin seeding and of mature and immature corn for feeding purposes, from which address I make the following quotations:

From the above facts, it will be seen that the real feeding value of the corn increased 166 per cent. after it had tasselled out, and 80 per cent. after it had nearly reached the roasting ear stage.

The considerable increase between September 10th and September 17th (amounting to 24 per cent. of the total weight) indicates clearly that a crop of corn should remain in the field as long as possible, weather permitting, to reach its greatest perfection.

One ton of green fodder corn in tassel contained, in one case, 307.2 pounds of vegetable matter; whilst in the case of the seed just beginning to glaze, 463.8 pounds of dry vegetable matter are found in one ton—a difference of 156.6 pounds in favor of the more mature stage of growth.

Other experiments might be referred to. The general conclusion is that, for quality and quantity of corn and ensilage, the plants should be grown in drills and allowed to grow until the kernels begin to glaze.

The crowding of corn together also has the effect of retarding growth and maturity and in most cases of increasing the water percentage.

Choose early maturing varieties, sown in drills so as to allow to mature and cut when well on to maturity.

An elaborate experiment was conducted at the Ontario Agricultural College for five years in succession in growing an early, a medium and a late variety of corn in rows 30, 36 and 42 inches apart and with plants 4, 8 and 12 inches apart in the rows. The largest yields per acre were obtained from the thickest planting in the cultivated rows.

In order to come to a satisfactory conclusion regarding the real value of thick and thin seeding and of mature and immature corn, it is necessary to take into consideration the yield per acre, the chemical composition and the digestibility. A considerable amount of work was accomplished along these lines in the latter part of the last century in the corn belt of the United States and, to a more limited extent, in Ontario.

BUSINESS METHODS AND FARM ACCOUNTS.

P. E. Angle, B.S.A., Simcoe.

Business methods are nothing more or less than the best methods you can devise to get the most out of your operations whether it is on the farm, in the professions or in the factory. Business methods, in my estimation, include any lawful method which will assist, by the least effort, to secure the greatest profit. The time was when, in this country at least, labor was plentiful, land was cheap, farming operations were pretty much self contained, and the farmer made nearly everything he needed. What few things he could not produce on his own farm he obtained by exchange. Farming problems, as we understand them, were not very difficult then, implements were of the simplest, and there were few outside attractions to take labor away from the farm. Industries, however sprang up, counter attractions were started in the cities for the young men, and farming operations were altogether changed. Machinery came in to replace the man who left the farm and other changes followed until to-day we have the most complex farming problems. We go through the country and see farmers with large farm buildings and large herds, and we say he is living on the fat of the land. That may be true in individual cases, but many farmers are not in such good circumstances, and are facing problems which they do not know how to solve. Our information on the question of production is extensive. We have been studying that problem for years and we have become efficient in producing large crops, but every farmer knows that he is not necessarily going to make more money because he grows more grain, more straw, keeps more cattle, or has more produce to sell. Increased production does not necessarily mean increased profit. Facing the difference between what we get and what we pay out is where business methods come in. Our redemption lies in any method that will reduce the cost of production in any work we have to undertake, to make the labor we employ more efficient, and to get more work out of one hour's time with men, horses and machinery.

One of the greatest difficulties farmers have to contend with is the fact that their operations are widely scattered. In the factory everything is within the four walls of the one building, and the factory man has everything under his control, but the farmer cannot have that; however, the more he can centralize his operations the more efficiency he will get. Systematize your work and systematize the labor that is doing it. I will mention some instances where this can be done. To properly control labor it is necessary to take a pencil and paper and lay out your operations for the year. Any busy farmer ought to be able to sit down and figure out a plan of just what he is going to do on his farm for the next year, estimating the help he will require and how and when to vary it under changed conditions. In the item of fixing machinery you can save a lot of time and labor. When large numbers of men are employed as on the farm I manage, a great deal of time can be wasted by men going to and fro from the field to the barn to obtain tools for repairing breaks. This lost time could be made much less by using a plan like the following: Supply a tool bag to the men which they can sling over their shoulder or carry on the horse collar, and make every one of the teamsters responsible for the care of one of these bags, which is filled with tools such as a cold chisel, a hammer, wire pincers, pieces of wire, extra straps, bolts, and anything else that may be needed. These articles are carried in the bag and then if there is an ordinary breakdown the workman can repair it in the field. We have lost no tools at all through this method, and very seldom have a man completely tied up in the field so that he has to go to the barn to get anything fixed.

We are accomplishing more in regard to pruning by using the same idea. The men go out with a bag around their waist in which they carry everything required. They can carry a pruning saw and sometimes two, and a couple of pairs of pruning shears of different sizes. If a man was pruning a large tree and did not have these tools in the bag at his waist he would spend most of his time getting up and down from the tree.

A perfectly fair method of efficiency can be introduced in labor saving. You don't have to chase your men around, but have simply to ask them to do a little thinking, and take their tools with them to avoid wasting their labor. Take the one simple operation in tobacco raising. We string it on the land, and a man who knows his business can string almost twice as much as another man who has not the right method, no matter how fast the untrained man may be able to work. Hoeing is about the oldest operation on earth and we do not think there is anything to systematize in hoeing, but there is a right and a wrong way to hoe. One man will go up and down a field and lose no time and will work no harder than the man who accomplishes just half the work by hoeing the wrong way. There are operations in almost every line of farm work where energy is wasted. Labor energy may be saved in spraying. When we spray on our farm we have to go a long way to get water with which to mix our spray material. To overcome loss of time in hauling water I had a spraying outfit made which can be hauled from one field to another, so that we simply take the water to the spraying outfit and mix where we are going to use the material. Under the old system we had two men travelling back and forth with their spraying outfit for water. Now we mix the spraying material in the field and do as much with two spraying outfits as we could formerly with four. We have a valve in the bottom of the water tank and connect it with the different spraying outfits as we wish to load them. We are now using a compressed air sprayer, and the air from the compressor forces the liquid from one tank to another.

We should have a system of keeping books, even if it is only a record of receipts and expenditures. This will at least show how much we spend and what our balance is at the end of the year. The chief weakness of the foregoing is that it does not tell us where in our farm operations we made a gain or a loss; it only sums up the whole. When I started to keep books I tried to get all the information possible. Some of it I obtained from bankers, some from retail merchants, and some from manufacturers, but very little of it from farmers. The result was I had to devise a system of my own, and will attempt this afternoon to tell you something about it. One of the chief cost items on the farm I find is labor. In my system of farm accounts these items of labor I charge against the crop which incurred the labor. The total time charged against the different crops should agree with the total hours the man worked, and it is, therefore, a pay sheet as well as a labor record, and I use one each week as we pay once a week.

A MEMBER: Do you pay by the hour?

MR. ANGLE: Yes, we pay by the hour, and for that reason it is necessary to keep these sheets separate, one for each man. I think the farmer who only has himself and one hired man, or himself and two hired men, could put them all together and only have one large sheet for the three. This method is accurate providing the items are entered up every night. You cannot let the work run on all week and then expect to make all these entries on Sunday because you will forget some of the items.

Horse labor is kept on the same sort of sheet as the man labor, but the word "Horse" is written at the head of the sheet in place of the name of the man, and instead of keeping a separate sheet for each horse all the horses are included on the one sheet. If we have ten horses working in a field that makes one hundred hours for the day; two horses working on a cultivator would make twenty hours, etc. We charge the horse labor up to each crop on which they have been working and total it at the end of the week. The totals both for horse and man labor are obtained by copying these records into the journal. We use a twenty-four column book. You can see how simple it is to copy the totals from the bottom of one of these sheets into this book for the various items in agriculture, and at the end of the year you add up the columns, carrying the balances forward, till you have the total for the fifty-two weeks, and that gives you the total labor for that particular item, both horse and man labor. Now then, the cost of the horse labor is obtained from records which we keep by adding up the items of the cost of feed. The home grown feed is charged at the ordinary market rate, not at the rate of the cost of production, but just the same as if we had to buy it. Then there is the item of interest on what we value the horses at, and the interest on harness, that is, our money invested in horses and harness; depreciation on horses and harness; cost of horse-shoeing; and the cost of veterinary attendance. The different totals will give a fairly accurate idea of the cost of our horses for the year. Last year feed was high, and we figured it cost us a little better than 11½ cents per hour for horse labor. The cost of horse labor will be less or more according to how steadily the horses are worked.

A MEMBER: Is your contract with your men by the hour, or by the month reduced to hours?

MR. ANGLE: No, the contract is by the hour. When we get a man who wants to hire by the day or month I tell him: "Suppose you only work half an hour, you will expect to be paid for the day." So I say: "Your wages will be so much a day in the summer and so much a day in the winter, to be calculated by the hour." His time is recorded and his pay made up from the total number of hours worked.

A MEMBER: Whether you hire a man by the day, month, or year?

MR. ANGLE: Yes, that is what I do. Reduce a man to an hourly basis. When I hire a man I say to him: "I want you to work for me every hour and every day you are satisfactory, and what you want to do is to work so well every hour and every day that I will want to keep you. If you do want to leave for any reason you will be paid for what you have done and you will have no claim on me." I have hired men that way for the past year.

A MEMBER: Do you hire the men who handle your teams that way?

MR. ANGLE: Yes, most of them.

A MEMBER: What do you pay them?

Mr. Angle: My wage for a man looking after a team is eighteen cents per hour. He has to attend to the horses in the morning, at night and on Sundays. The reason for making it eighteen cents is that we only charge up ten hours' time. I might pay them less per hour and charge up a greater length of hours, but by allowing a larger wage per hour and charging them for ten hours, when it comes to calculating the cost of anything, the extra hours for attending their horses in the morning, at night, and on Sundays, is more easily distributed over the crops where it belongs.

A Member: Do you allow him a house or any other perquisites?

Mr. Angle: No. I give them to understand when they are engaged that they do not get a house, or any perquisites. That, of course, is a personal matter, and every farmer hiring help has to set his own conditions but with us, if a man gets his living on the farm he is charged for it; if he gets anything at all from the farm he is charged for it. We do not ask him to give us anything, and we do not want him to ask us to give him anything. You cannot keep peace and harmony among your men if one is getting something the other man thinks he ought to have. If we allow a man a house he is charged from $40 to $70 per year for it, which comes back to us as his wages are reduced accordingly. I suppose you think eighteen cents an hour is a high wage. It figures out to about $375 a year with a house, and that ought to appeal to married men, the kind we want. I am a believer in paying good wages in order to get good work.

A Member: Do you prefer to have men work in as large gangs as possible, or are they scattered over the farm?

Mr. Angle: With cheap labor the more men you get together under the supervision of a good foreman who is not working himself the better. I prefer to get good men and leave them to themselves rather than have a man with them. I am, of course, looking after them part of the time though I cannot be with them all the time. I have another foreman.

Most of the farmers' business dealings are transacted in the field, and we do our business mostly as it comes along. It is impossible to have all the books necessary with you to record transactions, and for this work I keep the same kind of book which is used by a retail grocer. I have them in duplicate, triplicate, or quadruplicate. They can be made out as you want them in any number. If the teamster delivers goods to a man in town—we sell quite a lot of our stuff locally—he makes out a bill according to the price authorized, gives the original to that man, keeps the centre copy himself, and hands the other to me. If anything happens, or if a dispute arises, we have these two records.

Mr. A. S. Maynard: My experience in farming has been mostly gained in the school of hard knocks. I have tried to farm well eighty-eight acres of land, and have always maintained that the farmer, to be successful, must obtain at least twenty-five per cent. interest from the money invested. Many farmers will tell you there is no money in farming; there is no money in half-farming.

We keep accounts on our farm. I can tell you what it costs a year to keep every member of my family, including myself; what it costs to produce one hundred pounds of milk; or what it costs to raise an acre of corn. The boys know just how we stand as well as I do, and this adds to their interest in farming. I have found it good business not to buy anything on the farm until I could pay for it.

A Member: That is as good advice as I ever heard here.

G. A. Robertson: My line is fruit farming, and in my opinion the greatest factor in successful farming is the question of management. The fruit farmer also must be in possession of a large amount of patience. Good business methods in handling fruit are essential to success. Good transportation facilities are urgently needed in this branch of agriculture, and only the co-operation of all the fruit growers will secure it.

PROF. ZAVITZ: A few years ago some of you will remember that we had Mr. Spillman here from Washington, D.C., and he gave us a most interesting account of a little farm near Philadelphia of thirty acres, and of the wonderful work that had been done on that farm, where they practiced intensive farming. It was worked as a dairy farm by a man and a boy with very great success. Three years ago we had Prof. Warren here from Cornell University, who told us that in their investigations in farm management in New York State they found that the greatest profits were being made from farms of 200 or 225 acres in size. More recently we had two men here who told us of the profits they made on one acre, and two and one-half acres of land, respectively. We find in this Province, which grows so many kinds of crops, that where good management and business methods are followed profits have been made on farms of from one acre in size to those as large as one thousand acres.

IMPORTANT FACTORS IN CONNECTION WITH FRUIT GROWING IN ONTARIO.

PROF. MACOUN, EXPERIMENTAL FARM, OTTAWA.

I am glad that the Programme Committee of this Experimental Union have this year found a corner for the fruit growers. It is generally believed that fruit growing should be left to the fruit specialist, but there are many good farmers to-day who are making more money out of apples than some of the fruit specialists.

According to the census of 1910 in Ontario alone there were 6,544,788 bearing fruit trees, and some 503,202 non-bearing trees, producing about 6,250,672 bushels of apples, or a little over 3,000,000 barrels of apples. In this same year there were 645,845 bearing peach trees, and 824,569 non-bearing peach trees. Large as these figures are they are small when you think of the enormous number of apple trees alone which have been planted in the North-Western States. According to recent figures there are in the Western States 500,000 acres of apple trees containing 217,121,689 bearing and non-bearing trees. In 1910 the crop there was estimated to be about 45,000,000 barrels. The question naturally arises, is there any danger of over production? I am one of those who does not believe that there is, providing, of course, that there is proper distribution. The chief reason for my thinking that there is no danger of over production is that there will always be a market for good fruit. There will be a danger of over production for the poor fruit grower, but for the man who raises the highest quality of fruit I do not think there is any danger of over production. The fact remains that the population has increased, and is increasing, therefore, the demand for fruit is growing. For instance, if every man, woman and child who was capable of eating apples could get all he or she desired when they wanted them, and at a reasonable price, just think of the enormous quantity of apples that could be consumed. I estimate that I can eat an average of four apples per day, and there are some people who could eat four times that quantity. My condition has improved during the past fifteen years, and I have attributed it largely to my eating apples every day.

Now as to some of the important factors in the growing of fruit in Ontario, I do not intend to say anything about some of them, but will just give a list of a few. First of all there is the situation of the farm; then there is the question of varieties; of culture, which includes spraying, pruning and cultivation; of diversity of crops; of greater economy; of price; of co-operation; of selection and transportation of fruit; of by-products on the farm; of advertising; and last, but the most important of all, the question of the man himself. If you are going to fruit farm it is important to locate on a good road, and as near a market town as possible. At the present time there are a large number of towns and cities in Canada dependent on fruit grown in special districts. The man in the business knows the difference it makes when he compares his returns with the man who is off the main line, especially in the case of small fruits. He who is near a good town is making more money by selling his fruit locally than the man who has to ship it a long way to customers. I believe in the future there are going to be far more fruit farms scattered over the country close to cities and towns than in the past. Then there is the question of diversity of crops, but I can only briefly review this subject. I think it will be found that the fruit grower will go in for a greater diversity of crops than in the past. There is no good reason why a man should not grow several kinds of fruit on his farm. There is no good reason why the fruit grower should not be a good poultry or beekeeper, and also keep a few pigs.

Spraying is an important question. Those who have had to do with the marketing of apples this year have found a large percentage of fruit very badly scabbed. We should be prepared, year after year, to spray our trees so that no matter how bad the season is the scab will not be serious. The question of varieties is one of the most important factors to consider in fruit growing. There is no kind of fruit such as apples, pears, plums, and strawberries where we have an ideal variety as yet. Many of the varieties which we grow are chance seedlings received from nurserymen or from other sources, and while some of them are very good yielding sorts they are not very good for keeping or shipping. I hope this Experimental Union will back up the Horticultural Department of the College here at Guelph in any work they are doing both in the spraying of fruit and in the selection of varieties. It takes a long time to get a new, and at the same time a good variety of fruit. In connection with apples, in which I am perhaps most interested, there is no good reason why we should not have apples that will bear as early and as heavily as the "Wealthy," and an apple which will be free from scab and which will have a good season, from the July and August apple right on to the late winter sort. There is great room for the experimenter to develop new varieties of fruits of all classes.

Then there is another important point, and that is, economy in production. Mr. Angle, I think, showed you yesterday what an important factor that is in general farm practice. There is a most interesting article in the December number of *Fruits* which shows how the cost of production can be cut down even when it is already low. The editor of that paper, Mr. Shephard, who handles between 5,000 and 6,000 boxes of apples every year has been cutting down expenses on the harvesting of apples, and in picking and packing where there were twelve operations. In 1914 he saved 4½ cents a box in harvesting over the year 1913; and in 1915 he saved 4 cents a box over the year 1914. He did that by studying how he could systematize these different operations: picking, packing, hauling, and so on. He found by a little more system he could cut down the expenses of each operation and the result in the total was that he was able to pick and pack for 32 cents a box.

whereas he said four or five years ago it would have cost him just twice that amount. Another very important point, which I will leave to other speakers who are more competent to speak on the matter than I am, is the question of advertising. Just how to handle this has been a difficult problem to me for a good many years. I have often wondered why we have not done more in this line. Supposing you were passing a restaurant and had an empty stomach, and you saw in the window a sign like this: "Beef Steak, Mutton Chops, Kidney Pie, Liver and Onions," and everything about the place looked attractive, would not you be likely to go in there rather than pass on to the next place? I think you would. There are signs in our street cars and other advertising places which at once attract. Then there is that sign "Sunkist Oranges from Southern California." I was in California last fall and in every little town and village we saw this advertisement. We found Los Angeles to be a city of about 400,000 people, but the sign "Sunkist Oranges" was impressed on my brain more than the size of the city of Los Angeles. The general advertising of California itself has gone a long way towards advertising their fruit, and the advertising of the fruit has gone further towards advertising the sunny climate of California. I am glad to find that some good advertising has been done in the past year by the Canadian Fruit Growers in regard to apple buying, and also with other fruits. The general manager of the Fruit Exchange produced an article to this effect: "From 1890 to 1900 the population of the United States increased 20 per cent., while the use of citrus fruits increased 19; from 1900 to 1910 the population increased 21 per cent., while the shipment of citrus fruits increased 219 per cent. We are now shipping 50,000 car loads of citrus fruits, being the result of getting more people to consume them."

MR. P. W. HODGETTS: There are just three points I wish to touch on in this discussion. The first of these is pruning. Now, as far as tender fruits which are largely grown in the Niagara Peninsula and the Western part of Ontario in Essex, Kent, Elgin and Lambton Counties are concerned, I do not think they require any remarks from me. The men engaged in that fruit business are specialists, their orchards being clean and productive. I believe, however, it would pay our apple growers to prune very much more severely than they have been doing in the past. The fungus and rot spot which have been so troublesome would be very largely overcome if our apple orchards were more thoroughly pruned to enable the sun and wind to get through the trees. It is this lack of proper pruning which is also largely responsible for the discoloration of a large number of our apples. We find that in counties where the orchards have been very closely pruned we have a very low percentage of apples spoiled.

Now, as to the second point, bad grading is the cause of a considerable loss, not only with apples but with other fruits. During the past season I visited the Toronto fruit market, and one day I noticed a large shipment of plums which had arrived from California, Oregon, and Washington, and some being from the Niagara district. As usual the plums from the Western States were in tho crate of four cases, and they looked well and sold well. The Ontario plums were in six and eleven quart baskets. It was good fruit, being equal to that which came from the Western States in crates, but there was seven per cent. difference in the price which was paid for the Western States fruit over that which was paid for the Ontario fruit. I do not see any reason why plums coming into the Toronto market from Ontario should not be at least partially crated. We should pack our fruit in a way that will bring us the highest prices. In regard to apples, we find it impossible at the present time, under the Fruit Marks Act to purchase apples without re-sorting the fruit, and when some of the fruit has to be thrown out or undergraded from every barrel it makes a very considerable difference when you have to purchase a large quantity. Recently, I had to purchase two carloads and in looking over what was offered I found a good many barrels and boxes of apples. The one lot we opened first had to be rejected although the fruit was packed thoroughly and in accord with the Fruit Marks Act. I believe we could have repacked six baskets of apples out of every barrel and could have made them into No. 1 and No. 2, the No. 2 being slightly smaller than the No. 1. From another lot I do not suppose we could have obtained one good basket out of a barrel, and it was packed in accordance with the Fruit Marks Act, and graded No. 1. We could not purchase the fruit as laid down under the Act without re-sorting. One lot had been packed in the Georgian Bay section. It was sent down to Toronto and there was quite a lot of scab on the apples. They were well packed but there was too much scab in the No. 1 lot therefore, the fruit was rejected, and it was offered to us at a reduced price. Two other lots of apples we purchased gave us one lot of good fruit. After we had examined a number of boxes of different varieties we were satisfied that the whole pack was clean right through, and were able to purchase these apples at $1.50 per box. In some places where there is considerable scab the growers are afraid to pack under the Fruit Marks Act, and they crate their fruit using a crate which has been used in the West for one or two years, the open package wicker-like kind, made of open slats. The apples are simply placed on one end and the balance shaken down. Now this style of package, I take it, will grow tremendously in favor as it is tried, and it is cheap, costing perhaps ten or twelve cents laid down at the station.

I have heard a good deal about the American and British Columbia boxes coming east to this country, and I know something about them in connection with some of my own shipping experiences. There has been considerable quantities of this fruit shipped into the Toronto market from British Columbia and the Western States, running from five to twenty car loads. I read in a paper published just the other day that a good many fruit growers in Ontario will not be able to harvest apples to compete with the Western boxed stuff. These Western apples, as you all know, have the peculiar property of high lustre. In appearance they are magnificent, and the only varieties in Ontario which I consider equal to them are the McIntosh and the Snow. We can grow these two varieties and compete with the high class western British Columbia and American apples. I do not believe, however, that the other varieties which we are handling at the present time will do so, and it is up to our Experiment Stations to produce varieties of apples which will grow in Ontario and take the place of these Western kinds. The Spy is one of our best apples, but we have so far not been able to produce them in color appearance equal to the Western apples. Last year, for instance, in one of the best Spy orchards we had a large crop of green Spys. This year there was no spot and we had much better colored apples, but still they could not beat the Western apples. We took over three boxes this year to meet the Western Market's Association, and were beaten by one-quarter of a point. The man who won understood the high finish, and also obtained a number of points on packing. Those who received a copy of Mr. Johnston's report on the export trade will have noticed that this year a great many No. 3 grade apples have been sent abroad, and one of the articles in that paper from a Western man protests very strongly against our sending No. 3 grade apples to the English market. I do not know what our representatives were doing to allow that sort of stuff to be shipped. I think there ought to be something in our laws to prohibit it.

In reference to the third point, at the present time our market limits are rather circumscribed, and are fairly well covered by the individual buyer. Here and there we have fairly effective associations for packing and selling. We have a great many co-operative associations scattered all over the Province at the present time, but the membership is very small. Probably ten per cent. of the fruit growers are selling through the co-operative societies, but the individual dealer is the man who is selling and handling the bulk of the fruit, and the fruit grower is not getting all he ought to for his fruit. I think that the salvation of the industry in Ontario will lie in the organization of further associations to pack and to sell. The Western situation at the present time is very poor. In December a British Columbia representative was down here to explain the case of the British Columbia fruit growers. He states that unless something is done to aid the British Columbia growers, inside of three years they will be out of the apple business entirely, on account of the competition of the American Western fruit growers. They have been putting their apples on the Canadian market at twenty cents per box less than it costs the British Columbia grower to produce. It costs in Washington State about $1.06 to put up a box of apples, and out of the entire cost I think about 48 cents is for picking, packing and marketing. It will be held at $1.06 until the British Columbia men go out of business. These conditions do not prevail in Ontario for the reason that a great many apple growers sell to town markets. These men are not dependent altogether on their apples for a living, and they can stand the strain where the Western man, who is nothing more nor less than an apple grower, cannot. If you compare conditions you will see that the Ontario man is doing as well or better than the Western man. I do not think we need fear the competition that a good many of our people here in Ontario are looking for if we make up our minds to co-operate in producing nothing but the best fruit.

Mr. F. M. Clement: Having been asked to say a few words on this subject in company with men who are engaged in somewhat similar work, one naturally begins to look for the phase of the subject that will not be touched by the other speakers.

The Dominion Horticulturist from his office at Ottawa, being alike interested in all the Provinces, naturally studies Ontario comparatively. The Director of the Fruit Branch, Toronto, as head of the fruit work of Ontario must naturally first see the larger phases of the apple industry, the most important division of the work of the fruit industry in the Province. The Representative of the Markets Branch naturally turns his attention to markets and co-operative marketing. The Professor of Horticulture at the Ontario Agricultural College is keeping an eagle eye on the economies of the whole question. He is anxious to find out the place of the orchard on Ontario farms and then to find out if there is any money in it.

This leaves a comparatively small field for the speaker. Apples, and the marketing of them, are the big questions the Province is facing to-day. Peaches and grapes are of much less importance when their money values are compared. They are in demand, however, and when we consider that Ontario produces more than ninety-five per cent. of either fruit these industries at once assume an importance that is greater than their comparative money values.

The last step in the production of fruit is that of marketing. Unless the product is prepared attractively and offered for sale as a standardized article of commerce by men who are prepared to do business on a business basis the product is not marketed efficiently. It is from this point of view that I wish to emphasize uniform packages, uniform packs, and advertising. These are the basis of "business efficiency" in marketing.

It is assumed that the climax basket, in spite of its limitations, is the package in which the bulk of the tender fruits must be marketed. It is also well recognized that no one size of package of a particular shape will take fruits of all sizes. It seems necessary then to adopt two or more baskets of stated size and stated shapes. The six quart is the standard grape basket. The nine quart is popular as a package for two layers of fancy fruits. The eleven quart is in most general use and is used for all grades. Opinion regarding the shape of the eleven quart is divided. Some are satisfied with it as it is and others feel that if the sides were a little higher, perhaps one-quarter of an inch, it would be a more convenient package in which to pack the peaches of various sizes. Whatever is adopted it seems certain that the size, shape and quality of manufacture must be fixed by law, even to the extent of the Government supplying the forms. A uniform package is the basis of a uniform pack.

Is it possible to fix by law standards or grades or is this the work of Associations and Association Managers? It seems just as reasonable to fix certain standards or grades in basket fruits as in barrel fruits. Would it not be possible to fix by law the requirements of Fancy, No. 1 and No. 2 grades? Any fruit selling association fixes these standards by rules and regulations. Any combination of associations might do the same but so long as associations are competing against each other with various grades and packs, such control is impossible. The basis of uniform grades then seems to be either a reorganization of the present associations all having the same rules and regulations, or the formation of a central association which will control local associations. If the associations cannot fix standards this way to protect themselves should they not be fixed by law? It offers equal protection to the producer and the consumer. The uniform sized package uniformly packed is the next step in "business efficiency."

Ontario fruit must be advertised. The nature of this may be either advertisements to attract attention to Ontario fruits and consequently increase consumption, or advertisements calling attention to certain brands or packs of certain associations or individuals. The former is the plan that has been followed by the Niagara Peninsula Publicity Association this year. The latter will be possible for the fruit men only when they are agreed in their grades, packs and brands. It is possible already for the well established local associations.

I have said that the basis of marketing is uniform grades, rightly packed in uniform packages, well advertised. Little more can be said. This is the basis of business and until this ideal is reached whether in local associations or in the united association, managers cannot be expected to get the highest returns for their members.

One other point might be mentioned. It must be remembered that Ontario markets for tender fruits are largely local. In these local markets competition is faced from outside sources, and this product is well graded, well packed and well advertised. In long distance shipments similar and equally stubborn competition is faced. This competition can be successfully met only by equally efficient business methods.

It may be good policy at present to advise the union or amalgamation of local associations, but it is better policy to emphasize the standardization of packages, the standardization of grades and possibly the standardization of packs or to fix them by law. A united association will be no stronger than the business chains which bind the associations together.

Mr. J. B. Fairbairn: When I noticed the names of the gentlemen on this afternoon's programme who were going to discuss these fruit problems I realized that there would not be much left for me to say. I have been listening attentively to the speakers and there is one question which, to my mind, seems important to the fruit growers of Ontario, and, as Prof. Crow is to follow me, I will put my remarks in the form of a question and leave it for him to answer.

What is to become of the apple orchards on the average one hundred acre farm in Ontario? This question is sidestepped nearly every time it comes forward, yet it is one of the most important questions to the Province of Ontario. At the present time we can say a great deal about fruit growing in the north-western districts; but where fruit growing is not a specialty, and is done by the average man who is not as familiar with these things as some of us are, the problem is difficult from his point of view, and something must be done from an outside source which will assist that man. Something must be done other than the educational work which is being carried on by special agents of the Department of Agriculture, both Provincial and Dominion. The question of packages was dealt with in the last paper which we listened to, and there is no doubt but what we should have standard packages and specified crates. There is no more reason why we should have a "Fruit Marks Act" stating that we shall pack apples according to a certain standard than we should have an act saying that we should pack peaches according to a certain standard. We have just as much right to have a standard for packing grapes, cherries and other fruits.

One of the most important, possibly of all factors, connected with the fruit growing, which has been dealt with already this afternoon, is the question of distribution and selling. Many factors enter into this problem, and yet the outlook, especially for tender fruits at the present time, is none too bright. Many of them which have come under my notice were met with by men who were not connected with organized associations; their ability, so far as salesmanship was concerned, was limited; and their knowledge of markets confined to a very small area because of their inexperience. These men are often so busy when the fruit season comes that, though they have managed to get their fruit picked and packed, and drawn to the railway station, it is about all they are able to do. They have no channel through which their fruit can be handled. I saw one man drive up to a station platform, thirty minutes before the train arrived, with a load of fruit which was not packed according to our standard; the fruit was poorly graded, the baskets in some cases were pretty, but the covers were not well put on, and in fact everything went to show that the man lacked experience. He went to the first buyer who came and looked over his load and said: "No, I don't want that fruit." Other buyers did not want it, and the result was that the day's fruit was not sold. I know of other instances of men taking loads of fruit to the station platform and standing there with a load on the wagon, and no market. They did not have the necessary knowledge to sell their fruit. In the Niagara district I would say that not more than ten per cent. of the fruit growers are members of the co-operative societies, and the remainder, or ninety per cent., are either selling their fruit locally, by means of local dealers, or they are, like myself, listing their fruit. Now supposing that there was a co-operative concern in my own district, I would be very glad to become a member if it were possible, but the concerns which I have in mind are close corporations. They have a membership of sixteen or seventeen and their business is well managed, being largely co-operative, but when a neighbor wishes to become a member of this association he is invariably turned down. You say at once, if it is well established and a good thing, why don't they take in everybody. The reason is this: the competition is keen between the existing co-operative associations to sell their entire output to the buyers, and when they have a good business they feel it would be hazardous to increase their numbers.

I might just say a word in reference to the organization work which may, perhaps, appeal to some of you so far as apple production is concerned. I have had the privilege during the past couple of months of visiting several sections of the Province, and of a number of associations for handling fruit. I have been disappointed in a good many instances with their method of formation. Some of these associations, through weak organization, have started in the co-operative business but after one or two seasons have disbanded disillusionized. Generally speaking, the manager is largely to blame. He is often a local man, and under the circumstances incites a great deal of petty jealousy. He is generally given very much less authority than an outside man would be given, but a great deal more is expected of him. In the cases which I have mentioned as being so successful one association obtained a charter, and in the other case the men simply got together and decided to do certain things. They agreed to handle the output of their orchards through one man who was appointed from among themselves to do the selling, and was paid a low salary. The result was that this particular man was acting as president, general manager and seller, and became nothing more than an agent for a large commission house in Montreal, and every package which was sent out from the association went on consignment to this place. He was getting a commission from the Montreal firm on everything he was handling, besides the salary paid by the association.

A Member: You have considered two associations, one a co-operative, and the other apparently a share company?

Mr. Fairbairn: A co-operative company is one where every member shares equally. With some companies, no matter how much stock you hold you have only one vote, but most of the co-operative societies vote according to the acreage of their members, and the weakness in that method is this: a few men of large acreage get together and control the association to the disadvantage of the smaller farmer. The better practice, and the one which is gaining in favor to-day is, one man one vote.

Prof. Crow: As a horticulturist, I am one of those deeply interested in fruit growing, one who is supposed to be looking after the interests of the fruit grower, and I would put the question asked by Mr. Fairbairn in this way: Is it a desirable thing that the fruit industry of this country should be the side line it is at the present time? The side line is all right in good times but in bad times it drops out of sight. Territory which was given over to fruit years ago, and orchards which were bearing regularly, have dropped into a state of decay. Large areas that were apple producing have become non-existing.

Apple growing is carried on under, I should say, three separate conditions. First of all, you have a farm which may be dairy, stock, or grain, with an apple orchard of ten or fifteen acres. Then we have in certain districts apple orchards where the owners are engaged largely, or almost exclusively, in apple growing. The Newcastle district is a good example of this. Then, besides that, we have in certain portions of the Province of Ontario some educated general fruit growers. If you go to the Burlington district you will find good sized apple orchards of from fifteen to twenty acres, and other fruits such as plums, pears, cherries, and also small fruits such as strawberries, currants and gooseberries. It seems to me that the most successful apple growers are those who combine apple growing with that of other fruits. I have not the data upon which I can base a definite statement, but to my mind the solution of the problem lies just exactly where the solution of most other problems in agriculture lie. There are questions coming up every day, the answer to which we do not know exactly, because the conditions under which our various farmers are operating vary so greatly. It seems to me it is time we got down to business and made a careful study of the cost of production. I think the proper way to begin is to get the farmers of the Province of Ontario to tell us the conditions under which they operate, the size of the various crops they grow, the yield and acreage of each, and the labor situation—how it is distributed throughout the season. If we had that information, along with the other data we have respecting the fruit business, we could find out in the cases of farms which were not profitable, the reason for failure, and could perhaps remedy matters. I submit we need data on this particular point, and would strongly urge, with that end in view, that the matter be taken up. I have come to the conclusion that the question, of what is to be done for the apple grower, can be answered in that way.

We need new varieties of fruits of the very best commercial value. We have been engaged in the work of producing new varieties for a few years back, and I admit we will be much better satisfied when we have obtained some definite results. However, we ought to be satisfied with our work at this institution when we consider that there are men at similar institutions in the States who would be very pleased, indeed, to change places with us.

In regard to fruit markets, it was my pleasure last week to hear some new ideas on this question at the meeting of the National Fruit Growers' Association in Rochester. This State appointed Mr. J. Hill, a little over a year ago, as Commissioner of Fruit Markets, and to my mind Mr. Hill's work is one of the greatest on this subject in America to-day. How much does it cost ordinarily to put fruit in the retailer's hands? The cost from the car to the retailer's hands may be estimated at from 20 to 35 per cent. Now, by way of emphasis on this point, since I came back from Rochester I met in my office a fruit salesman, who told me that the firm with which he is employed made a profit of 200 per cent. during the past year. The Commissioner of Fruits for the State of New York gets that particular process done for 5 per cent., and this is really more than it has cost him, because he pays 3 per cent. for actual services and has in addition banked 2 per cent. out of the 5 per cent. he has been allowed. He works on a deposit of $50.000 to his credit in the bank. That $50.000 is the property of his Department, and it has thus grown larger instead of smaller under his management. The Commissioner has contracts with one large auction house in New York City which he pays three per cent. for services. Any consumer may go to that auction room and buy, and if the retailer buys it means that the only charge against his purchase is five per cent. The Commissioner tells us that the California Fruit Growers' Exchange are putting fruits into the hands of the consumers of New York City with all the handling, etc., at not more than five-eighths of one per cent. charge on a box of oranges. He said that there was no reason why with proper organization any business man should pay over one per cent. commission if he goes to work in the right way. Much has been done to reduce the cost of distributing fruit in New York City. The California Dried Fruits' Association were paid by the Commission dealers of the city 4½ cents per pound for dried apricots when they were selling in New York City for 25 cents per pound. The people wanted to know if that difference in price was legitimate. The Commissioner investigated the matter and came to the conclusion that 10 cents per pound would be a good selling price for dried apricots, and looked up a few retail stores who were willing to sell them at 10 cents per pound. He advertised to put into the hands of the housekeeper the best California Dried Apricots at this price to be had at certain places. The next morning there were five hundred calls from other retail stores wishing to be put on the list also. Now the result was that the price of apricots came down from 25 to 10 cents per pound. I may say the Commissioner also handles eggs, butter, poultry, and all other food products. The question in my mind is this: Would it be possible for us to have the same arrangement?

RURAL SCHOOL FAIRS.

Mr. W. B. Roadhouse, Deputy Minister of Agriculture, Toronto.

During the past three or four years the Ontario Department of Agriculture has been endeavouring to carry out certain plans with a view to interesting the young men in the rural districts in the work of agriculture. These have been inaugurated and developed quietly and unostentatiously until at the present time they cover, to a very large degree, the whole Province. In fact, so great is their extent and so impressive their importance that the Executive of the Experimental Union thought it advisable to have a statement of the junior work of the Department of Agriculture submitted to this gathering at these sessions. The plans are very largely carried out by the District Representatives as part of their manifold work in the counties, and they, therefore, come under the immediate direction of Mr. C. F. Bailey, the Assistant Deputy Minister of Agriculture, and it would be very fitting and appropriate if he could be here to present the story. The success achieved in the work has been due in no small degree to his ability, energy and enthusiasm. I join with you, therefore, in the sincere regret that owing to illness Mr. Bailey is not here himself as advertised to tell this story.

Let me cite at first just briefly the object in view—the problem in reaching the young. Up to a few years ago the work of the Department of Agriculture consisted of agencies and organizations which dealt very largely with the adult farmer, and little, if any, attention was paid to the boys and girls and young men. This fact impressed us in the Department as one which merited special attention, and it seemed that here lay a problem which awaited solution and which would give, to those who would utilize the time, results which would be gratifying to them and of benefit to the Province as a whole. Hence, we took up this work. We endeavoured to bear in mind the fact that our purview lay along the highways and byways and the side lines of the country. It was not our province to invade the jurisdiction of the school, because the school had its own work to perform. It could do much, and was doing much in connection with agricultural education, but outside of that altogether it seemed there might be scope for work among these boys and girls at their homes and on their farms. We recognize that "it is the mind that makes the body rich," and also that we learn to do by doing, and if we could link together in some way these two ideas, we might point the way in the mind of the rising generations to "higher things and better days." How, then, could this be accomplished? In some counties of this Province, as in some States across the border, a limited amount of work along this line had been done. In the county of Waterloo, school fairs had been held, the same sort of organization which we now have all over the Province, but serving only a limited area. In that idea we found the germ of a plan which we felt might be extended and broadened to cover the whole Province of Ontario. Hence in 1912, we took hold of this idea and made it the policy of the Department to conduct Rural School Fairs, and thereby interest and educate to a certain degree the boys and girls who at that time were not receiving so very much attention from other sources. As I have already said it was not our aim to encroach upon the territory of the school. While they are termed School Fairs they are so called because the school of the community is the center of organization, and as a rule the School Fair is held on the school ground, though not necessarily so. It was our plan to supplement the work of the school by giving them something which would interest and occupy the minds of the boys and girls outside of school hours. We were very glad, indeed, to have the hearty co-operation of the school teachers, school trustees, school inspectors and all those interested in the organization of the Educational Department. Before I go any further permit me at this point to acknowledge with gratitude that co-operation, and to bespeak its continuance in a still greater degree in the future.

Modest Start in 1912.

In 1912 we started out with twenty-five of these School Fairs. That was a small number compared with the greatness of this Province and the number of pupils in attendance at the schools in the rural districts. Gradually, year by year, it increased until last year, 1915, there were two hundred and thirty-four School Fairs conducted throughout the Province, embracing 2,291 rural schools, practically one-half the rural schools of Ontario, taking in 48,386 pupils who grew their grain and their vegetables on over 51,000 plots, and among whom we distributed some 6,868 settings of eggs, aggregating over 75,000 eggs altogether, most of which were distributed from the poultry plant of this institution. The greater part of the eggs supplied to the children were of the laying strain of Barred Rock hens. There were at the School Fairs a total of 116,000 entries with an attendance of 72,000 children and 84,000 adults, and these results, I take it, are the chief reasons why the Experimental Union considered that this movement had attained sufficient volume to justify at this time a statement of what is being done.

How a School Fair is Organized.

A word as to the organization of the School Fair. As you have already gathered it is under the immediate direction in each county of a District Representative who groups eight, ten, or twelve schools in the best arrangement, geographically. It is not necessary that each group should be confined within the limitations of any particular township boundaries. It is not essential that it be governed by any strict rule except that of convenience. A point is located where the selected group of schools will converge most conveniently. Having done that the next step is to visit the schools and effect organization. Each district has its own School Fair organization, and each school is called upon to elect a representative to this Board from among the pupils. This election is often very keenly contested, the children setting aside a few minutes during the day to nominate the persons whom they wish to represent them, and I am told that they show singular ability in picking out the best boy or girl as representative on the board. The representatives of each school come together in the office, perhaps, of the District Representative, and organize their association. They elect their President, Vice-President, Secretary and Treasurer from among themselves, and the balance are on the Board of Directors, with the District Representative as General Manager. Imagine then, if you can, a meeting of the members of the Rural School Fair Association assembled around a large table. There sits the president at the head presiding over the meeting, and having in the meantime looked up the best possible parliamentary procedure to cover gatherings of that kind, he directs the order of business and the boys and girls bring on their motions in true parliamentary style. They submit their proposals as to rules and regulations, and lay their plans for raising money, attending also to other details which are necessary to successful organization. In that meeting alone is a training of no small value.

Distributing Seed and Eggs.

After organization they are ready to receive their seeds and eggs. These are distributed at the school by the District Representative, he having first learned how many seeds are required in the different classes of crops, and how many settings of eggs are needed; these the children take home. Bear in mind that each child when he or she goes home must select the ground which is to be used for the experiment, must sow the seed, must fertilize and cultivate it, and must also set the eggs. Then in the summer the District Representative, or his assistant, pays a visit to the farm, has personal interviews with the boys or girls regarding their plots, scores them in accordance with the most approved methods, and points out how they may improve their work. Prizes are awarded on this inspection for the best plots, as well as for the products of the plots when shown at the fair. Many of the Associations have made it a practise to pay all the prizes by cheque, and although the prizes are small amounts, still, the very fact that they have to make out that cheque in strictly business form, take it to the bank, sign their names on the back of same and collect their money, is in itself a business training which many of us in our boyhood knew nothing about.

Financing the School Fairs.

School Fairs, of course, cost money, and how is this money raised? First of all there are money prizes which are paid in cash and aggregate from $80 to $150 which must be raised by the local Association. The Department has made that a rule from the beginning, and believes they have fully justified the rule because it develops the trait of self-confidence, local co-operation, and the hearty support of all in the community which is so essential to the success of this organization. This amount of money is spread over ten schools and is not very large for any one school. The boys go to the school trustees, submit their plans and ask for a grant, and perhaps receive $5 from each school board. Then they go to a township council and probably get a grant of from $20 to $25, and here again the experience is very helpful in developing the boy's business instinct, and the girl's too, as girls are occasionally selected for this work. There is another very considerable expense the larger proportion in fact, in connection with the organization, and that is the time spent in visiting the schools, in inspecting plots and the expense of livery and automobile hire necessary in order to cover the large area. This as well as the cost of the seeds is borne by the Department of Agriculture, and because of the educational value of these competitions we consider it very well spent.

The Fair is the Climax of the Season.

I have dealt with the formation, organization and financing of the work, and just a word now about the School Fair itself.

The School Fair is necessarily an important part of the scheme. It is the climax of the real work that has been going on through the summer months. It provides an incentive, without which the hard work which has gone before would not be possible, hence the reason why the School Fair is held. There are competitions in all of the various lines which have been suggested, in oats, barley, potatoes, chickens and cows, cooking and fancy work. Not only that, but there is also a competition for essay writing, telling how they grew their crops, how they raised their chickens; and in addition to all we have during the past few years established an oratorical contest. I can assure you in all confidence that some of the efforts which I have heard on the part of twelve or thirteen-year-old boys, who have given learned dissertations on the causes of the war and the financial and economic status of the various European nations, would compare favourably with speeches of those many years older. The School Fair also combines a social time with its educational and recreative feature, and has come to be more than a mere meeting place, for the people of the community enjoy this outing and take a pride in the achievements of their boys and girls. On one point we insist and that is that the Fair must be held by itself, separate from other attractions and organizations so that there will be nothing to overshadow or detract from the importance of the boys and girls and the work. This is a really important point.

Hence, it is, that I commend the School Fair to you, for three reasons: First, because of its beneficial influence on the child. I heard a story not long ago which illustrates the brightness of some of the little girls. One little girl had returned home from school one evening and when she turned to her father she said: "I am the brightest little girl in our school." Her father naturally said he was very glad to hear it and then said: "Did the teacher tell you that, Mary?" She said: "Oh, no, I noticed it myself." This shows that even at that young age they begin to notice things, and it is not a far step to conclude that they will notice the difference between good and bad seed, between good and bad cultivation, between proper fertilization and no fertilization at all, and other elementary matters which will result in better farming. The pupils are of a very enquiring and experimental turn of mind. The whole trend of this work must necessarily be to give agriculture a fair start with those who are choosing a vocation. There is a lot said about keeping the boys on the farm. I do not intend to go into that. I have read that the School Fairs Movement and other agricultural organizations are described as part of a conspiracy to compel the boys to stay on the farm. Nothing can be more ridiculous or absurd, but this it will do: it will give agriculture a fair chance as a vocation which combines the use of one's brains with manual labor, and it will make a boy or a girl more efficient no matter what line of occupation he or she may take up.

Testimony From Parents.

Second, it has an important influence on the agricultural and social life of the community. I have already mentioned something of the social life. Let me just illustrate what I mean by the influence it will have on the agricultural community. Here is the testimony of a District Representative, who says:

"One man, whose boy took Empire State seed potatoes for his School Fair plot showed me the crop which the boy was exhibiting this year and said they were the best potatoes for his farm he had yet tried, and that he had enough seed to plant his entire crop for the next year, and intended to grow nothing else."

You see that had a distinctly good influence on that agricultural community. Just another illustration as reported by a District Representative:

"Another man came to me and told me that he had had great success with O.A.C. No. 72 oats. From the boy's experimental plot he says they threshed seventeen pounds of well cleaned oats, and from this seed produced 25 bushels of excellent oats this year. The boy exhibited a sample at the Fair and they were certainly very clean. The man finished by saying that he had not seen an oat that could compare with them."

This influence on the community must have a good effect on the adult farmer. I have already mentioned to you the fact that there were over 51,000 plots, which means that the District Representative or his assistant personally visited over 50,000 farms in the Province of Ontario last year, and came in contact with the boy and in many cases with the parents on these farms. It has been our experience, and I think the experience has its basis in human nature, that the pride of the boy or girl in this work is more than ever reflected by the pride of the parents. Very frequently the man, who before had had no use for what he described under mistaken notions as "book learning;" the man who thought that School Fairs and Experimental Unions were nothing but a waste of money, has come to realize through the work of the boy, and through the visit of the District Representative, that it is not mere theory, but puts real dollars and cents into his pocket, and that is a line of argument he is prepared to listen to because he can readily understand it.

Third, then there is the sentimental aspect. The parents see their children prospering and developing, and obtaining efficiency in all the different lines of agricultural work, and there have come to us few more gratifying contributions than these words from a parent who has been interested in this work. He said:

"It has been an inspiration to us to keep in touch with our school childrens' lives, and some day we will call that man blessed who instigated School Fairs."

Courses for the Older Boys.

There are one or two other important agencies which I wish to mention. Among the most important of these, having regard to the older boys in the country, are the four to six weeks' courses which are held by the District Representatives throughout the county. Over forty of these are now in progress, having started yesterday. Last year there were forty-three of them, combining in all 1,114 students. Bear in mind that this is not a passing experience. They get together from four to six weeks for solid study. The morning is devoted to lecture work, the afternoon to visits to farms, and in this way they combine training in both practise and theory without which no real success can be obtained. Out of these have grown many agencies, and I will mention one or two of them at the present time. The Junior Farmers' Improvement Association originated as a result of these courses. We have now, I think, about thirty of such Associations with over eight hundred members. They were organized in order to make permanent the associations and benefits which were secured at these courses. They plan to meet from month to month during the year to carry on certain experiments, to test different varieties of crops for growing in their particular district, and hope in this way to improve upon local varieties. Then, too, these courses have resulted in the Acre Profit, and the Dairy and Live Stock Competitions. These competitions are limited to those who have attended short courses, and are, therefore, composed largely of young men ranging in age from eighteen to twenty-five years.

Profits Which Count.

Very frequently, perhaps, on casual thought there is no difference between yields and profits, but when you get down to a close analysis you see their is a distinct difference, and that after all it is profits which count. A man might pick out the best acre on a farm, spend large amounts for fertilizer, and might bestow upon that acre unlimited labor and then produce a crop which would startle the world by reason of its magnitude. At the same time it might not show a profit and therefore not be practical farming, and consequently it is required that not only the yield but the profit shall be taken into consideration. In many cases it has been the heaviest yielding crop that has realized the greatest profits, but it is not always so. These competitions have been held all over the Province, and there is an attendance at this institution at the present time of some eighty young men who have headed their communities in various competitions. Their attendance here has been made possible by the receipt of prizes which consist of all expenses for two weeks during their stay at this College, and their railway fare to and from Guelph. I would like to call your attention to what some of these young men have been able to do in these competitions. In oats the maximum yield was 100 bushels, with a profit of $23.98 per acre. Compare that yield with the average for the Province of 41 bushels. The maximum yield of mangels was 1,652 bushels per acre, and of barley 51 bushels per acre, the average yield for the Province of this last being 36 bushels per acre.

Developing our Greatest Asset.

These are some of the things that the Ontario Department of Agriculture is endeavouring to work out, in a desire to inaugurate and develop a policy of interest to boys and girls and young men in the country districts. Conceived in times of peace and security, but maintained and developed in times of war, it represents an effort to educate and interest the boys and girls and young men for self-improvement along practical lines. I believe that every short course, every school fair, and every competition which is held is a recruiting station for the Ontario Agricultural College, and for better agriculture. It is our purpose then to persevere in this work, to correct mistakes as they may occur, and to develop as opportunity offers. We welcome criticism if criticism is due, and rejoice in the co-operation of all those who are interested in better farming and better living in this fair Province of ours. Amid the wreck of empires and crash of worlds which we are witnessing at the present time, there are many doubts and misgivings as to what the future holds in store. Through all the clouds of uncertainty, there emerges, however, this one great fact for us to consider: that our future depends upon the manner in which we conserve and develop the natural resources of this Province. I submit to you that there are no more important natural resources than the boys and girls living along the side lines of rural Ontario at the present time, and consequently it follows, as naturally as the day follows night, that we have there one of the most important opportunities which awaits our Province. I commend it, therefore, to your thought and attention, and to your sympathetic good will and assistance.

THE GOOD ROADS MOVEMENT.

Hon. Findlay Macdiarmid, Minister of Public Works, Toronto.

I appreciate the honor and privilege of addressing meetings, the members of which are engaged in agriculture, that great industry upon which depends the future of this Province and this country. I am here to-night on account of the illness of the Minister of Agriculture, an illness which I trust is of but a temporary nature. It is unnecessary for me to tell you of his untiring efforts to do everything that it has been possible for him to do to promote the welfare of the various agricultural interests of the Province.

I think that it would not be out of place to-night if I were to take a few minutes and touch upon the Good Roads Movement, on account of it coming directly under the Public Works Department. The history of legislation dealing with the Goods Road Movement is one that does not date back very far in the Province of Ontario. In 1896 the first attempt was made to identify the Provincial Legislature with the Good Roads Movement, and at that time a Good Roads Inspector was appointed for five years. His chief work consisted of educating and stimulating the public to take an interest in this one question. The Highway Improvement Act was passed and a sum of money was set aside, out of which the Province was to contribute their share in constructing main or leading roads through the Province of Ontario. To-day there are twenty counties operating under the Highway Improvement Act. From 1902 to 1915 we contributed one-third of the cost of construction of main or country roads through any county in the Province of Ontario which wished to take advantage of that Act. During the last session of the Legislature a measure on broader lines, somewhat more comprehensive in dealing with the road question, was introduced after the report of thé Commissioners who looked into the question thoroughly during the summer of 1913, had been presented. Under the terms of this Highway Act we contribute forty per cent. of the cost of the construction of County roads. We contribute forty per cent. of the cost of constructing main roads, and in addition to that we have prepared and passed legislation which says that we shall contribute twenty per cent. towards the maintenance of roads in the Province of Ontario. We hope by this Act possibly to pursue a more vigorous and aggressive policy in connection with this question. We believe it is closely identified with rural life in the Province of Ontario. To make money alone is not sufficient to keep the people on the farm; they must have better conditions; they must have conveniencees; they must have comfort, because we are not all worshipping money by any means in this Province. We believe that through the construction of better roads we will increase the value of farm lands. That has been the experience where good roads have been constructed. They increase the value of farm property in sums ranging from $5 to $20 per acre for one situated on a good road as against one that is situated on a bad road. It brings the farm nearer to the market, and the producer nearer to the consumer. The railways of this country have had a tendency to settle population in the larger places, and all the large manufacturing industries in the great centres. We believe that the construction of good roads, and a development of the good roads policy will act in an opposite direction, and have a tendency not only to keep the people on the farm but to bring them to the farm: and will induce the city people to live out of town where they will have greater freedom and better opportunities for bringing up their families. All this we hope to accomplish through the building of better roads in the Province of Ontario.

There is no place where that sense of ownership seems so strong as when a man is on the King's highway. There is no place where we are all men of equality as we are on the King's highway. Now we hope in introducing this legislation that the counties not already operating under it throughout the Province of Ontario will take advantage of the Highway Improvement Act. We also hope that the county councils will prepare their by-laws, designating their roads and proceed with the construction of them. The question of main roads is one that has required a great deal of thought and consideration. We do not believe the farmer should be called upon to pay for a road beyond the requirements of a farm. There are certain roads in the Province of Ontario which carry outside traffic, traffic which originates outside the county, or the township. These roads under the classification of this Act are designated as main roads, and can only be constructed by cities that are connected by these roads. They must contribute their fair share of the cost of construction because the traffic originates in the city. The legislation proposed that a commission be appointed to take charge of these main roads running between objective points such as Toronto and Hamilton, Hamilton and Niagara Falls, Niagara Falls and Windsor, Toronto and Oshawa, and Toronto and Orillia, etc., and that the cost be borne by the municipalities through which these roads passed, and to which the counties would contribute forty per cent. In that regard we have succeeded in establishing the liabilities of the cities of this Province for roads lying outside their boundaries. Then again, there is another class of road in which we are all interested, and that is the Township road. What have we proposed to do in order to encourage the building of better roads in the township? We have the money voted already for that purpose to be spent by the township councils. We believe what is necessary is efficient management. With that end in view we have offered to pay twenty-five per cent. of the salary of a road supervisor, whom the township councils may employ in order to get away from the system of councils acting as commissioners. We have placed that legislation on the statute books with the hope that splendid results will be forthcoming from that one idea, because we believe it is just as essential to have a man permanently in charge of that particular class of township council work as it is to have a competent permanent clerk or treasurer of a township.

I have briefly outlined the road policy as it has a bearing on rural life in the Province of Ontario. We have contributed up to the present time $2,000,000 as our share of the money that has been spent on the public highways of the Province of Ontario. Owing to the sparse population we have, and the immense territory that we have to cover, the problem is perhaps more difficult to solve than it is in the adjoining nation, where the population is denser, the assessment greater, and where the cities are larger. We believe, however, it is a progressive measure and that the people of this Province will take advantage of the Government's offer to bear 40 per cent. of the cost, and 20 per cent. of the maintenance of the road, because the question of maintenance, perhaps, has been the great obstacle in the past. It is only by a thorough system of patrol that these roads can be maintained, and the money that has already been spent on them not lost. Now, I do not know that it is necessary for me to deal with the subject any further. I simply introduced it to the gentlemen here to-night, knowing that you are interested in it, as one of the problems bearing on rural life here in the Province of Ontario.

We have had a wonderful year of prosperity throughout the Dominion of Canada, and throughout the Province of Ontario. Great wealth has been produced from the land. We rejoice to know that prosperity is general throughout this great Dominion. Perhaps never before in the history of this Province or in the history of the Dominion have we had the same average yield in all lines of agricultural produce. This enormous yield is what has turned the balance of trade in favor of Canada. The banks are being expanded, the industrial conditions are good, the mining and the lumber industries are reviving, and in fact, all signs point to an era of prosperity notwithstanding the fact that we are engaged in a great war. In the midst of this general prosperity it is our duty to consider what part we should play in connection with this great struggle which has now been going on for eighteen months. The flag which floats over us stands for sacrifice, and is the emblem of the British nation. That flag was raised in Canada one hundred and fifty years ago, and proclaimed the sovereignty of Great Britain over this Dominion of ours. To that flag we owe allegiance, and what it stands for we all admire. The ideals represented by that flag are the ideals which every true citizen may subscribe to, and live up to, if he wishes to discharge his full duty as a citizen of this country. The British Empire, of which we form a part, is engaged in a great struggle. After striving to maintain the peace of the world she found it necessary to maintain her national honor and to keep inviolate her pledges to unsheathe the sword. The Prime Minister of Great Britain and the British Empire has stated that the sword will not be sheathed until full justice has been done to Belgium, and that Germany shall pay a full indemnity for the crimes she has committed. Here in the Dominion of Canada 150,000 or 200,000 men have put on the King's uniform to fight for the freedom and independence of Canada; for the future and honor of Great Britain; and for the rights and privileges of mankind. We have greater faith to-day in the future of this country than ever before, by reason of the fact that the best in our land have shown their willingness to voluntarily make whatever sacrifice is necessary in order that this Empire may hold together. We have a heritage as rich, as great, as grand as was ever entrusted to the care of mankind to guard and keep. We have inherited from Great Britain privileges which are of inestimable value. We have inherited from Great Britain Responsible Government; we have inherited those noble traditions of the Anglo-Saxon race, and other things such as the Habeas Corpus and Trial by Jury, and these are what we are to-day defending on the battle fields of Europe. We owe the prosperity and the freedom we enjoy at the present time to the iron clads of Great Britain. We owe the safety of our homes and of our loved ones to the fact that Great Britain has not neglected to maintain her fleet at the highest possible standard. There is no country in the world for which Germany would rather reach out to make room for her crowded people than this great undeveloped stretch of land from the Atlantic to the Pacific. We are now in the midst of this struggle, and I believe that the people of Canada have done well, and that they will continue to do their duty. If the freedom of Britain which we have enjoyed, and if the ideals for which the British flag stands, after a year of action, are worth fighting for, then it is the duty of every man to take time to determine for himself what is his duty in this hour of trial; not that we love war, with all its desolation and misery, but that we do not want peace at any price. We hate war, but we hate slavery worse. If the German Empire succeeds, democracy has received its death blow in this world. The whole past history of the human race seems to have been leading up to this one great struggle. The whole future history of the human race will reflect whatever decision is reached on the battle fields of Europe. We have an intimation of what the final outcome will be. Germany, to-day, is being strangled industrially; her fleet has been driven off the seas; her merchantmen are nowhere to be seen; and she is compelled to live within her own borders and devote her own energy and work on nothing else but the war. For forty years public opinion had been moulded by her statesmen with the same care and precision that her munition manufacturers bestow upon the output of cartridges; for forty years they have preached the doctrine that might is right; and it has filtered down through every layer of society, finally culminating in this great war. They have been preparing for this great struggle in order that they might dispossess Great Britain of her possessions. One hundred years ago Great Britain unfurled her flag to crush the military despot, and to check the career of the military tyrant. Again she has unfurled her flag, and with the assistance of her Allies and her Dominions, again she will be victorious on the battle fields of Europe, and liberty and freedom we trust will reign supreme in the world forever.

ANNUAL REPORT

OF THE

ONTARIO Corn Growers' Association

1915

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE,)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by A. T. WILGRESS, Printer to the King's Most Excellent Majesty
1916

Printed by
WILLIAM BRIGGS
Corner Queen and John Streets
TORONTO

To His Honour Sir John Strathearn Hendrie, C.V.O., a Lieutenant-Colonel in the Militia of Canada, etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

May it Please Your Honour:

For certain causes it has been deemed advisable not to print the Annual Report of the Association for 1915 separately, but to combine the proceedings with a later report.

The Financial Statement and a list of officers are appended.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Ontario Corn Growers' Association.

ANNUAL CONVENTION.

The Eighth Annual Exhibition and Convention of the Ontario Corn Growers' Association was held in the Curling Rink, Chatham, on February 1-4, 1916.

Although the past season was an unfavorable one for the production of grain of show standards, still the exhibits showed high quality and care in selection, a credit to any district in any year. The lectures were held in St. Andrews Hall and were well attended by optimistic, appreciative farmers and people from the City of Chatham. Many interesting addresses were delivered.

OFFICERS FOR 1916.

Honorary President.................................Byron Robinson, Wheatley.
President.................................R. W. Knister, Comber.
First Vice-President.................................Lester Gregory, Chatham.
Second Vice-President.................................L. D. Hankinson, Aylmer.
Secretary.................................J. W. Noble, Essex.
Treasurer.................................J. H. Coatsworth, Kingsville.

FINANCIAL STATEMENT FOR THE YEAR ENDING AUGUST 31st, 1916.

Receipts.		Expenditures.	
Balance on hand at last audit	$341 74	Prizes	$1,032 35
Legislative grant	580 00	Expenses of Directors and Local Judges	390 86
Kent County grant	250 00	Printing	242 40
Essex County grant	250 00	Advertising	283 58
Township grants	410 00	Building for Exhibition, shelving, light, fuel, etc.	300 00
Membership fees	445 50	Postage	84 08
City of Chatham, cash	200 00	Express, cartage, etc.	69 79
City of Chatham, building for exhibition, shelving, light, fuel, insurance, etc.	300 00	Expert judge, services and expenses	80 00
Donations	160 50	Membership buttons	18 34
Advertising in prize list	146 50	Stenographic report	25 00
Space at exhibition	122 00	Paper for shelving	13 20
Sundries	2 00	Moving pictures	10 00
		Cotton sacks for grain exhibit	11 20
		Banners	8 50
		Hardware, lumber, etc.	10 90
		Photos of prize samples, etc.	9 25
		Secretary	150 00
		Treasurer	50 00
		Stenographer	25 00
		Auditors	8 00
		Harwich School Fair	5 00
		Night watch and carpenters	17 00
		Exchange	3 29
		Rent of typewriter	1 00
		Sundries	1 12
		Balance	358 38
Total	$3,208 24	Total	$3,208 24

ELEVENTH ANNUAL REPORT

OF THE

ONTARIO

Vegetable Growers' Association

1915

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by A. T. WILGRESS, Printer to the King's Most Excellent Majesty
1916

Printed by
WILLIAM BRIGGS
Corner Queen and John Streets
TORONTO

To His Honour, Sir John Strathearn Hendrie, C.V.O., a Lieutenant-Colonel in the Militia of Canada, etc., etc., etc.

Lieutenant-Governor of the Province of Ontario.

May it Please Your Honour:

I herewith present for consideration of Your Honour the Annual Report of the Ontario Vegetable Growers' Association for 1915.

Respectfully Yours,

J. S. DUFF,

Minister of Agriculture.

Toronto, 1916.

CONTENTS

Ontario Vegetable Growers' Association

OFFICERS AND DIRECTORS, 1916

President: F. F. Reeves, Humber Bay.

First Vice-President: J. J. Davis, London, R.R. 7.

Second Vice-President: E. K. Purdy, Kingston.

Secretary-Treasurer and Editor: J. Lockie Wilson, Toronto.

Directors: T. H. Ketcheson, Frankford; Henry Broughton, Sarnia; W. McMeans, Brantford; W. S. Eborall, Beamsville; J. A. Sorge, Dunnville, R.R. 5; E. K. Purdy, Kingston; Jno. Moulton, London; T. M. Mulligan, Harbord, Ottawa; E. F. Montgomery, St. Williams; Chas. Brown, St. Catharines, R.R. 2; Colin McNicol, Stratford; Phil. May, Belle River, R.R. 1; Jno. Tizzard, Humber Bay; A. Nelson, Fonthill.

Executive: F. F. Reeves, J. J. Davis, E. K. Purdy, Thos. Delworth, J. Lockie Wilson.

Representative to Canadian National Exhibition: Thos. Delworth.


OTTAWA EXHIBIT BRANCH
ONTARIO VEGETABLE GROWERS
ASSOCIATION.
DONATED TO ORPHANS HOMES OTTAWA
VEGETABLE GROWERS
ASSOCIATION
SPECIALS.

Ontario Vegetable Growers' Association

ELEVENTH ANNUAL CONVENTION.

This convention opened on Tuesday morning, November 9th, 1915, at nine o'clock, with the President, Mr. F. F. Reeves, of Humber Bay, in the chair. This was the largest convention yet held.

PRESIDENT'S ADDRESS.

F. F. Reeves, Humber Bay.

It is my privilege to convey to you in the name of the Ontario Vegetable Growers' Association a cordial and hearty welcome to this our eleventh convention. It was my proud distinction to have the honour to preside over the 1906 meeting. The remarkable progress which has been made in the lapse of nine years is far beyond our expectations. The Association has certainly achieved many important advances in the interests of vegetable growers, and it is to be hoped that in future there will be a steady march forward. It may be of interest to you to know that many of the vegetable growers in various States of the Union are as yet unorganized even in sections where immense quantities of vegetables are annually grown and marketed. It is a credit to Ontario vegetable growers that they have been organized for such a number of years.

The season which is now fast drawing to a close has been one of more or less anxiety for the vegetable growers. Extraordinary weather has caused many sleepless nights among us during the earlier part of the season. The heavy spring frosts caused considerable damage to early vegetables, particularly the tomato crop of the Leamington district. Continued wet weather from the second of July until the last week of August made it practically impossible to carry on the necessary operations of cultivation. Many gardens suffered severely from the continued drenchings of rain which have not been equalled in 25 years. However, a spirit of optimism is to be found in the vegetable growing fraternity. We are all thankful to have plenty to live on with a little to spare, and we are glad to know that over one million pounds of desiccated vegetables have been sent or are in course of preparation for the troops and sailors of the Allies.

The Association this year has carried on its work as usual. The field crop competitions were held and some excellent exhibits were made at Toronto, London and Ottawa Shows. We hope another year that some provision for instruction of the judges of the field crops similar to those given other field crop judges will be made by the Department of Agriculture.

Three new branches have been opened up this year and vegetable growers, the Province over, are gradually becoming more and more interested in the work of our Association.

We are grateful to the Minister of Agriculture for the keen interest which he and his staff have taken in our work. Among other things, the Minister has seen fit to place the President of your Association on the Advisory Board of the Jordan Harbour Experimental Station. It will be his duty and pleasure to bring before the other Directors any feature which may be considered worthy of consideration in the interests of vegetable growers of Ontario. Certainly, vegetable growers are receiving more and more attention from our Governmental Departments and the work done is fully appreciated by us.

Prices this season have been on an average 25 per cent. lower than in the past few years. Of course we must take into consideration the fact that money was plentiful in Canada, and, naturally, we vegetable growers experienced some effects of the boom which has passed over this Dominion in the last seven years. One thing the older members of this Association will agree with me is that prices have been considerably lower in the last 25 years than they are at present.

The seed market is somewhat unsettled owing principally to the wet weather which has been experienced in the seed growing centres of the United States. I am told by an authority that we may look for a scarcity of reliable seed of the following vegetables for next season—onions, spinach, beans and celery.

The labor question is one which should receive attention. So many men have enlisted or are employed in the making of munitions that it is a difficult matter for the vegetable growers to secure sufficient capable labor. Probably this will right itself only on the conclusion of hostilities in Europe, which we hope will not be far distant.

There are some features of vegetable growing which should be more fully brought before us, and one of these in particular is the question of shipping packages for vegetables. While this does not affect the growers in the immediate vicinity of large cities, it is becoming a grave problem for those who ship vegetables from other districts into the large markets of Montreal and Toronto. It would be a very beneficial work for this Association if some information could be gathered relating to the various vegetable packages used in Ontario. This would enable us to be prepared to standardize our shipping carriers.

Another point which I wish to bring before this Convention is that of devising some means whereby vegetable growers in the various sections of the Province may become informed as to the acreage and conditions of certain crops at various seasons of the year. Many of you have seen monthly circulars which are sent out by the Dominion Department of Agriculture which deal with the conditions of growth, demands and markets which relate to the fruit growers' interests. I am of opinion that some such report might possibly be worked out by our Association and prove of unqualified value in all the vegetable growing sections of the Province. Certainly the time has come when the vegetable growers of this Province must "get together" and become familiar with the varied ways and means of disposing of produce.

During the past year we witnessed two distinctly new features of advertising in Canada, particularly in Ontario. I refer to the great advertising campaign carried on by the Minister of Trade and Commerce advertising Canadian apples and Canadian fruit in general, and also to the lesser advertising which has been given to the fish of the Dominion of Canada. This advertising has informed the world that Canada leads in the production of fruit and fish.

Would it not be worthy of some effort to secure such advertising for Canadian vegetables? If vegetables were thoroughly brought before the reading public as these two products have been, Ontario growers might reap some benefit in the increased demand.

Another feature which I would like to mention before coming to a close is the action of some of our American brother vegetable growers who are gradually dumping more and more of their surplus on our Ontario markets. This past season has been particularly noted for this practice. Owing to the large crops of tomatoes and cabbage in the Southern States and the over glutting of their own markets, carloads of these vegetables were shipped to Buffalo and

Intensive cultivation. Celery 10 x 10 inches apart, with Skinner irrigation system overhead. Note the manure mulch.

bought up at a very low price and shipped into our Ontario markets. Naturally the bottom fell out of your markets and our own early tomato and cabbage growers had to suffer. This would be a good line of work for the Ontario Vegetable Growers' Association to search into and try to remedy in the future.

In conclusion, we must admit that we are living in history-making times. Never before have Britain and her colonies been called on to fight a better fight for the laws of freedom and justice the world over. Canada has responded nobly to the call. She has opened her homes and given the best she had—her sons. She has given magnificently of her wealth, and the mother country realizes what a mighty support she has in this Canada of ours. Like all other classes of men, the vegetable growers have given their sons and of their wealth and are prepared to give even further in this great world struggle of right over might.

R. A. Hamilton: It might be well to look into that subject of the President's address, about finding out the number of acres that are grown under vegetables this year, and also about finding a market for the disposal of such product. I have no suggestions to offer in that way, but it would be a good thing for us to have.

F. F. Reeves: Some years ago we had crop reports from the different sections, and I have always been of the opinion that that would be a good work to bring up again, and I thought this was a good opportunity to bring it before the meeting. I have had during the past three months enquiries for vegetables of all kinds from practically all over Ontario. Now, if I had known where these could be bought, or if I could have given the names of the parties enquiring to the proper sources, it might in that way have been of benefit both to the growers and those who were trying to find out. I had no means of knowing, and it seems to me it would be well to bring that line of operation again into force in connection with our Association.

C. W. Baker: About that matter of advertising circulars which the President referred to, I think that that certainly is a splendid idea. If vegetable growers could devise some means of better advertising their vegetables, getting them before the people, and the idea that we are putting up the necessary good things that every householder needs, it would be a great advantage.

John Tizzard: The matter of American vegetables brought in here when our own stuff is on the market should certainly receive some attention. This is particularly the case in the spring of the year when we get carloads of stuff brought in here and we get almost nothing for our produce. The gardeners should get together and try to have some kind of a commission house, especially in a place like Toronto, so that they could distribute their stuff better than it is now distributed. At the present time the Toronto wholesaler buys the stuff for almost nothing from us and then sells it for a large price. If we could have a commission house that would give a better price for our stuff, it would be better for both consumer and producer.

J. J. Davis: I have often thought that if we had some sort of a clearing house at the leading centres in our business it would be a very great thing. But there are very great objections to be overcome in the running of it. We would need to run this house all the year round, and there are only certain seasons of the year when perhaps we would have any business, and meanwhile the expenses are going on just about the same. I have thought a great deal about that, but I have never been able to see yet just how we could work it and make it go. As to getting a commission man to handle our things and give us the larger part of the profit, I do not think we could do that, as no man is in the business for our benefit—he is in it for his own. If we had anything of that sort we would have to run it ourselves, and we are not in a position financially to undertake that.

Thos. Delworth: This matter of a clearing house has been discussed at different times, and it no doubt would work out to the advantage of the vegetable growers, but we have got to take hold of it in a large way. With regard to having a clearing house for our surplus product. as I see it. that would never be successful. Any man who takes hold of the work of running a clearing house would want the whole of our product. If we are only going to send to that man stuff when we have a surplus. do you see what he would be up against? He has got to handle it against a dead market. He wants the stuff when it is selling well, as well as when it is selling poorly, otherwise he cannot run any kind of a trade. Now, the only way I could see is this: We are all agreed that we could possibly get a better price for our stuff when only two or three men are selling in place of a hundred. The only trouble is whether our customers will be able to buy somewhere else and cut us out altogether. But I do not see that we can make a success of this by simply taking to this place the stuff that is a glut on the market.

JOHN TIZZARD: I believe the thing can be worked all right, provided you get hold of the right man to run it. and so far as taking all our stuff to one man, that I think would be almost impossible, but if we had a place where we could take the surplus of our stuff that is a glut on the market. it could be sold to places, such as hotels, boarding houses, etc.. and if it worked out with one house it could be done with more, perhaps four or five in Toronto. How many men have we got here who come out and meet us at the Humber. who just get out again and sell it wholesale. They make a good business of that all the year round. and I do not see why we could not have one or more men to handle our stuff that way. I myself think it could be worked if we only got hold of the right man to do it and get him to stick it out.

REPORT OF SECRETARY TREASURER.

J. LOCKIE WILSON, TORONTO.

Nineteen fifteen will long be remembered by market gardeners and farmers as the year of, practically, continuous rains during the summer and early fall. The spring was dry, but, when once the heavens opened. the rain fell on the earth in quantity beyond measure, and rust, blight, rot and other kindred diseases attacked and, in many cases, ruined the crops of the farmers and vegetable growers. Had 1915 been an average year, the gardeners' crops would have been very heavy, too much so, perhaps, for satisfactory prices to have been realized. It is necessary, of course, that the farmer and vegetable grower should get a reasonable price for what he produces, as if he does not do that, he will say: "What is the use of all my hard work when it is not paid for?" So I say there is a possibility of producing too much stuff and getting too small a price for it, and discouragement will set in for the men who are endeavoring to keep up their side of this country's wealth.

During the year new Branches were organized as follows: Clinton and Louth, Lincoln and Welland, and St. Williams. The membership of the Association remains about the same. A condensed report of the work of the year as supplied to me by some of the Branches is given herewith. A letter is sent out to every secretary asking that a short report be given of the work of his society during the season. Unfortunately, some of our secretaries are either too busy or too tired to send in a short report. I think it is the duty of every Branch to at least tell us in a very few words what they have been doing during the year.

Blackwell.—This Branch has done good work this season, notwithstanding the lessened demand from the northern markets on account of the war and the closing of construction camps and similar works. In former years a very large percentage of vegetables and fruit raised by this branch was shipped by boat to the north. In spite of this the members have experienced a prosperous year. An exhibit of vegetables was made at Toronto and London and also at the Lambton County Fair. The wet weather proved a serious drawback, especially to the potato crop which blighted and the tubers rotted. Potatoes are selling now for 90 cents a bushel.

Brantford.—Meetings were held during the winter months, and one during the summer, when Mr. S. C. Johnston gave a demonstration on onion spraying for blight, from which much benefit was derived. Membership fee has been raised to $1.00 per annum. Members total 39. Sales of vegetables brought in nearly $1,200, or double that of 1914. No canvass is made for members, as this branch believes that demonstrating what can be done in co-operative buying is more effective than canvassing. Two cars of baskets, one of lime and several tons of sugar were purchased for members. Co-operative selling has also proved very satisfactory.

Clinton and Louth.—The Clinton and Louth Branch of the Ontario Vegetable Growers' Association held four meetings during the year. The first in March was an organization meeting, the second was addressed by F. C. Clement, of the Horticultural Experimental Station on "Potato Growing," and the last two in July and August were held at the Experimental Station where Mr. Clement and his assistants explained the various experiments being conducted, giving special attention to the Skinner System in growing vegetables and small fruits. These very interesting meetings were followed by discussions. Several entries in onions were made in the Field Crop Competition in which Mr. Eborall was successful in obtaining first prize in District No. 2, with a score of 95½ points.

London.—This Branch has a membership of 58. No special work was undertaken during 1915. During last winter an exhibition contest was carried on between two teams chosen from the members, and at the close of the contest the losers paid for a supper to the winners. This proved educational, as well as interesting members in the work.

Ottawa.—The work of the Ottawa Branch for the past year may be considered as a progressive one. New officers were installed: President, H. L. Bailie; Sec.-Treas., A. V. Main: and a board of six practical gardeners. Seven educational meetings were held during the winter months, which were wonderfully well attended, the lectures being topics of first interest to the vegetable producer such as "Melon Culture," "Tomato Growing," illustrated lecture on "Insects that are Destructive to the Market Gardener," "Potatoes," "Storage of Onions and Celery."

Following up our winter programme, we commenced in June our monthly visit on a Saturday afternoon to our fellow members' gardens. These summer outings are one of our strong lines of work, as seeing is believing, and we realize that we are never too old to learn. Our local Field Crop Contest was well worthy of being continued. It included 300 celery plants, 1,000 cauliflower, 100 square feet of onions, seeded or transplanted, 500 tomato plants, and 50 hills of melons. Points awarded were for market value, uniformity of crop, being true to type, freedom from diseases and pests, clean cultivation, and general appearance of crop. An entry fee of 25c. was charged for each crop. At the Central Canada

Fair, the Association offered $18 in prizes and R. B. Whyte generously added $7 to this, for vegetables. A splendid exhibit of vegetables and fruit was put up at the Fair, no less than four large loads, making the finest display of vegetables in the Province. As in former years this was handed over to the orphans' institutions of the city.

Grants were received from Gloucester, $25.00; Nepean, $20.00; South Hull, $10. Owing to financial conditions, the City of Ottawa did not contribute.

A day was set aside for an excursion in July, when the complex side of our business was dismissed. Our membership was 65. We issued a winter programme, and prize list. Receipts, $189.25, expenditure, $187.10. Considering conditions of war which are more or less affecting the whole universe, and climate conditions for 1915, the market gardener has had his share of prosperity.

Celery bleaching.

Our troubles and trials are a small affair (we, as Canadian producers of vegetables live in God's Paradise) in comparison with those intelligent gardeners of Europe whose homes and pet gardens are smashed into wreckage.

Sarnia.—This Branch has over 100 members. 200 carloads of vegetables were shipped and two cars of baskets, etc., purchased. Seeds and potatoes were obtained at wholesale rates. Several meetings held and great interest is taken by the members in the welfare of the Association. A number won first prizes in the Field Crop Competition. The outlook is bright for another successful year.

Stratford.—Plant boxes, baskets, seeds and other requirements for the members were purchased in bulk to good advantage.

St. Thomas.—This Branch bought their supplies co-operatively, and held several meetings during the year.

Tecumseh.—Tecumseh Branch has 131 members in good standing. Receipts amounted to $240.46, and expenditures to $157.34, leaving a balance on hand of $83.12.

Toronto.—Considering the very unfavorable outlook for market gardeners all over the Province, the Toronto Branch has every reason to be satisfied. In common with our brothers the Empire over, we have had to contend with depression in trade and a very unfavorable season climatically. Our business on the whole is in a far better shape than it was a year ago. We have held regular meetings every month. During the winter we met at the Labor Temple and in the summer at the homes of some of our members. At our April meeting we had our Annual Exhibition in Greenhouse Vegetables, watercress, parsley, mint, green onions, rhubarb, lettuce and radish. Good prizes were offered and the competition was very keen. We were favored at our March meeting by joining with Mr. S. C. Johnston in having one of the special conferences for vegetable growers held at Lambton Mills. The speakers, Messrs. Cook, David and representatives of greenhouse building firms proved very instructive and interesting. The attendance was upwards of 300. Our outdoor meetings during the summer months were very profitable. The presence of the ladies at these meetings was very gratifying.

Welland.—Had a fairly good year. Bought 3 carloads of fruit baskets, one of lime and one of spraying material at a considerable saving to the members. Also placed a fine exhibit of fruit and vegetables at the County Fair and donated it to the Daughters of the Empire for Red Cross Funds.

Exhibitions and Competitions.

The exhibits at the different exhibitions were larger than ever and of finer quality.

The Field Crop Competitions among vegetable growers are continuing to prove of interest to all occupied in the work of gardening. Four kinds of vegetables were selected, viz.: tomatoes, celery, onions and early potatoes. The five prize winners in the fields in each district were allowed to compete at the Canadian National and Central Canada Exhibitions and at the Western Fair, London. The Central Association arranged to have neat boxes prepared for the exhibitors, which were distributed to the different Branches in good time to have their products shipped to the fairs above mentioned. The packing of tomatoes in boxes of two layers with cardboard between and each tomato carefully wrapped was a marked improvement and the experiment will prove of value to our shippers.

I was present at the Canadian National and the Central Canada Exhibitions when the tomatoes were shipped in, and in the past years previous to 1915, the tomatoes came to those different fairs in very bad condition. The shipping in baskets seemed to be an absolute failure. I suppose the rough handling by express men and on the trains was largely accountable for this. At any rate 30 per cent. of those shipped to the Canadian National and to the Central Canada Fairs arrived in very bad condition. I cannot say about the Western Fair, Mr. Baker had charge of it last year and he will be able to tell you what the effect was in 1914. Mr. Whale, who had charge this year, will be able to tell you the change in conditions this year. I am quite confident that there is only one way of carrying on our shipping business and that is to do it right. There is just one way to do these, and there is not a bit of use dumping tomatoes roughly in the basket, as it only causes disappointment all around. A little extra pains on the other hand creates satisfaction.

The following are the prize winners:

CANADIAN NATIONAL EXHIBITION.

CELERY:
1.—J. J. Davis, London, R.R. 7.
2.—Wm. Elford, Humber Bay.
3.—W. R. Trott, London, R.R. 7.
4.—J. Harris & Son, Belleville.
5.—Art. Carlton, Lambton Mills.
6.—F. F. Reeves, Humber Bay.
7.—Cooke Bros., Cataraqui.

ONIONS:
1.—Edward Worgan, Weston.
2.—Charles Aymer, Humber Bay.
3.—J. Tizzard, Humber Bay.
4.—George Riley, Aylmer, Que.
5.—W. I. Eborall, Beamsville, R.R. 1.
6.—W. E. Crandall, Ingersoll.
7.—Chris. Dent, Sarnia, R.R. 1.

TOMATOES:
1.—J. Harris & Son, Belleville.
2.—Charles Aymer, Humber Bay.
3.—C. H. Aymer, Jr., Humber Bay.
4.—G. W. Bycroft, London, R.R. 7.
5.—John Tizzard, Humber Bay.
6.—Victor Robinet, Tecumseh.
7.—W. Trick, Ottawa.

POTATOES:
1.—F. Gard, London, R.R. 7.
2.—W. R. Trott, London, R.R. 7.
3.—H. Hachborn, Brantford, R.R. 5.
4.—F. F. Reeves, Humber Bay.
5.—Hy. Broughton, Sarnia, R.R. 1.
6.—James Dandridge Humber Bay.
7.—Sanderson Bros., London, R. R. 7.

WESTERN FAIR, LONDON.

POTATOES:
1.—Fred. Gard, London, R.R. 7.
2.—F. F. Reeves, Humber Bay.
3.—B. Lancaster, Cataraqui, R.R. 1.
4.—W. A. Thrasher, Sarnia.
5.—Murray Smith, Sarnia, R.R. 1.

TOMATOES:
1.—Charles Aymer, Humber Bay.
2.—Charles H. Aymer, Jr., Humber Bay.
3.—George Bycroft, London, R.R. 7.
4.—John Harris & Son, Belleville.
5.—D. Dempsey, Stratford.

CELERY:
1.— J. J. Davis, London, R.R. 7.
2.—F. F. Reeves, Humber Bay.
3.—W. R. Trott, London West.
4.—Sanderson Bros., London, R.R. 7.
5.—F. M. Mulligan, Harbord.

ONIONS:
1.—Charles Aymer, Humber Bay.
2.—George Riley, Aylmer, Que.
3.—R. Hachborn, Brantford.
4.—J. Tizzard, Humber Bay.
5.—Cooke Bros., Cataraqui.

CENTRAL CANADA EXHIBITION, OTTAWA.

CELERY:
1.—J. Harris & Son, Belleville.
2.—W. Trick, Ottawa.
3.—F. F. Reeves, Humber Bay.
4.—W. R. Trott, London, R.R. 7.
5.—T. M. Mulligan, Harbord.
6.—P. T. Jean, London. R.R. 8.
7.—J. J. Davis, London.

POTATOES:
1.—Thos. Delworth, Weston.
2.—H. Hachborn, Brantford.
3.—F. F. Reeves, Humber Bay.
4.—James Dandridge, Humber Bay.
5.—Sanderson Bros., Sarnia.
6.—Robert Plunkett, Weston.
7.—W. R. Trott, London.

TOMATOES:
1.—Charles Aymer, Humber Bay.
2.—Chas. H. Aymer, Jr., Humber Bay.
3.—G. W. Bycroft, London, R.R. 7.
4.—W. Trick, Ottawa.
5.—J. Harris & Son, Belleville.
6.—W. H. Stewart, Aylmer, Que.
7.—D. Dempsey, Stratford.

ONIONS:
1.—Charles Aymer Humber Bay.
2.—George Riley, Aylmer, Que.
3.—W. I. Eborall, Beamsville, R.R. 1.
4.—W. E. Crandall, Ingersoll.
5.—J. Harris & Son, Belleville.
6.—H. Coldrey, Ottawa.
7.—Edgar Worgan.

It is a pity that any of our Branches should be too busy to enter into the Field Crop Competitions, which is perhaps one of the most important lines of work gone into by our Association. It has a broadening effect upon the members, putting up their skill against that of other districts, and the competition is usually very keen. Then the opportunity is given for those five prize winners in each competition to enter for the prizes in the three great Exhibitions in this Province—the Canadian National, the Central Canada and the Western.

Our Directors, knowing that this was a time of stress, financial and otherwise, deemed it advisable to curtail as much as possible the expenditure, and while there has been some slackening up in the efforts of our members, this is due solely to the war conditions. A large number of the stalwart sons of our members are now fighting in the trenches at the front. I wish to express our sympathy with our President, whose gallant son was wounded on the battlefield in France, and the only son of one of our past Presidents and a member of the Executive, Mr. Thomas Delworth, is now following in the steps of the son of his neighbor in the fight for freedom's righteous cause.

Tomatoes well staked. Stakes are 6 feet long and 1 inch square.

Time will not permit me to name the scores of others of our members who have been large producers of foodstuff, who at duty's call have depleted the ranks of our farmers and are now doing valiant work in another field of endeavor for their country.

The judges sent out for Field Crop work have on the whole been satisfactory, but I would suggest that, if it can be arranged, we have a short course for judges for the vegetable competitions the same as is now done for judges for the other field crops. It is of vital importance that there be uniformity of judging by score cards, if the best results are to be obtained. This is a matter that I should like discussed by the delegates at this Convention.

With the other forward movements of the Association investigation into co-operation has practically been allowed to stand still till the war is over.

A number of our members have experimented with growing of seed, but have not yet reported to the Central Association. Scarcity of farm laborers still continues to be a serious drawback to gardeners, particularly as so many of our men, as stated above, have gone to the front. Complaint is made continually that while there are so many unemployed men in our towns and cities, those who go out to assist the farmers seem to tire quickly of country life, and, in many instances, have returned to the city three or four days after leaving it. Scores of others absolutely refuse to engage as agricultural laborers.

We are looking forward to a large increase in the number of our members in 1916, and hope to be able to send out experts to address the members of the different Branches. Our work will, of course, largely depend on the duration of the war and the financial conditions resulting therefrom.

It is the bounden duty of those of us who remain at home to do our part in increasing the products of the soil and making every possible sacrifice so that victory may perch on the banners of the men who are fighting for King and Country.

FINANCIAL STATEMENT.

November 30th, 1914 to November 30th, 1915.

Receipts.

Balance on hand from 1914	$266 88	
Grant	800 00	
Membership fees	95 60	
Entry fees for Field Crop Competition	172 00	
		$1,334 48

Expenditure.

Stationery	$9 75	
Postage	10 00	
Expenses of delegates to American Vegetable Growers' Convention, Cleveland	25 40	
Auditing	5 00	
Prizes paid in Field Crop Competition	350 00	
Expenses of Directors attending Annual Convention	95 55	
Expenses attending Directors' Meetings	94 95	
Executive Meetings, services and expenses	114 00	
Stenographic services	15 00	
Expenses *re* London Exhibit, 1914	24 78	
Badges for Convention	14 00	
Cut	2 00	
Printing Constitutions	14 00	
Boxes for Vegetable Exhibits	22 05	
E. Longstaffe, Luncheon for Convention delegates	14 70	
Balance on hand	523 30	
		$1,334 48

F. F. Reeves: We have all been greatly interested in the Secretary-Treasurer's report. We all know he could not do otherwise than give us a good one. I am very glad to say that the boy who got wounded at St. Julien is once more fit for light duties, and I now have another lad in the ranks, and if the Almighty should will it and the Germans are good enough shots to put him out of the firing line, I have another one or two to take his place.

There is just one word I would like to say in regard to the tomato packing. The box is a great improvement over the old basket system.

R. A. Hamilton: In the matter of reports from the different Secretaries, while I am secretary of the Haldimand County Association, it was impossible for me from the time I received notice to make out the report. A special meeting was called for, and when we arrived in Dunnville, the building in which we hold our meetings had been fumigated on account of smallpox, and owing to that, there has not been anything doing since, and the report that I might give to you might take up too much time. The number of members of our Association are only 28, but last year we got quite a few new members. I am in sympathy with the Field Crop Competitions. They are one of the best things the Association has started, and I find it is one of the best things for the development of vegetable growing for communities to have these competitions.

C. W. Baker: In connection with the Field Crop Competition, I certainly felt very envious of Mr. Whale, who put up such a nice exhibit this year. I happened to be in charge of an exhibit just next to him, and people took a second look at his because those tomatoes were so nicely put up in those flats. Our secretary from London did not send in a very extensive report. We had an outdoor gathering inspecting greenhouses of Mr. Sanderson, Mr. Davis and Mr. Bycroft, who all live closely together. The gathering was a huge success, about 100 of the members and their wives being present. Just about that time the President of our London Branch enlisted and is now at the front, as well as several members—one of them has three sons at the front.

Thomas Delworth: Mr. Wilson's suggestion that we have Short Courses for the Vegetable Judges as for other crops is a very good one. In regard to the judges for stock, the class is addressed by men standing high in the different lines of stock. I can quite see how men who have attended a class of that kind will not make such mistakes as a man who goes to judge without such knowledge. We have been getting on very well with our Field Crop work, but we don't claim to be perfect. Some men will, for instance, judge a crop of onions and give 75 or 80 points for the absence of weeds, another man feels, as long as there is a good big crop with lots of money coming out of it, that is the main point. It is necessary for these men to meet and spend a day or two in a class and arrive at uniform ideas in regard to judging.

R. Dengate: With regard to Field Crop Competitions, while I might perhaps not be able to win a prize, I think that every member that puts in entries for a Field Crop Competition should be allowed to compete at the Exhibitions in the large centres, but not be forced to do so. While a man might not be able to win in the garden, he might be able to win at either one of the fairs. Last year my onions got blighted, my potatoes got frozen, and my celery was drowned, so I was out of it.

J. Lockie Wilson: When we started the Field Crop Competitions in vegetable growing, it was as an experiment. I am glad Mr. Dengate brought this matter up. In order that our exhibits might be respectable looking, we put in our regulations that the five prize winners in each section would be compelled to compete at London, Ottawa and Toronto. Now that was all right in the initial stages of our work, but from practical experience we have found that it is not going to work out much longer, for the simple reason that a man may take a 3rd, 4th or 5th prize in his district and that crop be a very inferior one, and yet he is obliged to send a sample of that crop of his to the larger Exhibitions. I think Mr. Dengate is right. We will have to throw off our swaddling clothes, and say that any man who competes may exhibit at these larger fairs, and drop out the compulsion. Because after all a man does not care, if it is a reasonably poor crop he has got, even though he may get a local prize, to bring that down to the larger fairs. The time has come when we should drop these bars and allow a man to compete at the big exhibitions if he feels that his stuff is worthy. This is a matter for discussion.

PROF. MACOUN: Representing the Ottawa Society, I was given two or three points which the members wished brought before the Association. This is one of them—that every member shall have the opportunity of exhibiting at the Exhibition if he cared to do so. I do not know whether that would meet with your approval or not.

Vegetable Experimental Plots, C.E.F., Ottawa.

J. LOCKIE WILSON: We pay the express charges on those tomatoes, celery, and onions to those different fairs, and I am afraid it would cost too much if we allowed everyone to compete, but we might try the plan of letting each competitor have the opportunity.

PROF. MACOUN: The next item is that the Ottawa Association would like a change allowing transplanted onions for the Ottawa District. The season is rather short, and in some seasons the onions grown from seed have not a very good chance, and they thought if there was an alternative so that both seed and transplanted onions could be included, it would help them out a great deal.

F. F. REEVES: I was very glad to hear the suggestion of both Mr. Dengate and Prof. Macoun. Prof. Macoun talks about it being difficult to grow seed-grown onions at Ottawa, but I saw the best crop of seed onions there that I could find anywhere in Ontario. I think if instead of every member, every competitor was allowed to compete, it would be a better idea.

Jno. Tizzard: I think compelling every one to send their stuff to these different fairs should be eliminated. Two or three years ago I got a prize for celery, but when I came to send it away to the fair I had not a head of celery in the whole patch fit for exhibition. This year I had one of the best patches of celery and I got no chance at all to exhibit, and if I had done so, there are few who could have competed with me for celery.

J. J. Davis: It would be all right to let every member compete, and if the number gets too large, we will have to let them pay their own express charges on their own goods. If a man thinks he has fine goods, he should not mind paying his express bill. If I thought my stuff was good enough to exhibit, I would not mind paying the transportation on it. But of course to be compelled to show whether I had good stuff or not, may cause a great deal of embarrassment, particularly in celery. Sometimes a man will have a good crop in the pink of condition when it is judged in the field, but, perhaps, by fair time, a blight might have come along and he might not be able to get a good showing of celery. I would limit it to competitors, simply to encourage people to compete. It is very hard in some districts to get people to compete.

W. McMeans: Celery and onions should be judged when they are coming on to maturity. That is when celery is at its best and when a man gets the money out of it: it should be judged a week or two before these Exhibitions come up.

J. Lockie Wilson: As our funds are getting a little limited, and these Field Crop Competitions are growing, I was wondering if this proposition would be all right, that the express charges on the goods of the five prize winners would be paid, but any competitor could enter by paying the express on his own goods. You can see that, if there was a good crop in the Province, we have about 800 or 1,000 members who might be inclined to enter the competitions and exhibit, so it is doubtful if that proposition would be workable.

R. Dengate: Let the prize winners pay their own. They are getting the most out of it.

Thos. Delworth: The suggestion that has been made to allow all competitors in the Field Crop Competitions to compete also at the Central Exhibitions is the better recommendation, one reason being, as Mr. Davis suggested, that it would tend to get more competitors in the Field Crop Competitions. With regard to paying express charges on the products of one man and not on that of the other, thus making two classes, this would create confusion and lead to dissatisfaction, and we should allow any man who enters as competitor in the Field Crop Competition to enter under the same terms as they are entering now. You will not find the expenses very large, because, in every competition, we have four or five prizes and there are only ten competitors. Some had eighteen, of course, but the whole eighteen did not compete. I have entered crops myself which looked very good within a week of the time that the judge came there. Blight came about a week after the judge was there, and of course destroyed the crop. This year the blight came about a week before the judge came.

J. W. Rush: The idea of Mr. Dengate is all right, to allow anyone who would enter the Field Crop Competition to show, those who cultivate their stuff to the best of their ability and you know they can only do their part and have to depend on higher powers for the results.

REPORT OF DELEGATE TO AMERICAN VEGETABLE GROWERS' CONVENTION, CLEVELAND.

F. F. Reeves, Humber Bay.

It was my privilege to be once more your representative at the Eighth Annual Convention of the Vegetable Growers' Association of America, held at Cleveland, Ohio, September 7th, 8th and 9th.

All the meetings were peculiarly interesting, the Cleveland Branch being organized seven years ago. The Cleveland Vegetable Growers whose hospitality is boundless, gave all the members a most hearty welcome.

By the reports of the Secretary and Treasurer the Association is in a very satisfactory condition, both numerically and financially. The original roll consisted of representatives of ten States: there are now thirty-five States and Provinces in the United States and Canada represented in its membership.

The attendance was very large (upwards of 400) especially when one considers that the conditions of vegetable growing have been unfavorable in nearly all sections of the country this last season. A particularly noticeable feature of the Convention was the large attendance of ladies at all the meetings.

The morning session of Tuesday, the 7th. was taken up with welcome addresses by Mr. Cooley on behalf of the Mayor of Cleveland, and Mr. John Cunningham for the Cleveland Vegetable Growers' Association, and receiving the reports of the Secretary and Treasurer.

In the afternoon an inspection trip was made to the Rocky River Greenhouse District, visiting the following farms: West Park Greenhouse Co., Rocky River Greenhouse Co., Western Reserve Greenhouse Co., Goldwood Greenhouse Co., and C. C. Christian Gardens.

The greenhouses on all these plants are very large, and contained lettuce and cucumbers in all stages from plants just set out, to plants that had been in bearing since June.

There were two inspection trips and on both of them visitors boarded street cars at the hotel which carried them as near as possible to the gardening district, where they were met by automobiles, upwards of 100 being provided by the Cleveland Growers for that purpose.

Wednesday morning session was taken up with a round table discussion on marketing problems, led by Mr. H. W. Selby, of Philadelphia; a great number of the members took part in the discussion which was largely on wholesale distribution, only one member, Mr. Foote, Cleveland, speaking on the retail side of the question.

Mr. Tiebout, of Louisiana, spoke particularly on cauliflower production. He said it had been proved that cauliflower can be grown successfully as a winter crop in that state to be marketed in December, January and February. All the growers in this state belong to one organization, whose manager markets the entire crop. Central packing houses are established in different districts. This Association purchased 375 lbs. of cauliflower seed in Denmark last year.

The advantages of advertising our products was also brought up. As a means of increasing consumption of our products, it was suggested that the growers advertise in the daily papers, when a full supply of a certain crop, say, tomatoes, would be on the market, and suggest that purchases be made for home canning.

The importance of close grading and careful packing was especially emphasized, the whole discussion was summed up in a few words by the Chairman, Mr. Selby, who urged that the time has come "to put co-operation into operation."

In the afternoon there was an inspection trip through the Shaaf Road Gardening District, Brooklyn. Among those visited were Mr. C. M. Hinckley, August Cook, H. H. Richardson, F. and C. Wutrick and M. L. Ruetenik. The outdoor celery in the gardens of H. H. Richardson and M. L. Ruetenik was exceptionally good. It had all been carefully sprayed, and there was very little indication of blight. The celery in nearly all cases was second crop, following early potatoes, peas, beans, radish, spinach, and, in one case, early cabbage. Paper was used for bleaching in nearly all cases.

In Mr. Cooke's greenhouse they were planting celery for a winter crop. It was planted about 9 or 10 inches apart, with paths at intervals. Mr. Cooke informed us that about the time this celery would be ready for market there was usually a glut of lettuce, and at that time there was a ready market for celery.

Visitors were greatly interested in the pre-cooling plant and cold storage warehouse at Mr. Ruetenik's. This is just completed and will be used especially for storing celery.

The evening session was devoted to a round table discussion on greenhouse problems and new crops suitable for forcing, led by Mr. R. L. Watts, State College, Pa. Among the crops suggested were celery, rhubarb, green onions, witloof chicory, cauliflower and lima beans. Mr. Ruetenik told of a successful crop of celery grown in his greenhouse this spring. The variety was Paris Golden, sown on January 20, pricked out when large enough 2 x 2 inches apart and set in the greenhouse beds 18 x 5 inches apart about April 15th. This crop was marketed between June 1st and 15th and realized from 65 cents to $1.25 per dozen. Mr. Ruetenik is also trying a fall crop of celery this year. Paul Work, of New York State College, led the discussion on muck land problems on Thursday morning.

The afternoon session was taken up with the reports of committees and election of officers.

Mr. D. M. Shoemaker, of the Department of Agriculture, Washington. D.C., presented a report of the Committee on Seed Inspection and Certification. He pointed out the desirability of greater uniformity of stocks of vegetable seeds. Seed potato certification and inspection is now in force in several states. It was suggested that there be two forms of certification, first as to freedom of disease and second as to purity of stock and trueness of varietal type.

The Committee on Nomenclature also gave a progress report.

It was stated that the American Seed Trade Association had appointed a committee to co-operate with the committee of the Vegetable Growers' Association, and take definite steps towards securing uniformity in the varietal names of vegetables and a decrease in the practice of sending out all sorts under new names.

The Convention closed with the annual banquet.

NOTES ON MUCK LAND, FOLLOWING DISCUSSION AT CLEVELAND CONVENTION OF A.V.G.A.

Muck may be defined as plant remains which have undergone more complete decomposition than in the case of peat. Muck is brown or black in color, and shows much less of the original plant structure than does peat. The plant food constituents in muck are not quickly available. Drainage, liming, applications of phosphorus and potassium compounds, and tillage, are the means employed to make muck soils productive. Van Slyke says: "A good bed of muck on a farm should be regarded as an important source of soil fertility, though largely indirect." It may be used for soil improvement, being used as an absorbent for liquid manure. But the main consideration of muck soils is in the growing of special crops such as celery and onions.

The round-table discussion was led by Paul Work, who started by giving a description of the formation of these muck lands. The prehistoric glacial action formed mounds and gulleys, which make up a "rolling" country.

In some of these hollows or "pockets" small lakes were formed, which were gradually filled in by plant growth. As these plants settled to the bottom and larger plants and trees grew upon the surface, we had, in time, a swamp formed.

Organic matter, such as leaves, branches and whole trees which settled into the swamp, underwent decay or fermentation through the action of bacteria in the absence of air. In the presence of air, this action is replaced by one which results in the complete combustion of the organic matter to carbonic acid gas.

Planting the seeds.

After years of this water-logged condition, in which organic material accumulates, we have formed large deposits of black or dark brown material known as humus or muck. It is essentially the same as the humus which we try to incorporate into any of our garden soils by the addition of barnyard manure or green crops plowed under. In a pasture more humus may be found that in a continually aerated, arable soil, more again in clays than in the lighter soils through which air easily penetrates. In other words, it is more difficult to maintain a sufficient humus supply in sand than in clay. This is for the reason that humus accumulates in the absence of air, as in water, which brings about the swamp condition. The accumulation of humus (or muck) reaches its maximum where considerable rainfall and an impermeable stratum combine to form a swamp or bog.

Under the above-mentioned conditions, calcium deposits are formed underlying the muck. This may be marl or clay. An old practice in England, in reclaiming, or bringing muck land under cultivation, was the marling process. Trenches were opened to the bed of marl or clay always found beneath the peat, and the clay thrown out and spread at the rate of 100 loads or so per acre. Where marl is less available, peat has to be brought into cultivation by draining the land with open cuts, allowing some considerable time to elapse during which the peat dries, shrinks, and consolidates, and then correcting the acidity with lime."

A characteristic of muck soils is their deficiency in soluble mineral constituents, notably salts of lime and potash. Because of the acid nature of the medium, it is also noticeable that bacteria of nitrification are absent or few in number.

Before considering the treatment of mucks, we must recognize the wide variation in their fertility. Coniferous mucks, or those formed from the growth and decay of "evergreen" trees, are brown and chippy. These are not so old as some other muck lands, or are of more recent formation in the long past. The deciduous mucks, or those formed from ash, maple, elm, etc., are older, black in color, more fertile, and come more quickly into use.

Another characteristic of the muck land is that its situation is low, usually in a sort of pocket, and therefore subject to frosts. For this reason we cannot have real early muck land.

A decided disadvantage with this type of land is that it lies level, is made up of very light material, and may be so windswept as to have the entire crop of seed blown away. As a preventative against a calamity of this kind, it is not desirable to attempt the growing of windbreaks. A movable wire and lath fence has been found very satisfactory. Another grower has found the most economical and satisfactory windbreak a fence made up of three wires stretched on posts or stakes. On these wires bags, in which the year's supply of fertilizer had been received, were cut open and fastened with ordinary clothes pins.

Drainage.—The question of drainage has to do with the moisture relation. Muck is the same as that material we call humus. It is porous, fibrous, vegetable material. Soils, on the other hand, are formed from rock. When we incorporate humus into any soil it helps to retain moisture. Humus binds together a sandy soil and makes it more retentive, while it makes a clay soil more open, due to the fact of clay being made up of very minute particles.

We find some muck soils 3 to 4 feet deep underlaid with about 10 feet of marl.

New mucks are generally hard to drain with tile; the difficulty being caused by the uneven sinking. In many cases, open ditches have first been used and sometimes are the only means of drainage. The chief objections to permanent open ditches are the inconvenience in crossing and the amount of land occupied. A calculation of the amount of land taken up with open ditches on some farms is surprising.

The tile drains have given best results when placed about 2½ feet deep. This maintains a water table close enough to the surface to allow plenty of water to rise by capillary attraction. One grower advocates the use of boards, on which to lay the tile, thus giving an easily obtained, level surface, and keeping the tile even until they have all settled. Another grower has never used boards under the tile, but has filled in the ditches gradually during the season. It requires greater care in laying tile in muck. Ditching machines have been used successfully on large areas.

Muck contains up to 4 per cent. of nitrogen, but not in an available form. For this reason it is necessary to apply fertilizers before we can hope to obtain best results. Undoubtedly muck requires a complete fertilizer and a 4.8.10 has been recommended as a good practice.

One grower prefers 2 tons wood ashes, ½ ton acid phosphate, and 150 lbs. nitrate of soda. Another grower has produced good crops with only 50 pounds nitrate of soda per acre.

Lime is of use and should be applied if the soil is acid, otherwise it may not be beneficial. In all cases bacterial action of the aerobic forms is needed. These bacteria may be introduced through the applications of barnyard manure.

Mr. Roebuck has found best results in the use of wood ashes, acidulated acid phosphate, and nitrate of soda.

Mr. Bowney, of the Western New York Farms Company, claims commercial fertilizer to be necessary, and advocates nitrate, phosphoric acid, and muriate of potash.

Coniferous mucks are less fertile, and because of the presence of resin there is less nitrogen.

Overhead irrigation is not used to any extent on muck land, but in Michigan the ditch method is used successfully.

Crops.—The crops which are favored for muck soil include onions, celery, lettuce and spinach. Cauliflower is a doubtful crop. Varieties of spinach most successfully grown are: Victoria, Viroflay and Eskimo.

Onion seed is best produced on upland rather than muck. Good potatoes are produced on some mucks in fall or spring, and the very best seed potatoes.

Muck soil has not been found satisfactory for greenhouse work; a sandy soil generally being preferred.

FERTILIZERS BEST SUITED FOR VEGETABLE CROPS IN ONTARIO.

B. Leslie Emslie, Division of Chemistry, C.E.F., Ottawa.

Market-gardening, or the Growing of Vegetables and Small Fruits, is a specialized and important branch of agriculture. It is the superlative expression of "Intensive Farming," whose successful pursuit demands intelligence, skill, business acumen, and, perhaps, above all, a knowledge of soils, manures and fertilizers, the factors which control in a very large measure the quantity and quality of the produce.

The primary object of the market gardener is to secure a maximum yield of first-quality produce from the land at his disposal, frequently a very limited area. Of equally great importance in the production of certain crops is the attainment of early maturity which permits the marketing of the crop at a time when the particular commodity is comparatively scarce and consequently commands a higher price.

"The early bird gets the first worm" is a proverb particularly appropriate in its application here.

It is not intended that this should form a treatise on vegetable and fruit-growing, but a simple and brief statement of certain important matters relating to the industry, a discussion of which may assist the market gardener in the successful and profitable pursuit of his calling.

Quality in Vegetables.—Although vegetables have a distinct food value, they do not primarily find a place in the diet of the majority by reason of their sustaining qualities. It is rather their wholesomeness and palatability and the fact that their use allows a pleasing, economic and thoroughly rational variety to the diet that a prominent place on the menu is accorded them and especially on that of the chief meal of the day. Quality ranks in importance with earliness and yield;

it is the factor that largely determines the commercial as well as the culinary value of the produce. Especially is it of importance, if the market gardener seeks to establish a reputation and a steady, profitable market for his vegetables, as is accomplished to-day by the dairyman and the poultryman for their produce.

Quality in vegetables implies succulence, crispness, good flavour, an absence of woody fibre, or stringiness, pungency and bitterness. Thus, in early beets and turnips, to be palatable, there must be no development of woody fibre; radishes must be crisp and free from pungency, lettuce must be tender with no suspicion of bitterness.

How is quality obtained apart from that inherent to and naturally governed by the variety? The answer is: By a quick and uninterrupted growth. The development of the crop must be rapid and continuous. Apparently the next question to be answered is: What are the factors, the conditions, that control this rapid growth? The factors are, briefly: Favorable climatic conditions, warmth, sunshine, rain, an agreeable, suitable soil, and an abundance, indeed an excess, of available plant food in the soil, ready at all times, when conditions of growth are favorable, to be utilized.

The recent introduction of irrigation systems enables the market gardener to partially control the moisture supply, and in greenhouse work practically all the factors are under his control.

THE SOIL.—It is unnecessary to describe the manner in which soils have been formed by the ceaseless operation of natural constructive and destructive agencies. Fertile soils are chiefly composed of varying proportions of sand, clay, limestone and humus. According to the predominating ingredient, soils are designated as sandy, clayey, limestone or muck. A loam soil is a blend of approximately equal proportions of sand and clay with an admixture of humus. A loam or sandy loam is the ideal soil for market gardening.

The soil must be well drained to permit the free circulation of air and moisture, and, at the same time, must be liberally supplied with humus to ensure the retention of sufficient moisture for plant requirements. A water-logged soil is always a cold one, and the sun's rays, instead of transmitting warmth to the soil, are utilized in evaporating the superfluous moisture.

The maintenance of the humus supply in the soil is important in all branches of agriculture, but particularly so in that of market gardening. Humus not only fulfils the mechanical function of rendering soils porous and more retentive of moisture, but furnishes also the essential medium for the activities of the favorable bacteria, and represents the chief natural source of the soil's nitrogen supply.

NECESSITY FOR MANURE.—The importance of manure in market gardening can scarcely be over-estimated. Stable manure has been and probably always will be the main stand-by of the market gardener. Its chief value is not due to its fertilizing properties—and these are not inconsiderable—but rather to the fact that it supplies humus forming material, without which the soil cannot become an ideal medium for the growth of crops. Very liberal manuring is necessary in order to maintain an adequate humus supply. Cultivation, or frequent stirring of the soil, promotes the oxidation and decomposition of organic matter, and thus depletes the humus. Consequently, in market gardening, where cultivation is essentially thorough and crops frequent, the rate of humus depletion will be exceedingly rapid were insufficient means employed for its maintenance.

It is possible, of course, to apply excessive quantities of manure, which, besides being wasteful, would be inimical to crop growth, but such a possibility is remote in market garden practice, where the frequency of cropping entails a heavy draft on the available plant food.

No farm product is so variable as manure whose composition and value depend on a great many factors. Among those are the kind, age, function and food of the animal producing it, the quantity and nature of the litter employed, and, last but not least, the care taken in its storage.

The analysis of a large number of samples of mixed fresh horse and cow manure from animals well fed and sufficiently bedded with straw to hold all the liquid ex-

Method of drying radish seed on Otto Herold farm, Beamsville, Ont.

creta, gives the following average figures per ton. Nitrogen 10 lbs., phosphoric acid 5 lbs., potash 10 lbs.

For the ordinary type of market garden soil partially rotted, "short" manure is better than fresh, "long" manure, and it should be well worked into the soil. If it is necessary to hold manure for any considerable length of time before its application to the soil, the heap should be kept compact and moist and protected from leaching rains.

The specialized nature of the market gardener's operations precludes the possibility of producing any appreciable quantity of stable manure on his own premises, and he is, therefore, dependent largely on city stables for his manure supply.

Although the production of the manure he uses is beyond his control, it is none the less necessary that the market gardener should be familiar with the factors which regulate its value.

Losses from manure occur chiefly through fermentation and leaching. If piled in a loose heap, fermentation (due to the free access of oxygen) is rapid, and serious loss of nitrogen, in the form of gases, results. Horse manure, being of looser texture and containing a larger proportion of undigested food, ferments more readily than cow manure. To reduce the danger of excessive fermentation, the manure heap ought to be kept firmly packed and reasonably moist.

Loss through leaching occurs when the manure heap is exposed to the action of heavy rains, or when the water hose is turned on it, after it has been loaded on the railway cars.

When we consider that more than one-half the nitrogen and nine-tenths, or nearly all, the potash of manure is contained in the liquid portion, the seriousness of this loss by leaching can be readily appreciated.

At the present time the potash contained in manure represents the almost exclusive source of that ingredient for the market gardener, so that careful conservation of the liquid manure is now particularly important.

THE COMPOST HEAP.—In market gardening the compost heap finds an appropriate place and provides a means of profitably utilizing large quantities of vegetable refuse, which would otherwise go to waste. If these are composted with a little manure and good loam a valuable soil dressing may thus be produced at a very small cost.

NITRIFICATION.—Incidental to the decomposition of humus in the soil is the process of nitrification, or the formation, through bacterial action, of nitrates, the form in which non-leguminous plants take up their nitrogen. In the decomposition of organic matter certain acids are formed which require the presence of lime to neutralize them and permit the bacteria to work uninterruptedly. For example, the bacteria producing lactic acid in sour milk cease their activities when .7 per cent. of the acid is present in the solution; if, however, a neutralizing base be added, the bacterial operation is resumed, and continued until the .7 per cent. of free lactic acid has again been attained.

LIMING.—It is safe to assume that the majority of market garden soils, to which heavy applications of manure have been made, will be benefited by lime in some form. Any soil which contains less than .5 per cent. of lime may be said to require liming.

The object of liming may be two-fold: first, to correct acid conditions, and second, to liberate mineral plant food, the latter object deserving special consideration at the present time.

Limestone, or carbonate of lime, also known as "mild" lime, is the chief naturally occurring lime compound, and is a suitable, safe form for general application.

When limestone is burned carbonic acid gas is driven off and lime, known as "burned," "quick" or "caustic" lime, is obtained, 100 lbs. of limestone yielding 56 lbs. of lime.

If water be added to lime, "slaked" or "hydrated" lime results.

Slaked lime, when exposed to the free action of air, gradually absorbs carbonic acid gas and thus reverts to carbonate of of lime.

Both the burned lime and slaked lime are caustic in their action and vigorously attack the soil's organic matter. For this reason caution must be observed in their employment, which should be restricted to soils very rich in humus and to heavy clays. On the latter type of soil lime acts beneficially by destroying the natural cohesiveness of the clay particles.

An initial application of limestone, to soils pronouncedly deficient in lime, might be made at the rate of four tons per acre, which amount would be equivalent, in lime content, to about three tons of slaked lime or two and a quarter tons of burned lime.

Land plaster, or gypsum, is a sulphate of lime, of which there are natural deposits in Canada. Gypsum is valueless as a soil-acid neutralizer and ought never to be applied with this object; in fact, it would rather tend to increase the acidity, as sulphuric acid, with which lime in this form is combined, is one of the strongest acids known.

Gypsum, however, when judiciously applied, at the rate of 500 to 1,000 lbs. per acre, may prove beneficial by virtue of its effect in liberating plant food.

While most of the unfavorable bacteria seem to thrive in acid soils (e.g., *Plasmodiophora brassicæ*, produce "club root" in turnips and cabbage), an exception should be noted in *Tubercini scobies*, causing potato scab, which is encouraged by an excessive alkaline condition of the soil. For this reason it is not advisable to apply lime, in any form, to land immediately before its occupation by a potato crop, the better plan being to apply it at a place in the rotation furthest removed from that crop.

Green Manuring.—The growing and plowing in of a cover-crop furnishes a valuable means of supplementing the manure supply where the latter is scarce, but is more adapted to "extensive" than to "intensive" agriculture, and, therefore, cannot be fully taken advantage of by the average market gardener.

Legumes, such as clover and vetches, owe their popularity as cover-crops to the peculiar faculty, common to all plants of that family, of deriving their nitrogen supply from the soil atmosphere by the aid of special bacteria which live in little nodules on their roots. Where its practice is possible, green-manuring with legumes commends itself as a means of enriching the soil in humus, as well as of supplying a large amount of valuable nitrogen, the most expensive ingredient in commercial fertilizers.

Commercial Fertilizers.—These should be regarded, by the market gardener especially, as supplements to rather than as substitutes for stable manure. At the same time they can probably be more profitably used in market gardening than in any other branch of agriculture, for when accompanied by thorough cultivation their use is attended by the most beneficial results.

Of the ten or twelve plant food constituents essential to plant development, but three tend to become deficient in available amount for crop requirements in the average soil. These are nitrogen, phosphoric acid and potash, and commercial fertilizers are employed with the object of supplementing the soil's available stock of these plant foods. We have noted that a ton of average, well conserved stable manure contains about 10 lbs. nitrogen, 5 lbs. phosphoric acid, and 10 lbs. of potash, so that manure may be considered a complete fertilizer. When we realize, however, that the majority of crops require at least twice as much phosphoric acid as nitrogen, it appears that manure is too highly nitrogenous to be a well-balanced fertilizer for certain crops. It is here that fertilizers find a use as balancers and in permitting a more economical use of the manure.

Numerous experiments have proved that in the production of large yields of first-rate quality the combination of a medium application of manure and suitable commercial fertilizer has produced results superior to those obtained from manure alone.

A knowledge of the functions of the three fertilizer constituents—nitrogen, phosphoric acid and potash—will guide the market gardener in the intelligent application of manures and fertilizers to hiis crops.

Nitrogen promotes the growth of stem and leaf, to which it imparts a deep green colour, and gives bulk to the crop. It is, therefore, an important constituent

Hothouse cucumbers ready for market, uniform in size.

of a fertilizer for cabbage, lettuce, or other leafy crop where a large leaf development is desired.

Phosphoric acid promotes the fruitfulness and early ripening; it influences chiefly the root development in the early stages and seed or fruit formation in the later stages of growth, which explains its importance for turnips and grain, as well as for all fruit of seed-bearing plants.

Potash is essential to the formation of carbohydrates, which comprise the starches of potatoes, grains, etc., the sugars of fruits and vegetables, and the fibrous matter of plants.

Ready Mixed Fertilizers.—There are numerous brands of mixed fertilizers on the market, containing varying percentages and proportions of nitrogen, phosphoric acid and potash, and usually designated by the manufacturer as suitable for certain specified crops, but the market gardener will find the purchase of the separate fertilizer materials the more economical and convenient practice.

If asked to recommend a standard vegetable fertilizer, we should consider one containing 4 per cent. nitrogen, 8 per cent. phosphoric acid and 10 per cent. potash as approaching the average requirements; 530 lbs. nitrate of soda, 1,000 lbs. acid phosphate (containing 16 per cent. available phosphoric acid) and 400 lbs. muriate of potash would represent the equivalent of one ton of 4-8-10 goods.

Quite evidently the primary object of fertilizing ought to be the supplementing of the soil's supply of immediately available plant food, thus ensuring adequate and proper nourishment of the crop during the most critical stages of growth. It therefore follows that the choice of materials should fall on those which will most readily yield up their elements of fertility, and a judicious selection is, as a rule, possible only with the employment of the separate fertilizer materials.

In many of the ready-mixed, "complete" fertilizers the plant food ingredients are present in slow-acting forms which, although suitable, perhaps, for certain crops whose period of growth is long, are not desirable in market gardening, where it is necessary to exert, to the greatest possible extent, control over the rate and amount of plant food assimilation at different seasons. Such a control is most nearly attainable through the judicious use of quick-acting fertilizers.

Nitrogenous Fertilizers.—*Nitrate of Soda* (containing 15 to 16 per cent. of nitrogen) is the most popular and quickest acting source of nitrogen. Owing to its extreme solubility, the rapid availability of its nitrogen and to the fact that, on light soils especially, nitrogen is liable to get leached to the subsoil by heavy rains, applications of nitrate of soda should not exceed 100 lbs. per acre at one time. The best results are secured by small and frequent applications, given according to the crop's demands.

The function of nitrogen in promoting growth of the vegetative parts renders caution necessary in applying nitrogenous fertilizers to fruit or seed-producing plants, as an excess may prove detrimental by causing abnormal and protracted growth and immature or late fruiting.

Sulphate of Ammonia (containing about 20 per cent. of nitrogen) is rather slower in its action than nitrate of soda, and perhaps, more suitable for application in moister climates, provided that the soil is adequately supplied with lime which is necessary for the nitrification of its ammonia.

Dried Blood (containing 12 to 16 per cent. of nitrogen), a by-product of meat abattoirs, is a valuable organic source of nitrogen and very suitable for market gardening, but its cost often prohibits its use as a fertilizer.

Tankage of various grades, also an abattoir by-product, finds extensive employment in the preparation of ready-mixed fertilizers. There are numerous other materials, such as wool and hair waste, hoof and horn meal, whose nitrogen is so slowly available that they cannot be considered worthy of a place in market garden practice.

Phosphatic Fertilizers.—Bones represent the oldest phosphatic fertilizer and are still employed in various forms. Of these *Steamed Bone Flour* is one of the most valuable, its fineness rendering it more easily decomposed than ordinary ground bone. Being an organic substance, bones are attacked by soil bacteria and ultimately most of their phosphoric acid becomes available, but the process is slow.

Dissolved Bones (containing 13 to 17 per cent. of available phosphoric acid) result from the treatment of animal bones with sulphuric acid to render part of their phosphoric acid soluble in water, and, therefore, more readily available to plants.

Sir John Bennet Lawes, founder of the world-famous experiment station, at Rothamsted, England, commenced in the year 1834 to conduct experiments with bones as a fertilizer, and found that by treating with sulphuric acid the phosphoric acid of the bone was rendered more available to plants. Later on, the discovery of the mineral phosphates furnished him with a new material which, treated in the same way, produced similar results.

Superphosphate or Acid Phosphate (usually sold in two grades, containing 14 and 16 per cent. available phosphoric acid respectively) is the most popular and quickest acting of the phosphatic fertilizers. It is produced from the treatment of raw phosphate rock with strong sulphuric acid. Phosphate rock is a phosphate of lime, and the action of the sulphuric acid results in the replacement of part of the lime by water, creating a water-soluble phosphate. All the phosphoric acid is not present in this form, however; part is in the form of di-calcic phosphate which, although not soluble in water, is soluble in dilute acids, such as are present in the soil. and, therefore available to plants. Another small proportion of phosphoric acid in Acid Phosphate is insoluble and practically valueless. The term "available" in its application to the phosphoric acid of fertilizers denotes that which is soluble in the chemist's citric acid test and includes the water-soluble, as well as the citric-acid soluble.

Basic Slag (containing about 12 per cent. available phosphoric acid) is a by-product in the manufacture of steel and is placed on the market in the form of a fine powder, 80 to 90 per cent. of which should be sufficiently fine to pass through a sieve having 10,000 meshes per square inch. None of the phosphoric acid in Basic Slag is water-soluble, and it is, therefore, slower in its effects than Acid Phosphate, but is often preferred on account of its basic nature for soils which are deficient in lime. Some brands of Basic Slag contain the equivalent of 40 per cent. carbonate of lime. In the preparation of Acid Phosphate sulphuric acid combines with lime to form sulphate of lime, or gypsum, whose characteristics we have already noted, so that acid phosphate contains a fairly large proportion of gypsum.

Potassic Fertilizers.—Previous to the war, the principal sources of potash were muriate of potash and sulphate of potash (each containing about 50 per cent. of potash), obtained from Germany. Now they are practically unprocurable, or only at such prices as preclude their use in agriculture. Consequently we have to turn our attention to substitutes, but the list of these is small and their supply limited.

Wood Ashes, once so plentifully produced in Canada, are one of the best, if not the very best potash fertilizers. They contain their potash in the form of a carbonate, the most favorable form for the nutrition of crops: they also contain about 2 per cent. phosphoric acid and 20 to 30 per cent. carbonate of lime. Their potash content varies, in good, unbleached ashes, from 4 to 6½ per cent.

Seaweed represents another source of potash, but is at present available only to those located on the seaboards.

Owing to the scarcity of potassic fertilizers, it would, therefore, seem that resource must be had to other means of overcoming the deficiency of potash in the soil. No other plant food can entirely replace potash in its functions, but it has been noted that where a marked deficiency of potash occurs plants will assimilate abnormal quantities of soda. Nitrate of soda then would appear to present a partial solution of the problem, although its favorable action in this direction would be probably more particularly due to its appreciable effect in liberating soil potash.

The use of lime, or lime compounds, as potash liberators has already been referred to. Another substance, sulphate of soda, has been suggested as a means to the same end, but, as this salt is the predominating one in the unproductive "alkali" lands, we should hesitate to recommend its extensive use.

After all, the market gardener is probably less affected by the potash shortage than are his brother agriculturists, for experiments have shown that where large, or even medium applications of good manure are made, the addition of further potash, as a fertilizer, is frequently unnecessary.

Attempts are sometimes made to prescribe fertilizer mixtures for certain crops, but, owing to the widely varying conditions of soil, climate, etc., and to different methods of treatment, these cannot have a very wide application. Within certain limits, of course, we may be able to predict results from the use of special fertilizers on crops whose peculiar appetites are known, e.g., the passionate fondness of the cabbage for nitrogen, of turnips for phosphoric acid, and of potatoes for potash.

It remains for the market gardener to discover by experiment on his own soil its more exact fertilizer requirements.

In market gardening, however, there is not the same necessity for close figuring as there is in general farming with its wider areas and less valuable crops, so that he will do well to err on the side of excess rather than on that of frugality in the feeding of his plants, bearing in mind that any surplus of phosphoric acid and potash over immediate requirements will be retained in the soil for future crops.

J. J. DAVIS: In my experience with fertilizers (and I have used them a good many years and to good advantage) I have found that potash is the one thing that I can dispense with more than either nitrogen or phosphoric acid on my land which I have cultivated for a period of at least twenty years, and I am buying more fertilizers to-day than I ever did. I find that the chief thing I need is nitrogen. I use phosphoric acid, and previous to the war I used potash, too, but I never saw any conspicuous results from the use of potash.

B. L. EMSLIE: What is the nature of your soil?

J. J. DAVIS: It is ordinary gravelly or sandy loam. There are lots of such soils in the country—rather porous land with pretty good heart in it, but too open bottom and it needs lots of feeding. It has been my experience that less of potash and more of nitrogen is what my land needs.

J. W. RUSH: I dare say nitrogen applies very well to leaf plants, but how does it work out with other crops, such as potatoes, tomatoes, etc.?

J. J. DAVIS: I find it works out pretty well. I have grown wonderfully fine crops of tomatoes, in fact, it has been one of my principal crops indoors and out of doors. I make a good proportion of my money on tomatoes—the nitrogen gets them along early. Of course, a person can go too much in that direction, because I believe a person could put on enough nitrate of soda so that his tomato plants would run wild, but I find, after the tomato plant once begins to set fruit, it is best to give it lots of nitrogen, and the fruit that is forming will keep the plant from running wild, and the nitrogen will protect all the fruit that it will set.

THOS. DELWORTH: Have you made any experiments with phosphoric acid?

J. J. DAVIS: Not separately; what I have principally used the last few years is a grade of six ammonia, thirteen phosphoric acid. Before the war started I used muriate of potash and used it rather liberally, but since the war started I have managed very well without it.

John Brown: This year I did a little work in the tomato line, trying out both nitrogen and potash. When we came to picking the tomatoes about the 20th of July, I found that we could pick ten baskets more to the 100 plants on the potash-fed plants than on the others.

B. L. Emslie: Regarding Mr. Davis' remark: of course 4-8-10 is a fertilizer pretty high in nitrogen, and the proportion of phosphoric acid is almost always higher, but I quite agree with him that results can be obtained under certain soil conditions with nitrogen alone. There is not the same necessity for buying potash, and it has been the experience of countries in Europe, that they have got good results by using large applications of good manure without potash, but where manure is of poor quality, the potash proved necessary.

The question was asked, what quantity of lime should be applied to ground where clover is grown or on a loam soil. Unless it is pretty rich in humus—and I

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imagine in this case where clover is grown that it would be rich in humus—an initial application might be used of two tons per acre, that is equal to nearly four tons of limestone in lime content. It aids decomposition of organic matter. Two tons as an initial application of burned lime—brick lime—would be suitable for soil rich in humus, or on heavy clay as I mentioned before.

J. J. Davis: What form do you consider is the best form in which to apply lime?

Thos. Delworth: As a general rule, I consider as carbonate of lime; but perhaps at the present time while potash is scarce, on my heavy clay soil or other soil that may not be so heavy but contains a large quantity of organic matter, I would be inclined to apply the lime in the form of burned lime, but only in such a case, because its action in developing plant food is more rapid than in the form of the carbonate of lime.

John Brown: What would you call excessive manure?

B. L. Emslie: It would depend on the crop—take, for instance, cabbage, it is hardly possible to apply too much manure for it.

F. G. H. Pattison: The French gardeners, who have, perhaps, with the exception of the Japanese effected the most extraordinary results in gardening, use from 500 to 1,000 tons to the acre of manure. I know very well about the French gardens, as I made a special study of that.

A Delegate: How is a man to know if his soil needs lime manure?

B. L. Emslie: The best way or the quickest way to find out if soil requires lime is to test it with blue litmus paper. You take a sample of soil and add a little water to it, put it in some vessel and put the litmus paper in, and after about fifteen minutes, if the blue paper turns red, you may assume that the soil is acid and requires lime, and of course, to some extent, the rate at which this effect is noticeable, would indicate the degree of acidity. But that is the simple way to find out.

A Delegate: One of our fertilizer companies has been charging $9 per ton for carbonate of lime. Another firm in Toronto are putting it up, if I remember correctly, in carload lots, in sacks, f.o.b. Toronto, at somewhere about $4 or $4.50 per ton. Now in a great many parts of the Province we have deposits of marl, and near my own place I found a deposit of this material. I sent it to Guelph, and I find it contains 90 per cent. pure carbonate of lime. In this case, of course, the demand was not enough to make it a commercial proposition, but where there are deposits of marl in any of your parts of the country it would be a very good idea to send a sample of it either to Professor Emslie or to Guelph, and it will prove a much cheaper source.

F. G. H. Pattison: In connection with the carbonate of lime, in the Niagara Peninsula they were selling in carload lots, crushed at 80 cents a ton, delivered in the fruit district. I should think you could get that at any time.

A Delegate: Would that be the Queenston Quarries?

F. G. H. Pattison: There are the Canadian Quarries, Limited, Vinemount, or the Canadian Quarries at Dundas. There are two or three large concerns. As a matter of fact, the fruit growers can get it and can hold it themselves over the winter. It is crushed very fine, so as to be available.

Prof. Crow: In regard to Mr. Pattison's statement as to the use of manure by French gardeners--the 500 or 1,000 tons which he speaks of as being used are not used in the nature of a fertilizer, as I understand it, but to make practically a hot bed of the entire ground. I understand the ground is practically solid manure, and they grow their vegetables in that way.

As to how humus can best be obtained, I notice in the *Market Gardeners' Journal* that some growers on high priced land near cities and under irrigation as well are putting down a portion of the lands, dividing their land, so as to make it a rotation—probably every six or seven years—in clover for an entire season in order to plow down for humus. Now would our market gardeners feel that it would pay them to devote even a small part of their garden to late clover for an entire season to plow down?

A Delegate: I think that depends on what stable manure costs to lay down in his place.

John Brown: I tried a little of that experience. I put in seventy-five tons of store manure from Toronto; the next season I could not get anything out of it, as I could not get my humus back. I put a strawberry bed in. This year, however, it was not in any part of the product except the strawberry bed.

J. J. Davis: In regard to what Prof. Crow said, the trouble is in plowing clover down, that he would need to give it a whole season, and we are generally limited as to area. Most of the gardeners of to-day don't like to lose a piece of ground a whole season for that purpose. I have taken off one crop, say beets or something like that, a crop that I could get off early, and then sowed the ground with Hairy Vetch. I had some time in plowing it down. It took three of us to get it under. Of course that was the first time I had tried it, and it took three of us a day and a half to plow about one and a quarter acres. The result was that the next year there was a crop and you could see that it did the ground good. After that I never let it get so tangled before plowing it under. This time it was getting to seed and you simply could not do anything. In some places the coulter would not go through. I put a man at it and I went to market, and when I got home they had given it up for a bad job. Then I got a rolling coulter and set them at it again, and it was not much better, so I went at it myself, and I did it, but I think it is a great thing for supplying the land with humus. It is about as good a thing as a man can do.

Howard W. Selby: Our ground near Philadelphia is valued at from $800 to $1,000 an acre, and as a brother at the end of the table said, we do not like losing any part of that ground for a season, but we have planted this Hairy Vetch for several years now, after we had taken in the beets and while the tomato plants are still in the ground, and it grows continuously all winter, and about March or the first of April, we plow it down. The way we made the discovery whether ground needed lime was to make a test with the vetch. It grew rather straggly in the ground which was left without lime and where we put the lime on, the vetch grew waist high. I drew some of the roots out of the ground, and I got parts of them which were from two to three feet in length. Now they were heavy with nitrogen-gathering bacteria, and the benefits which the ground got were certainly very great. The best celery we got was grown there, and we found that one of the best things for producing crops from your soil.

J. W. Rush: We use a double cut-away harrow, and we go over everything that is six feet high. It cuts it all to pieces, and any ordinary plow boy can operate it.

H. W. Selby: That is what we use in cutting our vetch.

ADDRESS BY FRATERNAL DELEGATES FROM ONTARIO HORTICULTURAL AND AMERICAN VEGETABLE GROWERS' ASSOCIATIONS.

Rev. A. H. Scott, Perth.

It was my privilege and pleasure, two or three years ago when President of the Ontario Horticultural Association, to come to your meeting and address you on behalf of our Association. It is to me an equal privilege and pleasure to meet you again this morning.

There are two points of contact that you will allow me to note, that make your interests and ours one. One of these points of contact you have noted feelingly and to me most sympathetically this morning, when you referred to Canadian interests and that means our personal interests, in the ghastly business that is being conducted across the sea. You spoke of your son; I have five sons. The most heroic of my five boys was the one whom we laid in his last resting place in a Glengarry cemetery a week ago last Friday—my eldest boy who fought tuberculosis for six long years and who succumbed to it just the other day. We talk about the heroes of the battlefield, and we speak of them feelingly and grandly, but we are a little inclined to overlook the heroism that is manifested often within four walls by our sick, brave and exemplary young men. I have another son who is at the head of a business department in one of the large enterprises of Canada. I have another who is a prisoner of war to-day in a hospital in Germany. Like others, he was wounded and he fell at Langemarck, left for dead by his own officers, he was afterwards picked up by the Germans and taken off to a hospital, where he has been treated since that time, and although he says he has five beauty spots in his side and a fractured hip and other parts of the body severely wounded. and is the most severely wounded soldier from the British expeditionary forces that

Growing carrot, beet and onion seed, Vineland Experiment Station.

has come to that part of Prussia, he pronounces himself lucky. I have another son who is at the head of one of the divisions of British Army Medical Corps. If he is permitted to come out as he has been permitted to do in the past, he will perhaps be able to tell us the story. My other boy is likely to go to the battlefield, and if these boys' father were younger than he is to-day, he, like they, would join the forces.

It is your privilege and mine to say these things in public utterance, and I suppose there are gentlemen around these tables to-day who could tell tales which would perhaps equal or possibly excel these.

The other point of contact that brings us close together to-day, is our common interests in the soil. For in the Province of Ontario we are particularly favored by a kind Providence in bearing testimony to the world at large and in seeking to do honor to our own selves, in being privileged to cultivate the acres in this Province of Ontario, for I have somewhat of an intimate knowledge of the conditions in European countries and in other parts of North America, and I have for a long time been under the spirit of a conviction that the sun shines more beautifully on no part of God's earth than upon our own Province of Ontario, and that, if we play our parts as we should play them, there is no part of this Continent that is better privileged to tell to the world at large what can be done upon the soil than here in the place of which this City of Toronto is the centre. And in order that we may do that, we should take particular notice of the three kinds of soil cultivation. There is that kind of cultivation that is called "Extensive Cultivation," the extensive meaning the taking hold, if we are farmers, of 600 acres or twice that number and spreading ourselves over that as water is spread over a very large area, and we don't do our work well if we do it too extensively.

Then there is what is called "Pretensive Cultivation," the kind of cultivation that lifts itself in a sort of pride and says, "A million of dollars expended upon a certain place for machinery and other things in keeping," and conducting their work on that basis, leaving the impression that the ordinary man with five acres or 100 acres is not doing anything, and if we cannot do our work as the millionaire does it, we cannot get the results. That is the "pretensive way." Some people say we are failures if we do not do things that way and we should not be carrying on business, but we should not be carried away by that sort of thing.

Then there is the last and the best kind of cultivation—"Intensive Cultivation." Let us do that and do it well, and we will be pre-eminently successful, and we will be setting an example to other people.

Before I sit down, in order that I may be as practical as possible, will you allow me to give you and the gentlemen around these boards a formula that I got long ago some place and I put it down in my book, and I have it in my head and I want to keep it, and if you have not got it I want you to have it to-day. It is:

Q plus Q plus M=S.

"Q," let us call it Quality—plus
"Q," let us call it Quantity—plus
"M," let us call it Method—and it gives you
Service.

And when in our various departments we seek to be servants, doing efficient and honorable service, we are doing a noble work, and I think this formula will be of value to you.

C. W. Waid, Lansing, Mich.: It was my pleasure a few years ago to be present at your convention, and I have always had a very pleasant memory of that occasion, and I am very pleased to be with you again to-day. At that time I was engaged in market garden work, especially greenhouse work, but at this time I am connected with the State Institution—the Michigan Agricultural College—and am thrown in contact with the gardeners of that State and frequently of other states, so that while I am not actively in the work at the present time, my sympathy is with them at all times.

I realize this year has been one which has tried many of the gardeners. I might speak at some length on that one thought, but it is not necessary for us to bring up our troubles, unless by so doing we can eliminate them and improve our conditions.

I am sure that if it was possible for some of the other gardeners of the States with myself to visit you, they would realize, as I do, that your work here is very successful so far as the organization feature of it is concerned, and, of course, that means the individual as well. I was very favorably impressed in meeting with you before, with the thoroughness with which your organization work is carried on. I realized at that time that we have few, if any, organizations in the States that are accomplishing the work that this little body has been able to accomplish, and I might add that at the time of my visit there were horticultural and pomological conventions, and I saw that the work was going on well in all these associations.

Howard W. Selby, Philadelphia: I suppose an introduction of greetings from the City of Brotherly Love, sounds good to you, particularly in a time like this, but I have been very much impressed on this trip from the time I crossed the Suspension Bridge, to witness the great spirit which is being manifested throughout your Dominion. The soldiers were boarding the trains all the way from Niagara Falls, Ont., at every station right into Toronto, and they certainly showed a wonderful spirit; it made one feel that they were out for business.

To speak on behalf of the Vegetable Growers' Association of America is a thing which I am always delighted to do. Your President brought into his report on the Cleveland Convention the fact that I gave the slogan to our National Association at Cleveland that "Co-Operation must be put into Operation." It seems that we have been talking along that line a great length of time, but what we have accomplished to this time seems to be very little. But what I notice amongst the members of the Association is that they are getting down to the hard tacks of business, and while they are appreciating the importance of the production element, they are also giving a great deal of consideration to the problem of marketing. And I could never say anything along the line of vegetable gardening without talking about the ultimate and marketing problem, the end of it which brings the dollars and cents out of it, because that to me is the most serious end of our work. Low prices are bringing us to the place where we must seriously work on that phase of our business.

I would extend to you the greetings of our National Association, and I do sincerely hope that a large number of you will attend our next convention. We have enjoyed meeting the men whom you have sent as delegates, and I believe they have brought back some pointers which they appreciated and put into practice. I hope more of you will find your way to our convention next year—the place has not been decided upon yet, but it is always in a centre where there are a live lot of market gardeners, and there are points brought up for discussion which are beneficial to all present.

VEGETABLE WORK AT THE ONTARIO AGRICULTURAL COLLEGE.

J. E. Britton, O.A.C., Guelph.

At the Annual Convention of the American Vegetable Growers' Association arrangements were made for all experimental station men and all college men attending the convention to meet at supper, for the purpose of becoming acquainted and to get together for a real round-the-table talk on questions common to all. About twenty gathered, representing different parts of the country, from Virginia to Michigan and from Louisiana to Canada. When the talk began, it took the form of a discussion led by T. C. Johnson of Virginia. Now the subject of this discussion was not college problems or experimental station problems, but by consensus of all present it was: "What are the Problems of the Vegetable Grower, and how can the Experimental Station and Agricultural College serve him?"

We all meet with problems and difficulties in our work, and we are often apt to consider our troubles of a nature affecting only ourselves, and for that reason try to solve the questions alone. But in council there is wisdom, and one thing I learned from this discussion: that from every part of the country, the college and experimental station men in vegetable work are meeting similar difficulties.

Vegetable gardening is recognized as that branch of agriculture which has received the least amount of scientific attention, and yet the practical vegetable grower is more expert in his work than any other farmer. The very nature of his work demands this. He carries on the most intensive form of agriculture and practices the most economical methods. Already, in so short a time, the question of production has been passed by, and the big questions discussed at our conventions to-day are markets and marketing, co-operation, etc. These are the questions confronting the fruit growers also. But there has been, and always will be, experimental work to be done which relates to the production of vegetable crops, such as fertilizers, plant breeding and seed production, variety tests, soil treatment, insect pests, fungus diseases, etc.

In the past, fruit growers have demanded much of the colleges of agriculture, while the florists and vegetable growers have not made such demands. The responsibility for work done in the several lines of horticulture does not rest alone with the members of the Department of Horticulture or with the Institution. What the vegetable growers want they, probably, will secure. And so it is largely up to the vegetable growers to help answer that question which comes from many quarters, "What are the Problems of the Vegetable Growers, and how can the Experimental Station and Agricultural College serve their Interests?"

Referring again to the Cleveland Convention, Mr. C. E. Myers, of State College, Pa., reported for the committee on Agricultural Colleges and Experimental Stations. His report represented the results obtained from a question which was sent out to various agricultural colleges and experimental stations in order to obtain the status of vegetable gardening in those institutions. In conclusion, he said that it is quite evident that the vegetable growing interests of the country are not being entirely disregarded by the educational agencies, while in some instances they are a prominent part of the work. In most instances, however, the work is not receiving attention equal to its importance, but this is due to no fault of authorities in control of the various institutions, but rather to the fact that there has been comparatively little request by vegetable growers for the work. When a persistent demand, backed by the organized growers of the state, is made, that demand is usually supplied and vegetable gardening takes an equal rank with other phases of horticulture.

The vegetable work is comparatively new, and not as yet properly organized, but if the growers are interested, as we think they are, we may expect more rapid advancement in vegetable work, so that it will soon occupy a more prominent place.

In reporting on the vegetable work at the Ontario Agricultural College, it should not be necessary for me to mention the conditions under which we attempt to carry on experimental work or the fact that the major part of our time is devoted to lectures.

These conditions have been stated on previous occasions, and are set forth in the reports of this Association for 1911 and 1914.

In addition to growing a supply of vegetables for the institution, we have tested a few varieties and continued the plant-breeding work and seed selection.

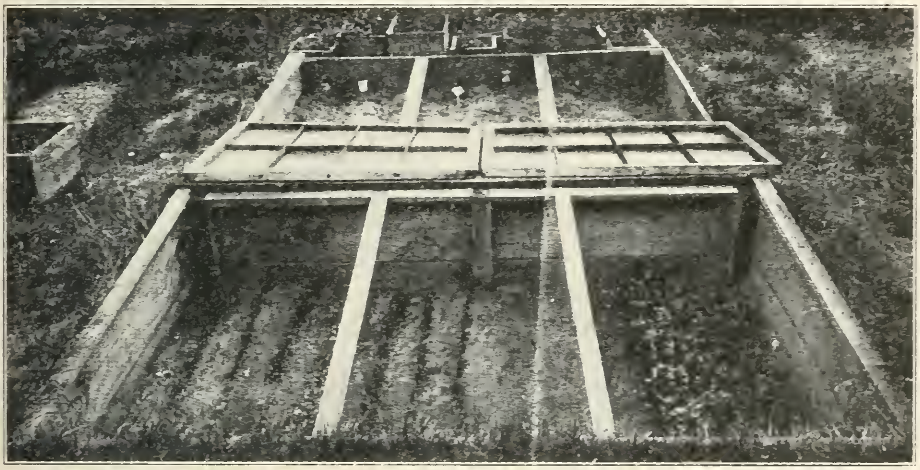
The possibilities for vegetable seed production in Ontario have received a good deal of attention within the last few years and more particularly so since the

European war has affected the source of our supply. In a small way we have been producing and testing out seeds of the following crops: celery, lettuce, beets, carrots, cabbage, onions and asparagus.

I will give an account of our work with these crops for seed and any other notes which relate to the various crops mentioned.

ONIONS.

The past season has been particularly suitable for the development of fungus diseases. In some of the onion-growing districts, the Onion Mildew (*Peronospora schleideniana*) has caused considerable loss. In one instance alone, the grower intended to plow under the entire crop of five acres. At the College the onions were almost entirely free from this disease. No preventive methods were employed other than a rotation of crops, or growing the onions on land which had not pro-



Cold frames.

duced onions within four years. This practice helps to protect many of our crops from disease, because the spores of the fungus causing the disease often winter over in the soil or on refuse from a diseased crop and are present ready to attack a second crop of the same nature.

Generally speaking, the disease attacking one particular crop will not attack another crop unless it is closely related, such as, for instance, cabbage and cauliflower, or plants belonging to the same botanical family. This is also true to some extent with insects.

The varieties of onions grown were Yellow Globe Danvers, Southport Yellow Globe, Red Wethersfield. The seed was sown April 21st. About the same time the transplanted onions were set out. Of these we grew the following varieties: Denia, Sutton's White Leviathan, and Ailsa Craig. The Denia onion has been grown at the College four seasons with considerable satisfaction. This year one-fifth of an acre was planted to Denia. The seed of this variety was sown in flats on January 20th, and kept in the lettuce house. As the plants grew over 3½ inches they were clipped back. On April 13th they were placed in cold frames. On April 28th they were set out in cold frames. On April 28th they were set out in garden in rows 20 inches apart, and 3 inches apart in the row. On September

14th the crop was harvested and weighed. The yield per acre was 787½ bushels. The onions were of good quality, but will not keep so well as in former years, probably due to excessive moisture.

Last fall, bulbs, which were true to type, of Denia and Yellow Globe Danvers, were selected for seed growing. In the spring further selection was made to obtain those which showed best keeping qualities: The texture of the flesh as well as the thickness of the shuck is important. These were set out in well-prepared soil about April 20th, and although the season has not been favorable for seed production, a very fair sample of seed was harvested, which will be tested another year.

In the field, each parent plant is given a number, and the seed from each is tested out separately.

In onion seed production, high, well-drained land will give best results.

Celery.

Considerable work has been done during the past two seasons in connection with the control of celery blight (*Septoria petroselini*). During the past season the celery at the College was sprayed with bordeaux every ten days from the time the plants were transplanted into flats. The spraying was continued until September 20th. At this date the disease was confined to the check rows, which had not been sprayed. Since then the blight spread more or less over the entire patch. Varieties grown were Paris Golden, Winter Queen, Winter King, Boston Market, Solid Violet and Giant Goldenheart. The Paris Golden seemed most susceptible to the disease. On ground where a blighted crop has been produced, celery should not be grown for several years.

Whether spores of the blight are on the seed or not has been ascertained by Dr. Stone of the Botanical Department. Celery seed of different varieties was obtained from different sources and examined for spores. Sufficient examples are given here to show results.

Variety.	Number of seed carrying spores in one ounce.
Golden Self Blanching (Foreign seed)	3,000 to 5,790
" " (Domestic seed)	1,050 to 1,950
" " (O. A. C. seed)	690
" " (Other sources)	4,950 to 12,120
Golden Heart	150
White Plume (3 sources)	0
Giant Pascal	6,780
Winter Queen (several sources)	90 to 540
Boston Market	720
Winter King	870

(It is estimated that one ounce of celery seed will contain 70,835 seeds).

Tests were made to ascertain whether the spores would produce the disease, but results were negative. Further tests will be made before a definite report on this point can be given. S. S. Rogers, in California Bulletin 208, states that the disease is carried over on the seed.

Two years ago we selected a few celery plants from the garden in October and planted them in the greenhouse, in order to see if we could produce seed. The result was successful. The following year we planted six selected heads of Golden-Self-Bleaching to grow on in the greenhouse. These were placed 24 inches apart, and by summer had produced large spreading tops loaded with seed. The blight spread rapidly on these plants so that it was necessary to spray them with Bordeaux several times, but with a little care a good crop of clean seed was obtained. These plants yielded an average of one-quarter pound of seed per plant. This seed has been tested in the early and late crop and gave excellent results.

Beet Seed.

The selected roots of Detroit Dark Red wintered over in excellent condition, packed in barrels in the vegetable cellar and covered with sand. The roots were planted on April 22nd, placing them deep enough to allow the necks to just protrude above the level of the ground. The seed was harvested September 24th, showing a good sample. The important points to be observed are, well-grown roots, not over-mature, perfect in type and color, and careful storage.

Carrot Seed.

Some fully grown Chantenay carrots were selected, also some small roots from seed sown in August and wintered over in the same manner as the beets.

There was no difference in the keeping qualities of these roots, but the fully-developed carrots allowed for selection in type and smoothness. The carrots were planted out April 22nd, and yielded a fair crop of seed, which was harvested about September 24th.

Cabbage Seed.

It is probably more difficult for the grower to secure cabbage for seed than most other crops. The necessity for careful selection with cabbage has been brought to our notice when we find such a variation in type with Copenhagen Market, and such a variation in earliness with Early Jersey Wakefield. It is easier to winter over a fully-developed head than one which is not solid. A practice has been to winter over half-grown plants, which go to seed when set out, but under this method no selection can be practised. We have wintered selected solid heads in trenches, and by planting out in spring obtained a fair sample of seed. The difficult part is to store the cabbages so that they will keep in satisfactory condition. They are liable to rot badly if wet or unventilated. The variety we have grown seed from is Glory of Enhuizen.

Lettuce.

We have had much better results from seed of Grand Rapids grown in the garden. Selected plants were marked and left to go to seed, the seed from each plant being kept separate. From this seed our greenhouse crop was wonderfully uniform in type and vigor.

Asparagus.

In selecting seed of asparagus the best roots at cutting time were marked and these alone allowed to bear seed, so that cross-pollination could not take place from inferior plants. Again in this case the seed from each plant was kept separate and planted under a number. Although the plants are still in the seed row, there is a marked and noticeable difference in the lots of plants from different parents. The most desirable plants have produced a heavy root system and a number of strong stalks which do not branch until six or more inches above the ground.

The vegetable growing work at the Agricultural College is carried on largely on our own initiative, rather than following any request from vegetable growers. If there is any question regarding the report that I have covered I would like to answer it if possible. I have with me samples of the seed which we produced during the past season at the College—beets, carrots, celery and onions.

Mr. Britton showed to the members assembled an onion which he claimed was an average one, and from which they had harvested 785 bushels to the acre.

Prof. Macoun, Ottawa: Did you say that the seed was sown about the end of January?

J. E. Britton: Yes: I believe we could have obtained just as good results by sowing it about the middle of February.

Prof. Macoun: You were not looking for specially large plants then?

J. E. Britton: No.

Prof. Macoun: I would like to ask some of the vegetable growers, whether onion settings could be obtained reasonably if they were sowed at that date. The city vegetable growers found that onions grown from onion sets give much better results than from either seed or transplanted onions.

F. F. Reeves: I prefer the seed: you will not find in this locality fifty bushels of onions grown from onion sets.

REPORT ON EXPERIMENTAL WORK CONDUCTED AT CENTRAL EXPERIMENTAL FARM, OTTAWA.

A. J. Logsdail, Ottawa.

I have not handled this work myself and my own interests are chiefly in the improving and selecting of certain varieties of crops. Our experimental work is in the hands of Mr. Grier who is now in France, and the results of his work during the past summer have not been completed, but I have secured from him some of the chief points of our work for a number of years past.

For a number of seasons past a considerable quantity of home-grown seed has been distributed throughout the Dominion from the Horticultural Division, Central Experimental Farm. This seed has been selected from crops that have been under careful supervision and has been sent to private experimenters who have willingly co-operated with us in the testing of this seed.

Last year we distributed over ten pounds of home-grown tomato seed at the rate of one-fifth of an ounce to each experimenter. This year we will have about twenty-five pounds of seed for distribution purposes. Sweet corn is another crop of which we have been sending out seeds. Last season we distributed one-quarter of a pound of this seed to twelve hundred experimenters, and we hope, during the coming spring, to more than double this number and somewhat increase the quantity of grain sent to each. We are doing this on the basis of the very high percentage of good reports received from season to season.

Other crops of which seed has been distributed to an extent are peas and dwarf beans. Small quantities of other vegetables have been sent at special request.

Several new varieties of sweet corn and tomatoes have been produced and are now being selected and fixed. Some of these new types are very promising and during the coming spring it is our intention to send out for experimental trial some of this new seed.

Hints in Seed Selection.

Owing to the unsettled condition of our seed markets and seed sources an earnest campaign has been carried on throughout the Dominion of Canada during the past twelve or eighteen months to try to encourage people to produce at home much of the seed that was formerly being produced abroad and paid for by Canadian agriculturists at a handsome profit to the producers.

Irrigated and non-irrigated celery, Vineland Experiment Station.

By saving seed at home one is able to secure it from the best plants of one's own crop, plants in fact that have succeeded best under one's home conditions.

The chief objects to be aimed at in seed production are three in number, namely pure seed, seed of good germination and seed from selected stock.

With regard to the matter of pure seed, one can roughly place all plants in two great classes, annual and perennial. Both of these classes can be again divided into two major sections, namely those that produce self-fertile seed and those that produce inter self-fertile seed.

With regard to the perennial types, except biennial, we have nothing to say in this brief survey of the work.

By the terms "self-fertile" and "inter self-fertile" are meant plants that are able to produce seed by the fertilization of pollen produced from the same flower as in their receptive pistil. Inter self-fertile plants are those that require the pollen from other individuals similar to themselves, but are partially at least self-sterile if pollenated with their own pollen.

Only crops which are strictly self-fertile can be grown where soil or other conditions are most suitable, without regard to the possibility of contamination of seed. As examples of such crops, may be mentioned garden peas, dwarf beans, broad beans, scarlet runners, etc., all of the leguminous types.

Crops that are not strictly self-fertile are very liable to produce mixed seed if not controlled. It would be preferable to grow a single variety of such crops, but if it is desirable to grow two varieties, the varieties should be grown at least quarter of a mile apart and with some crops quarter of a mile is too close to insure a pure seed harvest. Again it must be remembered that there is no danger of crossing between crops that are totally different, such as onion and carrot or carrot and cabbage, but crops of a similar botanical nature are very liable to cross; for example, sugar beets, mangels, garden beets may become hopelessly mixed if grown near each other. Cabbage is liable to be fertilized by several cruciferæ, some of which are dangerous weeds. In growing, therefore, a number of crops for seed the following points must be remembered:

(1) Close self-fertilized seed crops can be grown in close proximity.

(2) Inter self-fertilized seed crops must be grown in isolation, but can be grown beside other inter self-fertilized seed crops of totally different botanical origin (namely one variety of onions can be grown beside one variety of garden beets, of celery, of carrots and sweet corn), but it must be borne in mind that if it is desired to grow two varieties of any particular crop, the second variety of such crop must be grown at least four hundred yards distant from its relation.

During the past season several experiments were tried at the Central Experimental Farm in Ottawa, in the matter of growing seed to ascertain the probable quantity of seed that might be secured from small plots. Celery that had been stored in a pit during the winter was lifted in a poor condition: almost all the leaves had become decayed and the only sound portion remaining was the heart. These plants were cleaned and planted in the open and have, during the past season produced an ample supply of first-class seed.

With regard to the picking of celery seed, it was found that excellent results were obtained if the heads of seeds were picked in a green condition just prior to ripening and the heads were then allowed to dry out in a seed room. In this manner all the seed was saved and it proved to be of first-class quality. Similarly with carrots and cabbage, though with cabbage and carrots the crop requires several pickings as the heads approach maturity.

The crops that were tried during the past season in these seed experiment plots were beets, cabbage, carrots, cauliflower, celery, leeks, onion. Of these it may be said that the only real failure to produce seed was in the case of the cauliflower, this crop requiring a much longer season of growth than is possible with us at Ottawa.

As several varieties were being grown side by side an endeavor was made to keep the seed pure by covering the plants with a light grade of factory cotton stretched over a simply constructed, light, wooden frame. It was found that, though several crops including celery, carrots and beets matured seed satisfactorily under this covering, the total production of seed was considerably less than that produced by plants grown without a cotton covering. Certain crops, particularly the cabbage, produced no seed at all when covered and produced a fair crop of good seed if grown in the open. It may be surmised from these results that the pollen of cabbage in particular is carried from plant to plant by insects and not by the wind.

In growing the seed of root crops care should be taken in the first place in selecting roots that are uniform in shape, typical of the variety that they represent and in sound mature condition. With such roots as turnip it is advisable to twist rather than cut off the tops when storing, for by cutting off the tops too near the crown of the root, one is liable to remove the eyes from which the flower shoots grow in the spring. With beets and mangels this is not so likely to occur, as the eyes are deeply set. Such roots, after they have been selected, can be stored in either a root cellar or pit. The pit is often the more convenient as it can be made in a corner of the root field.

In pitting roots the pit should be so constructed as to afford a dry bottom, good drainage and good ventilation. Successive layers of straw and soil should cover the roots. Straw drafts along the top of the pit should be made for ventilation and such precautions as possible to keep rats and mice from making the pit their winter quarters.

Seed of certain market garden crops stand at a high figure such as the seed of Paris Golden Yellow Celery is quoted an example of the present market quotation of many of our seeds, and judging by the experimental work in our small trial lots during the past unfavorable season at Ottawa, it seems to me that there is an excellent opening for many a man with a good practical knowledge of market gardening and a realization of the essential factors in seed production to initiate and ultimately build up an exceedingly profitable business in home seed production.

It is is an indisputable fact that acclimatized seed produces better results nine times out of ten than similar seed introduced from distant countries. By the term "seed" I refer strictly to seed, not to roots, scions or cuttings, though even in these instances there are many examples of the superiority of home grown stock. The exception that I have in mind is that of potatoes, but a potato is nothing more or less than a root cutting.

Sweet corn is another crop that is particularly worthy of attention by Canadian growers. The majority of our sweet corn seed has been and is produced in areas to the south of us, which possess longer summer seasons than our own.

The continual importation of seed year by year excludes the possibility of ultimately acclimatizing and appreciably shortening the season of growth of these varieties. At the same time it also precludes the possibility of producing earlier maturing varieties than are generally found on the market.

Sweet corn seed has been successfully matured, improved and selected at Ottawa for a number of years past. If this can be done as far north as Ottawa with our comparatively short summers, similar work can be carried on throughout the whole Province of Ontario, and if the growers would only take this matter up, even in a small experimental way, the old adage, "Many hands make light work" would produce wonderful results within a few years time.

Owing to the quantity of field corn grown for general horticultural purposes, the areas selected for the growing of sweet corn seed should be distant from field corn by about four to five hundred yards, as corn intercrosses very readily, owing to the fact that it produces enormous quantities of light powdery pollen that is carried by the wind. Sweet corn that has been pollenated by field corn can be readily isolated in the ear of grain, but such segregation of seed greatly increases the cost of production, and tends to introduce factors that will ultimately destroy the pure type of the variety.

Corn can be covered with light factory cotton, provided the screens are not placed too close around the plants, affording a fairly free circulation of air, but, if the grade of cotton be too heavy or the enclosed corn too confined, the pollen seems to lose its vitality and practically no seed is produced. At Ottawa seed has been successfully secured in breeding cages made of a light grade of cotton, but in a number of instances no seed at all was secured when the grade of the cotton was a trifle too heavy.

Another crop from which a considerable quantity of seed has already been saved (but the amount might easily be doubled or trebled), is that of the tomato crop. Tomato seed is easily extracted from ripe mature fruits, by passing the pulp through a quarter-inch mesh screen, thereby removing the coarse cores and skins and breaking up the texture of the pulp containing the seed. If the pulp is then stored in glass bottles until slight fermentation has set in, the seed can be cleanly separated from this pulp by washing it with a stream of water on a screen

Experiments with varieties of lettuce, C.E.F., Ottawa.

of 1-12 inch mesh. The size of this mesh is that of the ordinary netting used on fly screen doors and is large enough to allow the fermented pulp to pass through and hold the seed on the top of the screen. By this method a quantity of tomato seed has been saved during the past three years at the Central Experimental Farm in Ottawa.

I consider the production of seed of many of our crops a practicable possibility to many men who are willing to tackle a new problem, remembering that not only is the production of seed necessary, but the production of pure seed. Any men doubtful about how to proceed with regard to any particular crop could, I feel sure, secure such necessary information from either Guelph or Ottawa. If not already acquainted with the fundamental botanical laws of production, by combining practice with theory, I see no reason why such effort should not be well repaid.

PROF. CROW: I should like to hear the experience of market gardeners who have greenhouse space available and put celery plants in in the fall. We put ten plants in last fall, five of them died, but the other five yielded a total of one pound of seed from the five. This was Paris Golden.

PROF. MACOUN: It would be profitable if we could get to the point where we produced our own cauliflower seed. Cauliflower is very expensive, too, and I would not be surprised if we could not grow some in greenhouses the latter part of winter or in the early spring. I want to read to you a letter from Dr. Malte, Dominion Agrostologist, and a clipping from a Swedish newspaper which he sent to me:

"I beg to enclose herewith extract of an article published in a newspaper of Gothenburg, Sweden, October 2nd, which I feel sure will interest you. The article refers to action taken by the Board of Directors of the Agricultural College of Alnarp, Sweden, asking for a government grant for the encouragement of vegetable seed growing:

"'The Board points out that the war has most clearly emphasized the importance, for the country, of home production of vegetable seed. Owing to the most important vegetable seed producing countries having prohibited the export of such seed, the prices of a great number of important vegetable seeds have risen enormously. And, still worse, some seeds can hardly be obtained at any price. It is reported, from a well informed source, that vegetable seed growing in the countries engaged in the war has been largely neglected during the past summer and that for this reason further advances in prices can be expected. Reports from Germany state that the supply of seed of spinach, carrots, most kinds of cabbage, onions, cucumbers and peas is utterly small. Furthermore, Germany has prohibited the export of vegetable seeds to the end of the war. There is, therefore, every reason to fear that we have to face the possibility of a very serious shortage of certain vegetable seeds.'"

You will be interested also to know that vegetable growers around the City of Victoria on the Vancouver Island are very enthusiastic about the growing of vegetable seed on Vancouver Island. The climate there permits of cauliflower, cabbage and celery being left out all winter. The lowest temperature they had last winter was 24, and that was only for a day. The last week of March I saw potatoes six inches high. So you can see the wonderful possibilities of their climate there. They could grow things that we could not grow, but we can grow a great many seeds here. Dr. Malte has published a Bulletin, No. 22, on Growing Field Root, Vegetable and Flower Seeds in Canada. This contains some good hints on seed growing, and we are trying all the time to bring together information from all the sources that we can.

THOS. DELWORTH: I received last year a sample of peas. I sowed them and I do not think I ever saw peas which showed such strong germination or so true to type. One sample was the English Wonder (I have forgotten the other name). It was very true to type, a heavy cropper, but it had a small pod. I think that for peas for canning factory purposes that would be just the type, but if you have got to pick them one pod at a time, you would have to pay so much for the picking that there would be nothing left for the market gardener. The peas were good, true to type, showed strong germination, but only one point was overlooked, namely, they were too small in the pod for the market gardener's purpose.

PROF. MACOUN: The pea was MacLean's Advancer. We appreciate your criticism, and are always glad to get reports on the seeds. Now take the Surprise Pea, we have been growing about twenty years at Ottawa, it is just as productive as any of the early peas, that we have got, and the private individual can ripen his peas, if he has a small plot, so that he can get enough for his garden next year. But what we are after particularly, we want to get from the vegetable growers, their standpoint. We are trying to get as good quality as possible, because the majority of people want that if they can get it; sometimes the most productive are not the best quality. If we can get something that will please both the consumer and the market gardener, that is our aim.

Thos. Delworth: When I went over the grounds at Ottawa with Mr. Logsdail, he showed me one that he grew last year. From the market gardener's standpoint it is the best I have ever seen. It is called "Southern Excelsior."

A. J. Logsdail: All we ask is a genuine criticism of our work. Just show us your idea, and we will do our best along that line. About two years ago, as Mr. Delworth was saying, I showed him our English MacLean's Advancer, and he commented on the size of it, and he also said it was not the type of pea that the market gardeners grow. We have done a lot of work trying to isolate individual plants and varieties to see which variety yielded the most peas under all conditions, and English Wonder, the American Wonder, and MacLean's Advancer were at the top, and there is no variety we have tried that can come closer. I came to the conclusion that what was wanted generally all around was a great big pea with a large pod, and I have a whole bed out, but, of course, the results are in the future still.

Prof. Crow: Mr. Delworth's criticism is certainly not untimely, and we appreciate his views on this subject. However, it is obvious that a standard of variety type is urgently needed. I do not know how this should be obtained, but if any of the experimental stations had the money to spend and would undertake the publication of literature similar to that published by the fruit associations of New York, if we could have standards for the various vegetable types—I mean to say a standard description, we would know what the standard type is. There is this difficulty with so many of us growing our vegetable seeds and perhaps growing the same varieties, we will have a great many varieties, and we should certainly exercise all possible care to get the exact variety type, and if we could find some means of establishing a national or international standard, we would be aiming at a mark that would be well worth reaching.

Howard W. Selby: You are coming to a point we have arrived at in vegetable growing. We have a committee on seed nomenclature which has been working for two or three years, and within the past six months the Seed Trade Association of America in convention at San Francisco, appointed a committee to work in conjunction with our association committee. They have work before them which will possibly take five or more years, but they are working to standardize the names of the different varieties of seeds. At the present time we are buying a certain variety from one seed man and another one comes along with one by a totally different name, but which after we have tried it, simply proves to be the same thing. For instance the Boni Best Tomato has about six or eight different names. I believe that that difficulty is to be solved by our Association in America, and on that score, too, we need your closest co-operation.

J. W. Rush: My idea is that the vegetable grower is looking for a pea that will produce a pod equal in size to the American or English Wonder. Then we will have something that is worth the grower's putting on the market, but no vegetable grower can afford to grow these small peas. It takes too long to fill the measure for the price that they receive.

REPORT OF VEGETABLE SPECIALIST

S. C. JOHNSTON, TORONTO.

In order to extend the instruction work among vegetable growers in various sections of the Province it was found advisable to hold a few meetings for those specially interested in the growing and marketing of vegetables. In working out this idea the principle which was followed was to make the meetings, or conferences as they were called, of a mutual benefit nature. To make this possible it was determined to secure speakers who had made a specialty of some particular line of vegetable work and have these men speak to the vegetable growers in other sections where this information would be of value. Speeches were delivered by competent men thoroughly familiar with the conditions whereof they spoke, and discussion was always encouraged. These conferences were held in four districts during the month of March, 1915.

The attendance clearly demonstrated the plan as a success, over 300 growers being at the Toronto meeting. I am satisfied that this method of imparting information to the vegetable growers is worthy of considerably more attention.

BACK-YARD GARDENS.

For several years there has been a movement in the large cities and towns of the Province toward encouraging more or less thrift and independence among the working men. During last winter much was done along this line in various cities, and during the past summer back-yard gardening made, probably, greater advances than ever before. Men, women and children of all ages and vocations received sufficient information to become enthused with the thought of growing something for themselves, whether from a sense of the need of thrift in these times of war, or merely from a sense of pleasure in accomplishing something out of their regular lines of work. Many who had previously been buying vegetables from hucksters' waggons passing the door have grown vegetables for themselves for the first time. They have saved considerable money for themselves, but the greater result has probably been in the vast improvement to be found in the various cities and towns in Ontario. To the promoters of this work considerable credit is due, and it is certain that the idea will not die out for many years to come.

To gather some definite information regarding the extent of vegetable growing in these back yards it was deemed advisable to make a survey of various towns and cities in the Province. The District Representatives of the Ontario Department of Agriculture were asked to visit five consecutive houses on ten different streets and make inquiries as to the size of the plot devoted to vegetables and to what extent the industry was carried on. The replies have been worked out on a percentage basis and the following figures may be of interest:—

33 Counties.

Number received	1,451	Per cent. raising sufficient for summer	61
Per cent. that grow vegetables	79	Per cent. raising sufficient for winter	2½
Per cent. started growing, 1915	12	Per cent. having surplus for sale	13
Average longest period grown	32	Per cent. desiring information	25
Average number of years	7		

From these figures the vegetable growers of the Province will find very little room for the feeling which has been expressed by some gardeners that back-yard gardening should not receive as much attention and encouragement, because it was taking away their means of livelihood. From the foregoing statistics we find that a very low percentage have commenced growing vegetables this year, that the average number of years during which vegetables have been grown covers well the last period of high prices for the professional vegetable grower. The percentage growing sufficient vegetables for winter use is practically nil. My deductions from these figures, and from personal conversation with those who have grown vegetables in their own yards for some time, is that the vegetables grown in the yard give the householder a desire for more of a superior quality. He has formed his own opinion of what can be grown, and he demands this on the market. He will and does pay a high price for a vegetable of a quality similar to those grown in his own garden. His space is limited, and, as his appetite for fresh vegetables will increase over his own output, he must needs buy from the vegetable grower. The discrimination shown by the consumers in buying in the stores in our cities or from professional growers can be traced to some extent to the growing of vegetables in the back yard, and this discrimination shows that the consuming householder is studying more carefully what he is buying and is willing to pay for the first-class article.

Celery Blight.

The work commenced in 1914 on the control of Celery Blight has been carried on successfully again this past season in spite of the extraordinary wet weather, which in some cases made it practically impossible to thoroughly spray each week. The services of an assistant, W. M. Anderson, were secured, and he devoted practically all the summer to giving instructions and advice on the spraying of celery. Demonstration patches of celery were selected and sprayed throughout the season in the following districts:—

Thedford, one; London, three; Hamilton, one; St. Catharines, one; Burlington, one; Toronto, six; Kingston, one, making a total of 14 plots, covering approximately 35 acres.

Meetings were held and the celery growers invited to come and see the results and discuss the spraying, etc., thoroughly. No change has been made in the amount of materials used from directions given last year at this convention—

4 lbs. copper sulphate,
4 lbs. lime,
40 gallons of water.

The main difference between this season's work and that of 1914 was the extra number of applications necessary owing to the excessive wet weather.

Results this year have been uniformly good. Several patches of from 3 to 4 acres in size have been kept practically entirely free from blight, so free that no heads were unfit for sale. Other patches which suffered severely from overflowing rivers and deluges of water are not of as good quality and yet the spraying certainly proved entirely satisfactory on these gardens, judging from the check rows.

Many of our demonstration plots were so wet that it was impossible to drive a horse over the ground for over two weeks. This gave the blight a chance to get a foothold, and only by constant spraying could it be held in check. One grower in such a predicament secured a knapsack sprayer and sprayed his quarter acre plot with this. He was diligent and sprayed after every rain, aiming to keep the plants covered with the mixture. He sprayed up one side, down the other and back over the top of each row, thus making three sprayings on one row. He did this as often as four times in one week. As a result he was able to sell every stick of celery from his plot at a high price, and not more than ten heads had any of the leaves affected with blight. This spraying with a knapsack cost, for time and materials, at the rate of $30 per acre.

In spite of unusual conditions the plots of celery which were carefully attended to from the seed bed until time of digging gave a striking result of spraying celery. The plots in Toronto district are among the few from which celery could be sold throughout the past season. The sprayed celery always could be handled at a high price, when the unsprayed, blighted celery could hardly be given away at any price.

It is hoped this work will be carried into new districts this coming season.

Onion Blight.

Onion Blight has gradually become more and more prevalent in the Province during the last eight or ten years. Starting in a few localities, its ravages have not seriously affected the onion crop in Ontario until this season. The experience of the American onion growers has been in some localities that something must be done to control this disease because of the great damage it does in such a short time. Onion blight has had very favorable climatic conditions for its growth and development, consequently we find an enormous amount of loss through this one disease alone. Wet weather, especially close and muggy weather, is most favorable to the growth of onion blight, as is the case with most fungus diseases. Some districts of the Province have been more favored than others. However, the district of Cataraqui, near Kingston, has the unenviable position of being attacked with onion blight practically every season whether wet or dry. It has not been determined why this locality should be so liable to this disease, but I am of the opinion that the Kingston vegetable growers have to contend with more fungus diseases than in any other districts in the Province. It was planned this year to carry on some experimental work with a view to determining if possible some remedy which would be practical, and either prevent or cure onion blight.

Bordeaux mixture has been recommended as a preventive, but so far as known this mixture has not been used for this disease to any extent in Ontario. The experimental work was carried on in the garden of Mr. John Baker, of Cataraqui, near Kingston, Ontario. Unfortunately, the blight struck the onions in this district this season two weeks earlier than has been customary in past years. We were unable to apply our spray mixture until after considerable damage had been done, and it was impossible to keep the spray on the plants owing to the continued downpours of rain. Each time the spray was applied a heavy rain would follow and wash all the spray from the leaves, and the ground was so wet it was impossible to follow up with another spray at once. Bordeaux mixture was applied for some five consecutive weeks, and, yet, owing to the above reasons, no favorable result was obtained. So far as could be seen, no influence as to the effect of the spray could be determined on this crop. However, in spite of a failure to give results under the most unfavorable conditions, and judging from results obtained in other countries, I am of the opinion that by a more diligent application of this mixture good results can be obtained. Furthermore, considerable experimental work will have to be carried on to determine certain factors which influence the work on onions. Some of these which are in mind for future work are as follows:—

(1) When should spraying be started? When the plants are young or just before the usual time for blight to strike the onion, which generally is July 1 to 15?

(2) What machine can be best used in an onion field where the rows are 14 to 15 inches apart?

(3) Is it necessary to use any stronger solution for onions than for other crops?

(4) Is it necessary to use a resin or a soap sticker to get satisfactory results?

These points are those on which most attention will be placed with regard to any work carried on with this disease.

Lettuce Diseases.

Some work has also been started to find some means of control for a disease in outdoor lettuce which attacks the plants in the summer months of July and August. The plants thrive until they are about half grown and then the leaves commence to wither and fall. A whole area of outdoor lettuce soon succumbs to this disease. Experimental spraying of lettuce from its early stages until maturity failed to give any result this season. It is hoped to continue this work in the hope of securing more information with regard to either prevention or control of diseases in lettuce.

Pelee Island Early Tomatoes.

Pelee Island is in Lake Erie, some 18 miles by water from Leamington, in Essex county. It consists of approximately 14,000 acres of land which has been yielding heavy crops for many years. Very few vegetables are grown there. Its season is about two weeks earlier in the spring and about the same length of time later in the fall than at Leamington on the shore.

To determine, if possible, if this advantage of two weeks' earliness in the spring could be put to some economic use and make the Island produce early tomatoes, a demonstration plot of these was placed on the farm of Mr. Frank Harris. This work was carried out with the able assistance of Mr. John Noble, District Representative for Essex. Well-grown plants in seven-inch veneer bands were secured from one of the Leamington growers and taken over to the Island and planted two weeks before any plants were set out in the Leamington district, which is the earliest in Canada. They were planted on ground which had grown corn the previous year and was ordinary farm land, having been given only bare preparation for such a crop as tomatoes. They did not suffer from the severe frost which played such havoc in the Leamington district last spring. The plants grew beyond expectation and the crop of fruit would be a credit to any district in Ontario which gives the most exacting care and attention to growing early tomatoes. With respect to earliness, the tomatoes from Pelee Island compared very favorably with those grown in the Leamington district. The crop of extra early ones would compare very well with any grown on the shore. It has been claimed also that the flavor of the tomatoes grown on the Island is superior to that of those grown anywhere in Ontario. From our work this year we are convinced that with selection and care of soil early tomatoes can be grown on Pelee Island which will be ready for market at least one week earlier than those grown on the mainland in the Leamington district: that Pelee Island could, with some changes in the transportation facilities, become a valuable adjunct to the Leamington early tomato-growing district and so help to further the slogan "Made in Canada" with regard to extra early tomatoes for Ontario and Western Canada markets.

Cost of Production.

Very little work has ever been done with regard to the cost of production of vegetables. No two growers give exactly the same attention to the same crop, and we are led to believe that there is some limit to the cost of profitable production, but as yet it cannot be stated that an average acre of vegetables grown by a professional market gardener costs approximately a certain amount of money. Our

Hothouse cucumbers. The prunings from the vine are seen on the walk.

friends the fruit growers have determined in many instances the cost to a fraction of a cent of picking, packing and producing a box of apples. Their figures differed widely when this was first commenced, but at the present time they have a standard which varies more or less, depending on local conditions, and this standard has helped to create a system among the fruit growers which assists them to produce an article of quality for the lowest possible price. This cost accounting is a line of work which was considered to be of great value to the vegetable growers of Ontario, and a start was made this season with the hope that in a few years considerable information could be distributed and discussed on the subject. Mr. F. F. Reeves, of Humber Bay, kindly consented to keep a memoranda of the time spent on the various operations necessary to bring a quarter of an acre of onions and a quarter of an acre of early potatoes ready for market. Mr. Reeves' garden is between five and six acres in extent, and is similar to many of those in the Toronto district. One-quarter of an acre was chosen, because it is a reasonable average of the quantity grown by many gardeners in the Toronto district.

The value of the land on which these crops were grown was not taken into consideration because of the fluctuation of the real estate market at the present time, and because it plays no part in the actual cost of production in so far as the operations necessary to cultivation, etc., are concerned. Land worth $150 per acre may produce as good a crop of onions as land valued at $2,000, and yet the cost of the cultivation, etc., may be considerably higher or lower, depending on local conditions.

Following are the actual costs of producing a one-quarter acre of onions and potatoes:—

Onions.

(Fertilizer applied by hand).

April 12.—3 hours, one man.
" 13.—Disking and harrowing, 2 hours, man and team.
" 14.—Drilling in, 2 hours, one man.
May 20.—Weeding, 20 hours, one man.
" 28.—Wheel hoe, 3 hours.
June 5.—Wheel hoe, 3 hours.
" 13.—Weeding, 5 hours.
" 26.—Weeding, 6 hours.
July 10.—Hoeing and weeding, 10 hours.
" 18.—Hoeing and weeding, 6 hours.
Sept. 3.—Pulling, 20 hours.
In rows 14 inches apart.

Onions were planted on clay loam which had been given ten team loads of manure per ¼-acre. From this one-quarter of an acre the yield was 165 bushels.

Cost of actual cultivation is as follows:

Man's time, 80 hours at 20c. per hour	$16 00
Horses' time, 2 hours at 30c. per hour	60
	$16 60

Potatoes.

April 23.—Man and team, disking, 2 hours.
" 27.—Butting potatoes, 1 man, 3 hours.
Planting and covering with hand rake.
Planted by hand, right side up, 5 hours.

May 15.—Harrow, both ways, 1 man, 1 team, 1 hour.
June 1.—Scuffle, 1 man, 1 horse, ½ hour.
" 9.— " "
" 21.— " "
" 23.—Hoeing, 1 man, 3 hours.
" 26.—Moulding, 1 man, 1 horse, 1 hour.
July 5.—Bugs, 1 man, 3 hours.
" 18.—Bugs, 1 man, 2 hours.

Cost of actual cultivation operations are as follows:

Cost of digging apparatus	$5 00
Man and team, 50c. per hour, 3 hours	1 50
Man, 20c. per hour, 17 hours	3 40
Man and horse at 35c., 2½ hours	88
Paris green, 2 lbs. at 25c.	50
	$11 28

CONDITIONS.—These potatoes were grown on clay loam soil in rows 30 inches apart. The sets were planted by hand 7 x 9 inches apart with the sprout right side up. They were covered by a hand rake. The yield from this quarter of an acre was 140 bushels.

SEED GROWING.

Considerable interest was aroused at last year's convention with regard to the production of home-grown vegetable seed in Ontario. To encourage home-growing of some vegetable seeds and to determine the approximate cost of operations and yield of seed it was decided to attempt the growing of onion seed in the onion-growing district of Leamington. Onion growers there rank with the best for the quality and quantity of their output, and why should not some of them go a step farther and grow seed for distribution in other parts of Canada, instead of depending on seed of unknown quality, secured from seed-growing centres in the United States. If onion seed could be grown satisfactorily in Leamington which would produce onions just as good as seed from seed-growing centres in Ohio or California, Ontario growers would be willing to pay a good price for it and at the same time keep the money in Canada. Mr. Jos. Ainslee, of Leamington, was satisfied that the venture was worth trying, and we were enabled to carry on some work with him which will help us in the future to increase the production of home-grown onion seed. Nearly 100 bushels of Yellow Globe Danvers onions were carefully graded and planted, approximately one acre of land being used. They were carefully selected as to type and graded with three sizes, large or select, medium, and small. These were planted in rows five feet apart and the bulbs placed eight inches apart in the rows. These were carefully attended, scuffled and moulded up during the season and prospects were for a good crop of onion seed. Unfortunately, the wet weather and blight practically destroyed the crop in less than a week. However, several points of interest have been noted, and we now have a good foundation for future work in this line. The most important of these is that the grade, large or select, gave the best indications of a crop of seed. The seed stalks were more in number, stronger, and the seed balls were larger and more evenly filled out than in either of the other grades. The small grade, when compared with the select grade, was fully fifty per cent. less in quantity of seed. It is hoped that this work will be carried on more fully in later years. It will be practically impossible to do so in the coming season because the quality of onions from which one would select seed stock is not up to standard. However, those who have seen this seed-growing plot are of the opinion that onion seed of a first-class quality can be grown to advantage in the Leamington district.

CABBAGE ROOT MAGGOT.

The cabbage root maggot has been one of the worst insect pests with which early cabbage and cauliflower growers have had to contend. Numerous inquiries from many sections of the Province led to the following work being carried on in the London district through the able assistance of Mr. I. B. Whale, District Representative for Middlesex County, on the garden of Mr. Geo. Bycroft, of Byron, and in the vicinity of Weston on the garden of Mr. Thos Delworth. The following experimental work was carried on at London, approximately 2,000 plants being treated with the following mixtures:

Paris Golden, White Plume, Rose Ribbed Paris and Evans' Triumph, grown in a Toronto back garden, all of which won first prizes.

(1) Corrosive sublimate, 4 ozs. dissolved in 40 gallons of water, applied at the rate of half a cupful to a plant with a water-can.

(2) Moth balls—4 placed in the soil at the base of each plant.

(3) Carbolic emulsion, made by boiling one-half pound of common soap in one-half gallon of water until thoroughly dissolved, adding a tablespoon of Gillett's lye, and pouring in slowly one pint of crude carbolic acid. This solution is made up to forty gallons and applied by a water-can.

(4) Tar-paper disks placed at the root of each plant.

(5) Oil of tar dissolved in wood alcohol and diluted with water and applied with a watering-can.

This work was commenced the day the first eggs were seen (May 11th). Careful attention was given for a period of five consecutive weeks. All cabbage, irrespective of treated or untreated rows, were harvested, and the quality was excellent. One observation worth noting was that a small plot of vetch close to the cabbage plot was badly infested with cabbage root maggot and practically destroyed.

On the plot in Mr. Delworth's garden approximately 3,000 plants were treated. Only two materials were used here, tar-paper disks and corrosive sublimate. The experiment was carried out in triplicate with Skinner irrigation and without.

The following results were obtained for the first year:

Corrosive sublimate, loss less than 1 per cent.
Tar-paper disks, loss 5 per cent.
Check rows, loss with water, 60 per cent.
Check rows, loss without water, 100 per cent.

Four ounces of corrosive sublimate were dissolved in forty gallons of water. The solution was applied with a water-can once a week for five weeks. Cost of materials for 1,000 plants treated with corrosive sublimate:

7 four-ounce packages of corrosive sublimate at 12½c. per oz....	$3 50
5 hours' time (one hour per week) for man at 20c	1 00
Total for materials and time	$4 50

Tar-Paper Disks.—Commercial tar-paper disks were secured from Rochester, N.Y., and were placed around the plants at the first sign of eggs.

These had to be taken off and replaced after each hoeing or scuffling, as the earth was thrown on top of them, destroying the influence of the tar-paper.

The cost of treating 1,000 plants with tar-paper disks is determined as follows:

1,000 disks at $2.00 per M. plus duty and express	$3 75
Time of adjusting, replacing and cleaning 1,000 disks for 5 weeks at rate of 2 hours to place 250 disks—40 hours at 20c. per hour	8 00
Total cost materials and time for 1,000	11 75

This gives a difference in cost of $7.25 for the treatment of the same number of cabbage for the whole season.

The quality of the cabbage treated with either corrosive sublimate or tar-paper disks was 50 per cent better than those plants which survived in the check rows.

Nothing further need be stated. One year's work has been carried on and the results have been far beyond expectations. Further verification of these results will be carried on next year.

Green Aphis.

Probably no insect caused as much damage in vegetable crops this season as the green aphis or green fly, or, as commonly called, green lice. It occurred in vast numbers in several sections and caused considerable damage to crops of celery, lettuce, beets, carrots, parsnips in particular. As this is a sucking insect a few hundred of them on a small celery plant very soon caused considerable damage, and in some under observation cases these insects so injured the foliage that the plants were permanently stunted, thus causing practically a total loss of the season's crop.

Although no plans were made to control this insect the damage it was doing determined that some remedy must be found. In several districts vast numbers of these green aphids were destroyed. Two forms of tobacco were used for this purpose, as follows:

(1) One pint nicotine; 50 gallons water.

(2) Solution of tobacco water resulting from soaking one pound of tobacco stems in one gallon of cold water for 24 to 48 hours.

The first solution is a commercial tobacco extract known by many greenhouse men and can be secured from seed merchants. This costs, this year, $1.75 for a pint bottle. An ordinary celery or potato sprayer was used, and two applications three days apart cleaned the celery patch. One 50-gallon barrel was sufficient for one acre of celery.

The second solution mentioned can easily be made by securing a large barrel and placing in it one pound of tobacco stems for every gallon of water. Twenty-four to forty-eight hours' soaking gives a tobacco water sufficiently strong to kill green aphids, although it is not so good a remedy as the commercial tobacco extract. This costs practically nothing, as the vegetable growers usually secure tobacco stems for the asking.

IN MEMORIAM—M. F. RITTENHOUSE.

Moved by Thos. Delworth, seconded by J. W. Crow. "That the Ontario Vegetable Growers' Association, in convention assembled, learn with deep regret of the demise of the late Mr. M. F. Rittenhouse. This Association desires to place on record their sense of deep appreciation of his splendid personal qualities and of his generous and intelligent interest in the horticulture of this, his native Province." Carried.

TOMATO BLIGHT.

D. H. Jones, Professor of Bacteriology, O.A.C., Guelph.

Blight is a term somewhat loosely applied to various diseased conditions of plants. Many fungus diseases and many bacterial diseases of plants are referred to as "blights," and even bad insect attacks of plants, as for instance infestation by aphids are sometimes referred to as attacks by the "blight." As a result some confusion of ideas is liable to ensue in a discussion of a diseased condition of any plants unless some more specific term than "blight" is used in connection therewith. Hence, when I was asked by Mr. Lockie Wilson to address you on tomato "blight," I did not know for certain just what disease of tomatoes was implied or whether the term included several or all of the diseases affecting tomatoes that have so far been investigated and described. However, I eventually came to the conclusion that what was wanted was a presentation of results from the investigation of the diseased conditions of tomato plants that Prof. Howitt, Dr. Stone and myself have been making from time to time during the last eighteen months or so.

This disease was first brought to our notice in the spring of 1914. At that time Prof. Howitt received a consignment of diseased tomato plants from a grower who complained of considerable losses from this disease in his tomato crop under glass. His winter crop had suffered and the disease was affecting his spring crop. In both these crops the disease affected individual plants scattered here and there throughout the crop.

Prof. Howitt sent me a portion of the plants for a bacterial examination. At first sight, the lesions from the stems appeared identical with those of the disease known as *Brown Rot of Solanaceæ,* a bacterial vascular disease affecting the potato, tomato and egg plant. Microscopical analyses of affected tissue, however, failed to show any bacteria. A number of bacterial cultures were also made in various culture media, but only a few bacterial colonies developed and these proved on examination to be non-parasitic. I was a little surprised at these negative results for the vascular system of the affected parts looked so much like the vascular system of the tomato, potato and egg plants suffering from the Brown Rot of Solanaceæ, which was shown by Dr. Erwin Smith and others to be due to a bacterium—*Bacterium solanacearum.* With this disease, however, the casual organism is present in the vascular system in large numbers and can readily be seen in miscroscope preparations made from affected vascular tissue and will grow readily in the common culture media used in the cultivation of bacteria.

Prof. Howitt and Dr. Stone at the same time made an extended examination of the affected tissues for parasitic fungi which might be causing the trouble, also with negative results. Some of the plants were then sent to Dr. Erwin Smith at Washington, who first described the Brown Rot of Solanaceæ and had conducted many experiments with it, and to Prof. Selby of Ohio, who had published a short account of a tomato disease, the description of which was somewhat similar to the disease in question. These men reported similar results to those we had obtained. Later a second lot of affected plants were sent to these men at their request, and their reports on this second lot were a duplicate of the first. Hence we are forced to the conclusion that the disease was not any of those the cause of which had been established as either bacterial or fungoid.

In the fall of 1914 the grower who had complained of the disease in his previous season's crops reported the loss of practically his entire crop in one house containing about 5,000 plants. It was learned also that tomato growers in the vicinity of Philadelphia had given up growing tomatoes because of the heavy losses caused by a disease that appeared to be similar to this one.

In June, 1915, a visit was paid to the house where the disease had been so disastrous, and to a few other houses where its presence was reported. A few isolated cases only were found. These were carefully observed and the following is a description of the lesions on affected plants.

Appearance of the Disease.

(Observations of the disease in tomato plants seen in houses near Hamilton and Toronto, June, 1915.)

The lesions of the disease apparently may show first on any part of the plant, but usually it begins in the younger tissues of the plant where growth is taking place. If it occurs when the plant is young it is most serious: the vigour of the plant is impaired in proportion to the extent to which the disease develops: the plant is usually stunted, the leaves affected shrivel up, little if any fruit is produced and this is of inferior quality, or the plant may dwindle and die. If the disease first develops when the plant is well grown, it occurs mostly in the younger issue, the yield of fruit is much curtailed and of inferior quality.

1. LESIONS ON FRUIT: Lesions on the fruit appear to begin as small indentations of the epidermis. They may occur on any part of the surface. There may be one or several lesions on a fruit. They may be irregularly circular or irregularly linear. They assume the latter form more frequently than the former. With time they enlarge and where a number of lesions occur on a fruit they frequently become confluent. Young lesions are yellowish in color and later usually become brown and opaque. They have somewhat the appearance of a burn or a scald. Frequently the lesions are confined to the surface and only the epidermis apparently is affected. Occasionally, however, especially in advanced cases section shows the brown discoloration to extend into the subjacent tissues to a greater or less extent. Such tissue appears to be dead and the epidermis is subject to crack

Vegetable garden.

open and if tomatoes with such lesions are picked and kept for a few days, various saprophytic molds are liable to develop in them. In some cases examined it looked as though the disease after having developed on the growing fruit had gradually worked backwards down the stem.

2. LESIONS ON THE STEMS: Lesions on the stems, peduncles and pedicles appear as brown, shrunken areas. They may occur on any part, be numerous or few, separate or continuous. As with the fruit the epidermis alone may be affected, but more often than is the case with the fruit, the affection penetrates the underlying tissues giving them a brown discoloration, causing them to shrink and frequently to form cavities. Frequently the vascular bundles are blackened, such discoloration being sometimes continued in these bundles beyond the general outlines of the affected area.

3. LESIONS ON THE FOLIAGE: The lesions on the foliage are very like those described for the fruit. In outline they may be said to resemble at first the burrowings of a leaf miner. They become dark brown in color, dry and spread until much and sometimes all of the leaf is involved, dries up and shrivels. They appear first on the younger growth, increasing in area as the leaf develops, and cause malformation and shrinking of development.

Affected Fruit After Being Picked.

When affected fruit of any stage of development is picked and is kept for a few days, or even weeks, the lesions do not extend in any direction beyond the point to which they had developed at the time they were picked, except in cases where the epidermis was ruptured and saprophytic molds or bacteria had found entrance. Then of course the usual degradation of decaying tissue takes place. There is the same absence of further development of lesions in the stem, branches or leaves of plants that have been removed for examination. The ripening of affected fruit after it has been picked proceeds in a normal manner except in the parts affected where the development remains apparently stationary. The unaffected part of the fruit develops the normal red semi-transparency of the ripe tomato while the lesions, if of recent development, will remain a greenish yellow or if further advanced to the brown stage at the time of picking they will remain brown.

Various saprophytic molds develop where the epidermis has been broken on the lesions of the fruit, stem and foliage, when such material is kept covered in glass jars or dishes. Among those observed, the genera Cladosporium, Penicillium, Botrysporum, Aspergillus, Macrosporium and Mucor were represented. These are all saprophytic molds and will grow on most dead organic tissues, but will not induce the disease.

Second Series of Experiments.

Portions of diseased plants observed near Toronto and Hamilton in June were brought to the laboratory for further examination. Bacterial plate cultures were made from affected stems and fruit both external and internal diseased tissue being used as inoculum. Some bacterial colonies developed in each case, but these were not in sufficient numbers to warrant them being considered as the cause of the disease. However, six colonies were picked off and grown in pure culture for inoculation tests. For this purpose twelve tomato plants about twenty inches high, growing in pots in the greenhouse were selected and these were heavily inoculated in duplicate in stems and foliage from each of the cultures isolated.

Result: No signs of the disease developed in any inoculated plant at any time later.

In the meantime Dr. Stone had been conducting a series of experiments to find out if the trouble could be traced to the soil.

In November, 1914, he obtained some seed from the grower who had suffered so heavily from the disease. This was from the same lot of seed as was used for the crops which became diseased. This seed was sown in three plats of college soil.

He then obtained soil from the beds where the disease had been prevalent. This was filled into pots and half of these were sterilized in the autoclave, steam pressure at fifteen pounds or 250 degrees F. for one hour. Other pots were filled with college soil. He thus had three lots of soil in pots: I. College soil: II. Diseased soil not sterilized: III. Diseased soil sterilized. Into these pots he transferred the seedling tomatoes.

Results:

In College soil plants all remained healthy. In diseased soil not sterilized some plants were killed by rhizoctonia—damping off. (No signs of the disease being investigated.) In diseased soil sterilized, plants all healthy.

It was considered that these experiments were not conclusive and so some more soil was obtained from the diseased beds in January, 1915. Seed from the same lot as used before was sown in this diseased soil and in College soil. Then a portion of the diseased soil was sterilized as before and when the seedlings were ready six were transplanted from College soil and six from diseased soil to each of the following soils:

(Note.—All seedlings appeared healthy when transplanted.)

1. To College soil.
2. To diseased soil unsterilized.
3. To diseased soil sterilized.

Results:

1. Seedlings from College soil to College soil remained healthy.
2. Seedlings from College soil to diseased soil unsterilized, one out of six developed the disease.
3. Seedlings from College soil to diseased soil sterilized all remained healthy.
4. Seedlings from diseased soil, unsterilized, to College soil, two out of six developed the disease.
5. Seedlings from diseased soil unsterilized, to diseased soil unsterilized, four out of six were diseased.
6. Seedlings from diseased soil unsterilized to diseased soil sterilized two out of six diseased.

Note that only where the plants had been grown, either as seedlings or after transplanting, in the so-called "diseased" soil unsterilized did the disease develop in them. Where both seedlings and plants were grown in such soil four out of six became diseased. Where seedlings and plants were grown in steamed soil, no infection took place, but where seedlings were grown in unsteamed soil and transplanted to steamed soil, one out of six showed the disease.

It would appear from this experiment that the trouble lay in the soil, and that sterilizing the soil with steam prevents the disease. As, however, we cannot find any micro-organism, bacterial or fungoid responsible for this disease, present in the plant tissues, it would appear that the steaming of the soil in this case must be beneficial, not because it destroys micro-organisms but for some reaction which it induces, possibly of a chemical character. What this factor is has not yet been determined.

Other Tests.

Dr. Stone also attempted to establish the disease in healthy plants by bringing diseased fruits directly in contact with them—results negative.

Fumigation tests were also made with hydrocyanic acid in various strengths, as high as 1-3 oz. to 1 oz. potas. cyanide per 1,000 cubic feet, plants both wet and dry, to see if the disease was caused in this way—results, negative.

At this stage of the investigation it was decided in co-operation with the Horticulture Department of the College and others interested to carry on more extensive experiments in the College greenhouse with soil obtained from the house where the disease had been so bad. Plans were drawn up for the experiment to be conducted this fall and winter, but for some reason or other the soil was not forthcoming and so nothing further has been done in this connection.

The Disease in the Field or Garden.

Dr. Stone and Mr. S. C. Johnson searching for signs of the disease under field conditions in Ontario, found:

1 plants affected out of 400 in one field, and
3 plants affected out of 800 in another field.

Further

Dr. Stone took some diseased plants which he had grown in his plot experiments and placed them in his garden with other tomatoes which had been started at the same time and place but in different soil.

Results:

At first the new growth that developed was healthy, but later the disease continued to develop in the plants that were originally affected, giving lesions in stem, foliage and fruit, but did not spread to other plants alongside.

This would tend to show that when a seedling gets affected in the bed, the disease will be carried over when the plant is transplanted, but that the disease will not spread from plant to plant. Probably this was responsible for the few infections found in the fields examined by Dr. Stone and Mr. Johnson.

Literature previously published on this disease or one very like it:

Winter Blight of Tomatoes.

Bailey's Bulletin (43) N.Y., 1892.

Winter of 1890-91, disease first appeared in greenhouses at Geneva.

Thought to be bacterial, possibly same as bacterial potato blight.

Specimens sent to Burrill, Illinois, who reported probably not same as potato blight.

Then thought might be identical with the southern tomato blight described by Halstead, Bul. 19, Miss. Specimens were sent to him and he reported the diseases were *distinctly different in external appearance and in causal organism*. Bacterium causing southern blight, and micrococcus present in the N.Y. disease.

Prof. Dudley, Ithaca, made reports as follows:

Micrococcus found in limited numbers in cells of both young and old lesions of foliage. (Question if granles were cocci, D.H.J.)

Lesions looked similar to lesions of bacterial diseases on other plants, blanched at first, later blackened and blighted.

Cultures made from juice of lesions gave no bacterial growth.

Cannot feel sure that this disease was caused primarily by bacteria, which were certainly not present in abundance.

Carried some diseased plants over the summer for further work.

Treatment.—Sprayed with ammoniacal carbonate of copper—negative results.

Boxes in which diseased plants had grown were emptied and the insides washed as follows:

3 boxes with ammoniacal carbonate of copper.
2 boxes with lime wash.
2 boxes with lye.
1 box with bordeaux.

Fresh soil placed in those boxes and healthy young plants set in them.

Placed in house near healthy and diseased plants.

Results:

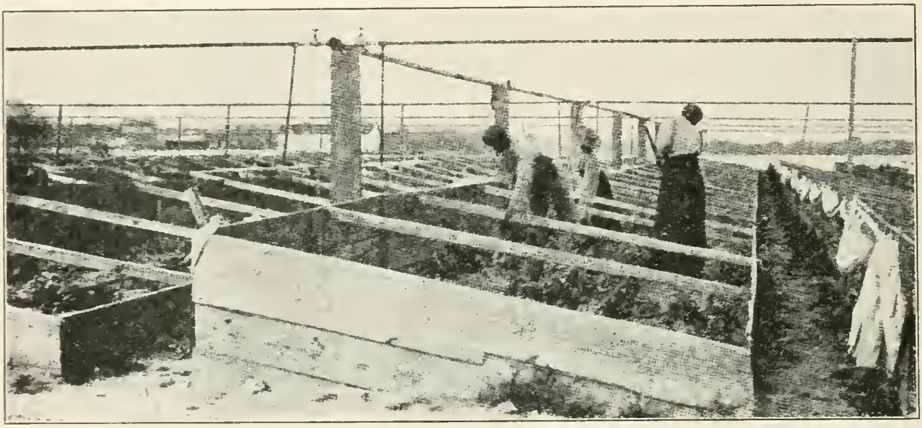
For three or four weeks the plants appeared healthy, but after that time all plants became diseased regardless of treatment.

The same result followed through watering of the soil with ammoniacal carbonate of copper, nitrate of soda and lye.

In one box containing three plants which became diseased, one died and it was replaced with a very vigorous healthy plant. This became diseased in less than three weeks.

Disease spread from plant to plant in separate boxes, their tops not touching.

These experiments led us to the conclusion that the best treatment for this winter blight is to remove all diseased plants at once and if it becomes serious to remove all plants and soil and start anew.



Irrigation system that can be utilized when frames are removed.

We lost entire tomato crop in endeavour to treat the disease.

Bulletin 214, Wooster, Ohio. Page 449—Selby.

(Illustration of diseased fruit on p. 450, showing lesions identical with those we have observed and worked with.) (D.H.J.)

Wilt.—A wilt (*Fusarium sp.*) of tomatoes in addition to that described under bacterial disease has been discovered recently in greenhouses in Ohio as well as other states. It is due to a Fusarium.

The symptoms of the wilt are rather characteristic. It may attack plants either vigorous or of slow development. Commonly the first symptom noticed is the yellowing and drying up of the lower leaves. Soon dark areas appear in the stem and also in the fruits. At all stages cross sections show darkening of vessels. The roots become darkened and watery in the region of the vessels. Eventually the top of the plant wilts and the leaves die both above and below, while the fruit has become worthless. We believe this to be a soil-infesting disease that should be controlled by thorough sterilization.

Correspondence.—Prof. Howitt—Prof. Selby, Dec. 11, 1914. Prof. Howitt wrote Selby asking if he were satisfied that Fusarium, as reported in his bulletin 1910, was cause.

Reply.—Not satisfied that either Fusarium or Bacteria were cause.

CONCLUSIONS.

It would appear from the foregoing experiments and observations that the disease of tomatoes under investigation here called "Tomato Blight," is not of a parasitic nature, either insect, fungous or bacterial. It resembeles in many respects the Brown Rot of Salonaceæ particularly in the browning of the vascular bundles. So far as we can determine up to the present it appears as a physiological trouble in the plant tissue induced by some factor in the soil, possibly an injurious chemical reaction, which enters the plant system through the roots. It occurs in tomato plants grown under cover and is liable to cause heavy losses. It has been found only to a very limited extent in the field.

Steaming the diseased soil has, in a limited number of experiments, proved beneficial. Whether treatment of the soil with chemicals will prove equally effective we cannot say from our own experience, as we have not tried it.

F. F. REEVES: With regard to propagation of seed: does disease propagate from seed or not?

D. H. JONES: We are not sure on that particular. We have tested growing plants from seed to produce the plants which in the original case reported became diseased, but when such seed was sown in our own soil we did not get any disease from that seed. But the experiments with so-called affected seed have not been very extensive and we should not like to say for certain whether it is carried over by the seed or not at present.

F. F. REEVES: I have tried to save some of the seed from every plant, in particular where every fruit was affected—and from this seed, on the plant grown every fruit was affected.

D. H. JONES: We will be delighted to have some of the seed.

THE SKINNER SYSTEM NECESSARY FOR SUCCESSFUL MARKET GARDENING.

THOMAS DELWORTH, WESTON.

I certainly believe that statement is correct. Some of the other speakers today have intimated as to what success in market gardening means. Our good friend, Mr. Scott, here, indicated something along that line in his address, as to extensive, pretensive, and intensive farming. We have visited gardens where we have found some very well-grown specimens of vegetables, but when we come to figure up the work and look over the methods, we decide that while that man was producing very good vegetables they were being produced at a very small minimum of profit. Other places we have visited again where large operations were being conducted, large fields devoted to various crops, and, in looking over the work and the results, we have thought that business, too, was conducted with a minimum of profit to the proprietor.

The most successful market gardener is the man whose business is conducted to give the largest percentage of profit in his business. Now perhaps someone will say, that is a small view to take of your business—to figure it out in dollars and cents. To that I would reply, in the first place, to get the maximum of profit, we have got to give the people what they want—a little better than they have been getting, and we have got to cut down the cost of production, so that we will be able to give them what they want at a price that will allow us a larger percentage of profit than the ordinary man is getting. That is how we are getting the best results out of our business.

I have all sorts of sympathy with co-operation: in order to get a better price you must have the sympathy and help of others in the business. There is something in this line that we have got to work out by ourselves that will very materially assist us in making the best returns from our business.

In regard to the Skinner Irrigation System: I do not know that there is any need for me to advocate the Skinner as against other similar systems of irrigation. There are a number of them that are all doing good work. I have seen several of them in operation for myself after adopting the Skinner, and the Skinner seems to me to meet my needs better than the others I have seen.

In order to get the best returns, first of all we should consider the question of cost. I have had a number of people say to me, to what expense would a man be justified in going in order to instal that in his place? How much per acre do you think he could put on it and then make a profit on capital account and make it pay? That is a question in which a great many other questions are involved. You have to get, in the first place, the man's market, the man's product, and then the man himself. There are some men who have gone to work and bought animals for stock-raising purposes, paying $1,000 per animal, and they have made money; other men, again, could not begin to make money at it. I have seen one of my neighbors who paid $1,000 for a team of Percherons. Before he had them two years he would have taken $400 for them. Other men, as you know, have gone into that and paid more money, and waxed rich on the job. But, taking a man of good business ability who will make good use of his opportunities, I may say that an installation of the Skinner system good enough for all commercial purposes may be recommended at about $100 an acre, that is, of course, figuring that you have the water supply on your place. That is over and above your pumping plant and delivery. Then you have to give the distributing mains and the overhead work, nozzle mains, etc. But a system good enough for all commercial purposes may be installed for $100 an acre. I am figuring work as well in this.

This work is rather a tedious job. In some places we have men who take contracts to do the work of drilling and putting pipes together. If you put a greenhorn at it, he will break parts and it becomes expensive and is tedious at that, and if you have a man in the neighborhood who is taking contracts to do this work, I would advise you to have him do it. We have a firm here in Toronto that do it at a reasonable price, and it will pay you to give them the work. I figured out the cost that this firm charged a neighbor of mine to do the work, and then I figured my own, and I made $10 a day for the work last summer, so that with a little practice a man can get into the way to do the job himself. But if you have a lot to do, the job is apt to hang on your hands.

A great many find it impossible to supply themselves with irrigation. There is no use putting up overhead mains, nozzle mains, etc., unless you have an abundant supply of water. As to what expense it would pay any man to go to, we come back again to the old proposition, so much again depends on the crops he intends to grow, his market and himself. There are a great many crops it would not pay you to have Skinner irrigation for unless you have a fancy market. Wherever you have that, it certainly is a factor in getting that fancy article. Now the Skinner irrigation, or any irrigation scheme, will supply moisture for the growing of the crop. You can't grow crops on water, but you must give a plant water in order to give it a chance to grow. Water simply acts as a medium to make the plant food available to the plant, as that food becomes soluble in water, and the plant will not use the food unless it has water and an abundant supply of soil. Now, the Skinner irrigation properly installed will give you that, so that you will never have your plant growth checked by lack of moisture.

This presents a number of very interesting and very intricate points. One of these is companion cropping. Now the most intensive companion cropping I saw was on a large scale a year ago in Philadelphia, on the Seabrooke farm. Three or four crops growing on the same farm. I may say for myself that I have never succeeded in making any kind of a success of that sort of thing. I have tried it on various occasions, but I have never made a success of it. I find that I get better results by taking one crop off and putting the other in. But that is made possible by irrigation.

Potato digging in New Ontario.

Mr. Davis spoke of getting a crop after his crop of beets and potatoes. The trouble I have always found is that when you take a crop off the latter part of June or the early part of July there is not enough moisture there to start the second crop. We generally have rains about the latter part of July or the early part of August. Irrigation often makes a second crop possible where otherwise it would not be. After the first of August this year we had more rain than we knew what to do with. In June we used our irrigation, and during July until about the 22nd of the month. Now we took off a crop of potatoes on the 11th of June—I may say that our potatoes suffered the same as all of yours by being frozen on the 27th of May and they had to make another start, which made them about ten days or two weeks later than they would otherwise have been. We planted some of our celery about that time, the crop was very dry until we applied the irrigation. Unfortunately, owing to the wet weather, it was not covered with spray as much as it might have been, we had a little blight, but we had a fair crop of celery. Some of that celery was planted on the 21st of July, and we finished up on the 29th and 30th of July. Some of those peas that I was telling Mr. Logsdail about this morning and some others we took off about the same time, and we put in another crop of celery after that. Well, you may say, we had lots of rain, and it was easy enough to have a second crop in a year like this. After about the first week of August we did not use our irrigation at all, in fact, a big umbrella was more suitable, but it simply makes these combinations possible, and they are impossible without the irrigation.

You have a problem there as to whether it is wise, as to whether it is good business to try this out, perhaps to the disadvantage of your principal money crop. I have always found in my experience in market gardening that it does not pay, for the sake of taking a chance on a small after crop, to spoil your chances on a crop of cauliflower or celery. Bank everything on your main money crop, whatever you do; but do not let the small crop interfere with your money-maker. Another crop we tried this year was a crop of early cauliflower. We had a crop of that with a crop of celery. I do not want to go into that except to say that I advise every member of the Association to look up in Mr. Johnston's report the treating of cauliflower and cabbage maggot. I found that my crop of cauliflower maturing the early part of July will stand an awful lot of water, and we can give it by the Skinner irrigation and keep it growing right along. One peculiar thing was with that cabbage maggot, that on the part of the ground that was covered by irrigation and treated we carried them through and made some sort of a crop, but where they were not covered by irrigation the plants that were not treated died out completely. We could carry them along as long as we could supply them with moisture, but when that failed they died. I am telling you this, that where plants are not allowed to wilt and suffer from lack of moisture at any part of their growth they have a chance of fighting other disadvantages with which they may have to contend.

I do not know that I can give any more definite figures in reply to the first question as to what expense it would pay a man to go to instal irrigation. The cost of getting my water supply was a great deal more than my cost of distributing. I now have about seven acres under irrigation—I have only eleven and a half acres in my place—and I hope next year about this time to have most of it covered. At $100 an acre, you see that would be about $1,150, and my plant outside of that cost just about double that—my supply outside of the distribution. We are thoroughly satisfied with it. We think it is a good investment, and we are proving it. Whether it would pay you to go into that or not depends on your market, the kind of crop you grow, and on your business ability.

Take the Toronto market—we grow for Toronto market exclusively. If we can get something on the market here when others have not got it, you all know what that means. I can get the price for it. If we all get it together we have to compete against each other. We do it in a friendly way, but we have to do it, and, when we get out of that competition, then you can begin to charge your own price for the goods. You will say, "But suppose we all come to this, what will the result be?" In the first place, all the vegetable growers in the Province are not going to do it. A very, very large number of them would have a great deal of trouble in getting their water supply. I have talked with a number of them who are going into this thing, they will say: "I have got a splendid well in my backyard which has never gone dry yet," Did you ever put a steam pump on it for 24 hours? One of my neighbors put a windmill on his place, it ran for two hours and then went dry. The Skinner irrigation uses approximately 40 gallons of water per minute. They use about 200 nozzles per acre. Those two hundred nozzles will discharge approximately 40 gallons of water per minute. On any source of supply that will not allow you to take 40 to 50 gallons a minute and keep it up continuously for 4½ hours, I would not want to spend a great deal of money because you would be so restricted in the work you were doing and the amount that you could do, that it would be hard to make it a profitable proposition. But my own supply of water is inexhaustible. I have to lift my water 120 feet. My source of supply is 120 feet below my garden, that is an ordinary pressure of 156 pounds owing to the height that I have to overcome, that is when I am working 40 pounds per gallon. I like the electric engine. I have used gasoline, but where I can get electric power I do not want gasoline. Gasoline possibly is just as cheap, but it is not nearly so reliable. The best gasoline engine that ever came along will try your temper once in a while.

That is all I can tell you with regard to that. If there are questions you would like to ask, I will be pleased to answer them to the best of my ability. I certainly think that where your market lies close to a large city like Toronto that additional expense is warranted, providing, of course, you can get your supply of water.

As regards the kind of soil for an irrigation system: I have seen it in operation on a great many different kinds of soil. I had an old market gardener once in the Province come to me and say, "My soil is not suited to this at all, it will get so hard." I had already spent a little money, and I had made up my mind to go ahead with it. I have seen this used on a great many kinds of soil, and I do not just know what kinds of soil it will not do for. I believe it can be used on all kinds of soil. We all know that a heavy clay soil is not suitable for market gardening, and yet we all possibly know of someone who has made money on heavy clay soil. It is not an ideal condition, it means you have to give it more care. Sandy loam you can go and plow, with a clay soil that is not always possible. But to decide that the thing cannot be made a successful proposition on account of the soil is a mistake.

W. McMeans: How far apart do you space the nozzles?

Thos. Delworth: I have tried to have mains placed at different lengths. I have tried them at 4 feet and at 3 feet 6 inches space, unless you get heavy pressure. To test out what different pressure would give me, I like to get to work at from 10 to 45 pounds, and put the nozzle lines close together, then you could do all right with 4 feet apart. We usually work with about 35 pounds, and I have put them 3 feet 6 inches. Now with our supply I have used as many as 24 feet of nozzle line at the present time running 600 feet. We have a pressure gauge at our distributing point, and another down at the pump, and we can take the pressure about 3 feet 6 inches. I find we get the best results with 4 feet.

W. McMeans: With 600 feet long, what size pipes do you use?

Thos. Delworth: We start out with 1¼ inch pipe to 300 feet, then we go down to the 1 inch and finish up with ¾ inch, which will carry a steady pressure. If we let our pressure go down to say 20 pounds, the throw in the centre will be farther than the throw at the far end. In installing, make plenty of provision for flushing out your pipes. You know they are likely to get dirty in the winter time and apt to clog. The question of keeping that out is a very, very serious one. I have tried wire mesh and all sorts. You get this fine copper gauze and put it over, and start it going, and you will get the result, that, while the gauze will be filled over with vegetable growth, to look at it down the water it is perfectly clear, but the water will not come through it, and the only way to clear it is to take it off. Then I tried coarser mesh, common cheap door screen. That did fairly well, but it allowed little, small stuff to come through. Now this trouble has not been very serious with us. For flushing out, the best thing I have seen so far, instead of putting on a cap put on a valve with a level opening. That is what they use in the Seabrooke farm. If you get a $\frac{3}{4}$ inch valve, that costs you, I think, somewhere around $13 a dozen, with a level opening, you push that level down and the opening is the full size of the pipe, and it flushes up and brings everything with it. Shut off the water and turn off the cap, and it comes along steadily, but there is no pressure. You open it and you get that pressure, then fish up the valve. Then at the supply end we put another one, and you can shut them off.

C. W. Waid: Have you tried irrigation to control frost?

Thos. Delworth: No, I did try this spring, with a batch of potatoes under irrigation. They got frozen. I was sure at night they were going to freeze. The boy and I talked over what we could do, and decided that it would be a tedious job running that irrigation all night, some one of us would have to stay up all night, as if you want to use it as a protective against frost you have to keep the water moving continuously. So I said, "One of us will get up early in the morning, and if there is a frost we will see what effect it has on the plants before the sun goes up." I got up the next morning. There was a frost, about $\frac{1}{4}$ inch ice. The potato plant leaves were so that you could break them in two. We started the pump, but there was no advantage at all on those operated on over those that were not.

SOME GREENHOUSE PROBLEMS.

C. W. Waid, Lansing, Mich.

The man who is engaged in the Vegetable Forcing Business has his problems to meet, no matter whether he has just started in this line of work or has been engaged in it for years. Some problems are like a bad penny, liable to return at any time, while others are like a silver dollar, soon gotten rid of. Still others are like counterfeit money and must be watched for all of the time.

The person who is just starting in the forcing business has many things to learn. Even though he may have had much experience in outside gardening, he will find the inside work quite different. Vegetable-forcing is the most intensive kind of gardening, and because of the heavy investment each foot of space must be made to give a maximum return, if the undertaking is to be a profitable one. It may seem to the beginner that it should be easier to grow crops under glass, where the grower can control the heat and water supply, than outside, where the weather man gets in his work, but he soon learns differently. Of course it frequently happens that on new soil and where things run smoothly at first the inexperienced man has wonderful results the first year and especially with the first crop. The writer saw an excellent crop of tomatoes in a large greenhouse, 72 x 540 feet, the past season which was grown by a man who had never grown tomatoes inside before and had never seen any grown. He was, however, a successful florist, and the house and soil were new.

As a rule, after the first season, and frequently during that time trouble begins. One of the most common mistakes of the beginner is neglect of details. If he has been an outside gardener, he is liable to underestimate the value of small things. The man who has not had experience of any kind in garden work is even worse off, as he not only fails to realize the importance of little things, but often makes big mistakes.

After crops have been grown for a few years in the greenhouse, soil problems frequently arise, and diseases are usually more liable to give trouble. There is often need of a greater diversity of crops to meet the market demands after a person has been in the business for several years than at first, and this means a study of the requirements of new crops.

In order to be more specific, we will consider some of the more common greenhouse problems.

The prospective greenhouse man is confronted with the question: "Will it pay me to go into this line of work?" In reply, I would say that depends upon the demand and supply at his available markets and his ability to apply himself and his likes and dislikes. There is no doubt but that in some parts of the United States the supply of greenhouse lettuce is greater than the demand, with resulting low prices. Not knowing the conditions around Toronto or other parts of Canada, I cannot say whether you can profitably erect more greenhouses or not at the present time. You can decide that part of the problem better than I. Human nature, however, is pretty much alike the world over, and I would caution the man who cannot apply himself closely and see and do the little things against attempting greenhouse work. The man who does not like such work should not attempt to force himself to do it because he thinks there is money in it. The man who has to push on his own lines will seldom keep his traces tight. I know a greenhouse man who has one son. The father is very anxious that the son should take an interest in his greenhouse work which is extensive and would give the son a good income. The son, however, does not like greenhouse work, and while he has tried to carry on the work two or three times he has never stuck to it, and I think would never make it a success. The prospective greenhouse man should keep in mind that this kind of work is very confining. It means careful attention day and night, Sundays and holidays, as well as ordinary week days.

When a person makes up his mind that he wishes to start in the vegetable forcing business he should consider several things before locating his houses. The closer he can get to a good market the better. Avoid having to ship if possible. Locate the houses near a shipping point if coal is to be used as fuel. It is expensive to move large quantities of coal even a few miles, especially over poor roads. The soil over which the houses are to be built should be well drained. A heavy clay is least desirable. A sandy loam is to be preferred, although a clay loam is quite satisfactory. Be sure of an abundant and pure water supply. If possible, locate the houses where they will be protected from the prevailing winds.

The Seed.

Whether the greenhouse man is a beginner or an experienced grower, the seed question is always an important one. Cheap seed is usually the most expensive in the end. Pure lettuce seed is hard to get year after year. If a person does not care to grow his own lettuce seed, which is not so very difficult, he should test out a sample from two or more sources before deciding which particular seed he will use for his crop. Several cucumber-growers have developed special strains by selecting from individual plants in the greenhouse. This same method will prove satisfactory for tomatoes. The successful grower is very careful about the purity and germinating power of the seed, and he spares no reasonable expense in getting the best available.

The Soil.

The condition of the greenhouse soil spells success or failure for the grower. It must be open and porous; by this we mean full of humus or organic matter. It must contain an abundance of available plant food, but should not contain an excess of one element and an under supply of another. In other words, the plant food in the soil should be supplied in the proper proportions for the crops to be grown. The chief source of plant food and organic matter is of course stable manure. The greenhouse man usually supplies manure more liberally than the outside grower. In a few cases that have come under my observation there was too much manure used for the good of the immediate crops. This is the exception, however, and not the rule. A more common mistake is to think that stable manure has all of the plant food in it which the plants need. As a rule, stable manure is deficient in phosphoric acid. To supply this deficiency some growers are adding acid phosphate to the manure at the rate of about 40 pounds per ton of manure. This should be done as soon as possible. If the manure is taken from cars and piled, the fertilizer can be applied when unloading. The manure which is made on the place should be treated with acid phosphate in the stable. One of the most satisfactory methods of handling the soil which the writer has used is to apply what we call the summer mulch. From four to six inches of manure are applied on the surface of the greenhouse soil as soon as the cucumber or tomato crops are taken out in August. This manure is left on the surface for from four to six weeks, during which time it is soaked with water once or twice a week. This watering is very important, as it keeps the soil in good mechanical condition and carries down into it much readily available plant food. Just before the lettuce crop or any other is to be planted, the coarser part of the manure, if there is any too coarse to work into the soil, is removed and the remainder spaded into or under the soil. If this plan is carefully followed there will seldom be need of more manure or fertilizer being added until the tomato or cucumber crops are maturing fruit the following spring or summer. Greenhouse soil is usually so well supplied with nitrogen and potash through the manure that these chemicals applied in the form of fertilizers seldom show marked results. It is, however, a good plan to save and apply to the soil all ashes from burned tobacco stems. In some cases, when the soil needs are known, chemical fertilizer can be profitably applied in small amounts.

Growing the Young Plants.

One of the most important things to keep in mind in connection with the growing of all greenhouse crops is to have good healthy, well-rooted plants of the proper sizes when planted into the permanent beds. Many lettuce-growers make the mistake of letting the plants become spindly. They never overcome this tendency entirely. Too close planting in the seed bed or not transplanting them soon enough are two reasons for spindly plants. Too high temperature in the plant house is another. The seedling plants should be set at least 2 inches apart each way in the seedbed. It is an advantage to have the plant house so arranged that different temperatures can be kept according to the needs of the plants growing in them. To start cucumbers successfully in cold, cloudy weather the temperature of the plant house should be seventy at night and during cloudy days, and it may run much above that during bright days with no ill effects. The important thing to keep in mind when growing cucumber plants is that they should never receive a check in growth. This applies also to tomatoes, but cucumbers are even more liable to be damaged by adverse conditions than tomatoes. The temperature for tomato plants need not necessarily run quite so high as for cucumber plants, but it is best to have it 65 or above if possible. Tomato plants which are checked in growth either by low temperature, lack of water or in any other way, are more liable to fail to set an abundance of fruit than plants that have received no such check.

The small grower who desires to make the most of all of his ground in the greenhouse can use two-inch clay pots in which to grow his lettuce plants to good advantage. The lettuce should be started in the regular way, then transplanted once into flats or benches and before it begins to crowd into the pots. The pot should next be plunged into the soil in the benches or beds in which lettuce plants which have just been set are growing. The potted plants may be left in this location until they begin to crowd then transplanted into the soil in other beds.

Sutton's Excelsior Peas on July 1st.

Ventilation and Watering.

Much trouble is caused by lack of sufficient ventilation in the greenhouse. The resulting moisture-laden air and high temperature when the vents are down tight on bright days furnishes ideal conditions for the development of certain organisms which cause some of the diseases known to greenhouse men. I contend that for most plants it is better to give plenty of air and get them accustomed to it than to baby them too much. It usually happens when the houses are kept closed most of the time that sooner or later someone will leave the vents wide open on a windy day and the tender plants become covered with mildew or some other fungous trouble. My advice is to keep the ventilators open at least a "crack" every day except snowy days or when the temperature is very low outside.

The modern method of overhead watering has simplified that operation considerably. At first many growers thought it would not do to use the overhead spray for all crops in the greenhouse and at all times. Most of the growers who have used this method for some time find that by watering on bright days and preferably early in the day, they have no bad results from overhead watering. Of course judgment is needed at all times. If some diseases get started such as lettuce drop, it could no doubt be enhanced by injudicious watering. It is not advisable either to water lettuce when it is nearly mature, as it is liable to lodge and thus much of it is brought in contact with the wet soil. Both as to economy and efficiency the overhead system of watering is far superior to the old fashioned hose.

Diseases.

The disease problem alone is sufficiently large that we could spend considerable time on it profitably. Some of the operations which have been discussed have a direct bearing, however, upon disease control. It has been my contention for some time that if a plant is given as nearly as possible ideal conditions for its growth, trouble from disease will be greatly reduced thereby. I fully appreciate the fact that certain diseases such as nematodes will attack and destroy or greatly weaken the most healthy plants. When such diseases get a foothold drastic action alone will overcome the trouble. Such diseases, however, as lettuce drop, rhizoctonia, mildew, etc., will seldom give serious trouble on perfectly healthy plants, when such plants are given proper attention.

Here is where the "attention to details" comes in very strong. When a person visits a greenhouse where the owner is always on the job and has his eyes open for every little operation that goes on in the plant, the visitor will usually find little serious trouble from diseases. On the other hand, when a person visits a greenhouse where the owner divides his time between the greenhouse and some other business so that he is away from the greenhouse a good deal, he can expect to find diseases playing havoc with the crops. Of course there are exceptions, as there are to all general rules, but, in most cases, the health of the plants depends on how they have been handled, not from the cradle to the grave, but from the seed time to the harvest.

J. J. Davis: What do you do if you have a lot of lettuce you cannot sell, and you have to hold them for another two or three weeks after they should have been on the market?

C. W. Waid: I usually advise having a good supply on hand, so that if you find it necessary to throw away any you will have some left. Here is another thing that you can do, that is to cut them back at certain stages without seriously injuring them. I do not recommend that as a very good plan to follow as a general rule, but under conditions you speak of it is better than losing them.

J. J. Davis: We often find we are obliged to clip them.

C. W. Waid: The larger growers arrange to have a regular space that they cut every week for a continuous supply, and they have those plants coming on in such a way that they are about the right size when they remove them, even though they may not be as large as they would like to have them, so that in that way they do not get the overgrowth.

J. J. Davis: What is the nature of the disease Rhizoctonia?

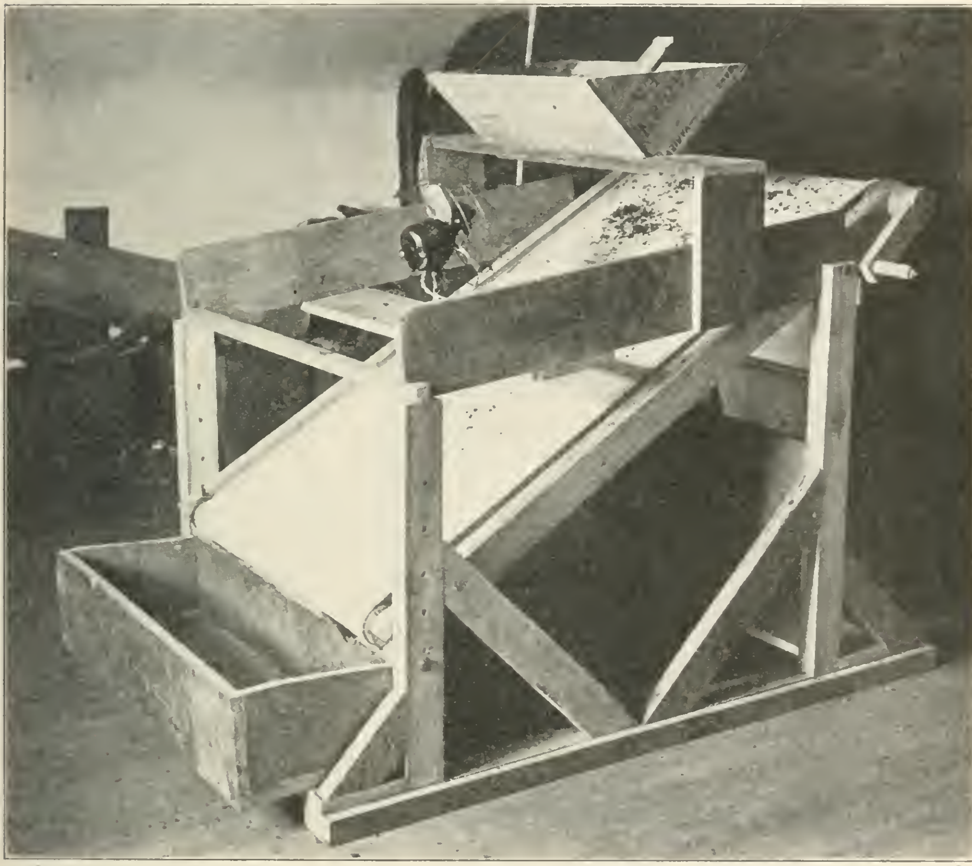
C. W. Waid: There is a bunchy root growth and dark colored roots; in some cases the plants will never get more than two or three inches in height. I have seen entire houses in that condition.

J. J. Davis: Last year in a house that I sterilized I had a lot of that in the first crop after sterilizing. Afterwards I had no trouble at all. This year again in the house that I sterilized I had the same trouble, while in the house I sterilized last year there is no trace of it. I have been wondering if steam in sterilizing kills the bacteria in the soil or what it was attributable to?

C. W. WAID: There have been some unsatisfactory conditions on certain soils from steam sterilization. What is the nature of your soil?

J. J. DAVIS: Sandy loam.

C. W. WAID: I should hardly think in your case that steam sterilization would be responsible for your trouble, and I would need to be there and study conditions



Home-made seed-cleaning machine. The heavy, clean seed rolls down the belt into the box at the bottom; the rough surface of the belt and the electric fan carry the chaff and dirt upward, and, when turning over the upper roller, it is removed by a brush.

before pronouncing judgment. You are sure that an abundant supply of water was given at all times?

J. J. DAVIS: Yes.

C. W. WAID: I have frequently seen where plants showed this disease where sterilizing was done and not sufficient moisture given the plants. In your case, where you sterilized and watered also, it would be hard to explain without a more careful study to get the details more thoroughly.

J. J. DAVIS: It seems to me more in the first crop after sterilizing. The next crop is all right. In the houses that were sterilized last year, I do not think lettuce could do better than it did in them.

C. W. Waid: In what kind of soil did you start your plants?

J. J. Davis: Sterilized soil.

Thos. Delworth: Can overhead irrigation be used on tomatoes without injuring the blossoms?

C. W. Waid: It can be used successfully if applied early in the morning and not too frequently.

J. J. Davis: What do you mean by "lettuce drop"?

C. W. Waid: It is a disease which causes the plant to rot off near the surface and fall right off.

J. J. Davis: After it gets large?

C. W. Waid: Usually, it is in the latter stages of the growth, and very largely a matter of giving plenty of air and using judicious watering. If you water later in the day and have too high a temperature you are very apt to bring about that condition.

F. F. Reeves: How is it that you frequently see that directly under the ventilator?

C. W. Waid: Of course that would be rather hard to explain in the cases you refer to, but it might be the draft coming on it very suddenly. The temperature being held up during a portion of the day and then the ventilators being thrown open and the draft striking the plants would cause the condition.

J. J. Davis: Is not that considered to be a bacterial disease?

C. W. Waid: No.

J. J. Davis: It has a milky, sticky appearance. We get lettuce perhaps that looks all right one day, the next day it is entirely down.

C. W. Waid: Where do you find the sticky condition—around the stem?

J. J. Davis: Yes, and wherever that plant touches another plant the leaves decay.

C. W. Waid: It may be that you have another disease there that I am not familiar with, but the lettuce drop shows usually a mildew appearance soon after it develops right near the surface.

J. J. Davis: That is a different thing. I have been trying to find out whether this was the same or not.

C. W. Waid: Yes, it is a mildew: you will often find the same thing on tomato plants, and it will show in this way: that the stem of the plant will have pronounced black-colored disease germs showing a good deal like a heavy application of mildew, and if that is left on for some length of time it will cause the stem to rot off entirely, while if you take it in the early stages of its growth and wipe it off entirely it will usually not develop.

J. W. Rush: Lettuce drop does not appear until the lettuce is pretty well developed?

C. W. Waid: No, it does not appear in the early stages of the growth. In very bad cases of lettuce drop the cheapest way to get rid of it is to sterilize the soil.

PROBLEMS IN MARKETING.

Howard W. Selby, Philadelphia, Pa.

I had read an article written on the Departmental Stores of Toronto and their co-operation with the market gardeners of this section, and that you were marketing your produce through this medium. And I imagined that I was coming to Utopia and could get ideas whereby we might obtain the same accomplishments and results. So that when I came I diligently looked your newspapers over, thinking I would surely find some write-up of the departmental stores and their food products department in Tuesday morning's issue. However, I did not find anything. Then I visited the St. Lawrence market, expecting to find some farmers' stalls there, and instead of that I found a number of merchants, all of whom told me they buy their products direct from the truckers in this neighbourhood, and that they themselves are not engaged in the business of producing. I judge that you have not yet succeeded in finding a one hundred per cent. perfect method of distribution.

Now, a word of introduction relative to my connection in Philadelphia County. As Secretary of the Vegetable Growers' Association, I come in pretty close contact with vegetable gardening. About 1829 the pioneer of the market gardening industry started up in Bustleton section, which is about fourteen miles from the centre of the city of Philadelphia and at the same time within the city limits. At first they carried on the business of general farming, then they went into that of making butter and raising vegetables, only on a small scale, and at last a good farmers' market developed there, and the farmers were getting good prices out of the products sold, and gradually took steps to enlarge the gardening space. Now there are farms of from 10 to 225 acres devoted entirely to the production of vegetables and small fruits.

Here is our problem—land valued at from $600 to $1,500 an acre—all heavy clay loam, and as Mr. Delworth said in his talk this afternoon, that is without doubt one of the hardest soils to work for market gardening. They say you cannot use irrigation on it. Let me say that one of the difficulties with irrigation has been that the farmer thought all he had to do was to irrigate, paying no attention to the feeding of the soil or to cultivation, and he would have satisfactory results, with the outcome, of course that they had a few failures.

In the course of this growth in the business, there was a wide field for the study of market conditions. With the beginning of the business the market handling did not require much ingenuity. As the gardens increased, however, every grower had a man standing continually in the farmers' markets. A little later on some growers found that they were producing too much to handle in the markets, and that resulted in selling to the grocer and to the consumer at his own door. Later it was learned that it took some half dozen wagons to handle any quantity of produce, and that real experienced salesmen were required as wagon drivers. The outcome was that they found it was costing twenty to thirty per cent. to do business in that way, and the consequence was that a few years ago our company opened a wholesale produce house in Philadelphia. Some of our neighbours later approached us and asked us if we would not handle some of their produce on a commission basis. As a result, our business grew into a general receiving line, and we now represent the farmers from New Jersey and Southeastern Pennsylvania, and scattered sections of the Eastern United States.

In the local markets where we used to sell there are a number of the market gardeners of our Philadelphia Association still operating, and we know that they are doing business at a tremendous expense. The man who raises the crops always has that desire to go to the market and see that they are properly placed, and they will stand there two, or possibly, three days a week, sometimes, at the height of the season four days a week. And what is the result? The labour at home becomes inefficient and careless, and his division of time results in neither that man's garden nor his market interests being looked after with the proper attention. My contention is that a man in order to be an expert in either of those lines must stick to one or the other. If he is going to be an expert market man, it is going to take six days a week to do it. If he is going to be an expert market gardener, he has to stick to it six days a week. Therefore the produce was turned to our commission house, and we found that instead of costing us about thirty per cent. or more to stand in the market selling our product it was now costing us a commission rate of ten per cent. to sell the goods.

I was surprised to learn in going to your St. Lawrence market that there were no market gardeners there. And I was informed that Saturday was the only market day you have in Toronto. I was also told that you stay at home during the five days in the week and come in to the market on the sixth; that during the five days you sell to the hucksters who sell your product to the consumer in the city. Suppose we were to try that thing at home. What would be the consequence? Simply this, we have a line of goods which we are trying to standardize, trying to put up in an attractive manner, and we want the people to buy those goods from us every day in the week. If we come in only one day a week, we can't supply the product fresh every day. If we stay out five days and come in on the sixth, we are going to have only transient trade.

In our section we have a question before us in the matter of transportation. I understand that most of your market gardens are within a radius of five miles of this city, some of them extending eight miles. Some of you seemed to be interested in a discussion to-day regarding the use of motor trucks. We have found that that is the only solution to our problem. Formerly we brought our product from our farms, fourteen miles, requiring three teams—six horses. That meant three drivers to do the work, which we are now doing with one motor truck of three tons, and we are finding that a saving. That means that the market gardening section is reaching out more than fourteen miles from Philadelphia, and as far out as twenty to twenty-five miles, you can find gardens where the man can get in with his product quickly. Now, then, how much cheaper land can you get by going out twenty miles from Toronto? And I understand your roads are in excellent condition. You can overcome a great deal of your problem there by using the motor truck and developing truck gardens on cheaper lands. The motor truck which we run carries 120 barrels at a time, but such a truck is not to be recommended to the average trucker. A lot of our men are using a one-ton capacity truck, and these pay for themselves in a short time. In this way we save wearing out of horses, getting through at earlier hours, and altogether make the position of the market gardener much more delightful and business-like.

Then there is the question of standardizing of packages; and the package question has received a great deal of attention. In Bustleton section the farmers have for years been accustomed to packing their celery in barrels, forty to fifty bunches in each, according to the size of the celery. In this way, when a man comes in to market the first thing the prospective buyer does is to dig down into that barrel and draw up five or six bunches to look at it. He may buy it or he may not, and you know what the result of such handling is to the appearance of that celery. We have adopted in that neighbourhood a gift package which holds twelve or fifteen bunches. Our bunches are tied three or four stalks in a bunch and tied flat. This we cover with waxed paper, and when a box of that celery is opened, the waxed paper is turned back and the man who wants to buy it can see exactly what we offer. These packages cost us exactly ten cents to put up. And what is the result of that simple little bit of ingenuity of wrapping that celery up in waxed paper and offering it for sale in the neat package. The celery brings us in from two to three cents a bunch extra, or thirty cents more for the box, which means a gain of twenty cents on a dozen bunches.

There is something more in it than the extra price which we get out, and that is in creating the demand. I will give you an instance here that I came in contact with last season. It was not with vegetables, but with apples—but what applies to fruit applies in the same way to vegetables. We have a shipper of apples in Virginia, a woman who manages large orchards there. She uses for a trade mark the orchard name. She packs those apples in her own way in barrels, labelling them with the trade mark. Last year when apples were so cheap and 175 cars were standing in the yard at Philadelphia, her car of apples came in, and was sold out at from $3.50 to $3.75 a barrel. Why was this? The prevailing market price on this particular variety of fruit was $2.75 to $3.00 a barrel. Simply because the purchasers knew her brand of goods; they knew that every apple was going to count. There was character in that package. That same thing holds good with our celery. We put our name on labels on every box of it, "Grown, Packed and Guaranteed" with the name of the farms from which the celery is secured. What is the result? People are calling up from various sections, and ask us to "save me so many packages of that celery." They are satisfied to buy from Long Distance, because they know that the goods that bear that name can be depended upon. So much for what people think of this standardized package. Why is it not applicable in our business? Take the "Uneeda" biscuit. Instead of buying "Soda Biscuits" the way we used to do, we now go into a store, lay down our nickel and we get the neatly wrapped package with waxed paper, and we are paying at the rate of fifteen to twenty cents a pound for that biscuit. That five cent package is all that the average household needs. That thought is applicable to the wrapping of apples or anything else. My thought is to bring the package down to the absolute need of the housekeeper. In Pennsylvania we have some wonderful land for the raising of apples. After three years of work we find that those people have something which is worth while presenting to the public, something which they are pleased to put their name on. The thought is to get away from the barrel of apples, and we are using the bushel box, with the result that we are packing the apples in the orchards of this section in the bushel boxes. We advertise them to the housewife of Philadelphia, by telling her that we have a box of apples that she can place in her home which will keep until they are used, and they can depend upon every apple being guaranteed and in good condition. Every one of those boxes is labelled, has the name of the orchard and the name of the grower on the box. Last year I started on the fruit of one particular orchard in the southern part of Pennsylvania, and put out a letter telling the people of our section that they had been using apples which came from the North-West, beautiful in colour and glow, but when they began to eat them, they were a sad disappointment—that we had apples which were grown a few miles from their residence, and that we guaranteed them to have the colour, with quality backing them. We talked them, "Health's best way eat apples every day," and "An apple a day keeps the doctor away." Using those slogans, we put that apple on the market. I sent letters to some ninety banks in Philadelphia and suggested to them that they have a box of apples under their desk and when their friends came in, instead of treating them to a cigar, give them one of those apples. We had every box labelled with our firm name. At the end of the week I traced eight sales to one bank. They were giving satisfaction. As I said before, apples were cheap last year. Stayner Winesaps were selling at $3 a barrel, sometimes as low as $2.75 a barrel. But when packed in a box we got $2.25 a box for them. It takes three boxes to make up a barrel, which gave us $6.75 for a barrel of those apples. Of course, you have in this way to absolutely guarantee the fruit in the boxes, and every apple must be depended upon to be first class, and it is true that some fruit would have gone into barrels which would not have gone into the boxes. But how much better, was it not, to get $6.75 a barrel for the absolutely first class fruit, and sell the balance as culls, which they actually were.

We have much difficulty in the growing business thinking too much of time we have spent, how much care we have given in selecting the seed, and how much thought and time we give it in every respect, and we think that because that product was grown on our farm it must be ideal. We must get away from that thought. We must think of the person who is ultimately going to consume that product. What is he going to think about it? The public want quality, and they want the appearance, and we should give them what they want—so long as they pay for it. I have been working on the farms in Southern Lancaster County in Pennsylvania, and it has been an interesting procedure. Prior to the time of my going out there they had been sorting their potatoes out after a fashion, but I gave them the suggestion that they label their potatoes with "Grown and Packed by ———." It was surprising to see how quickly their interest rose in that package. Their name was going on it, it was going to be carried through the Commission House, through the hands of the retailer into the hands of the consumer, and it meant that if they did not put up a standard product or put in anything which was undersized or did not have any business to be there, it would not be in the hands of the commission man and then it was up to him—the farmer's name was on it. Of course the commission man's was also on, but at the same time the farmer's was on, and he regards what is packed under his name.

The thing to do in putting this stuff on the market is to put the name of every producer on his product. I was speaking last week to a man who referred to Mr. Burpee, saying, "I like Mr. Burpee all right, but for every five words he says, he says Burpee seven times." We in our business don't hesitate to talk "Self" to the retail dealers in Philadalphia—talk your name; it is the thing you want to get before the public. You want to keep their trade, and to keep their trade you have got to keep your name before them, and that name must stand for quality produce, to be of value.

That brings to mind another thing: You have got to give the public what they want. You say, what is the use of all this flossy business of wrapping celery in waxed paper? What do we care? The people want it, and if they are willing to pay the price, we give it to them. We are getting from two to three cents a bunch more for that celery. That is our business. We in this line of business of producing have been too thoughtful of our own ideas and not thoughtful enough of the consumer. In this line of advertising, as I say, we are talking our own name and are talking it all we can. We put that name on the tops of the strawberry crates, we put it everywhere that we can possibly get it, and when the goods are right, we have increased the demand for our produce.

Let me give you another illustration of this: A couple of years ago I was watching Italians picking strawberries, and the thought occurred when watching them that we might take a little more trouble in packing them. So we began having those strawberries packed with the stems all in one direction on the diagonal across the face of the box. We put possibly another half a dozen berries in the quart. We did not put the very best berries on the top, but we saw that those that were placed on the top had their best face turned upward. When these berries came into Philadelphia the next morning, it drew the trade around the store and everyone was commenting on the choice strawberries and we sold them at twenty cents a box. Jersey berries at that time were bringing eight cents a quart, and we had geen getting twelve cents. I figured up the Italian boy's time in sorting those berries over, and I found that it had cost twenty-four cents extra per crate on account of the extra packing. By spending the twenty-four cents we increased the value of the berries by $2.56 per crate. You know how the women fall for appearance—then give them appearance if they are willing to pay for it. The thing is to conduct your business in such a way as to please the consumer.

New Hybrid sweet corn varieties and tomato crosses, showing by means of ribbon the parent stock from which they were produced.

We have been trying to do some work out in our locality in the way of co-operation. We have not accomplished anything very definite yet. I thought this morning what a wonderful thing it would be if you market gardeners co-operated in the way of having one every day in the week selling your produce and advertise under "Ontario Vegetable Growers' Association" name. If you are not large enough to carry on your daily marketing individually, you can all combine and have your goods sold under the name of the Association, so that you would create to a certain extent what your meat men have in your market. I saw down at the St. Lawrence Meat Market this morning some of the most ideal meat stalls that I ever saw in travelling through the eastern country. They have everything that tends towards sanitation. I do not believe that, individually, you could do anything of the sort, but collectively you surely could. Those meat men are represented there daily. There is an awful lot of talk in the United States about the high cost of living, but the people seem to think it is worth the price. They want style and good looks. Quality, of course, is essential, but it is in a sense secondary. If you have all of these three things first and then have quality, you will have all that is needed. Now if the meat people can do this, why can you not get your vegetable market on the same plane? I saw celery in the market this morning—it was tied up in bundles. They called it "Hearts of Celery," about twenty stalks I suppose in a bundle. Suppose an individual would take a little more care of that, tieing it up flat, I believe you would get from two to three times as much money out of it.

In years when there is over-production, who is the man who is going to come out square in such a year? This is a time when we are giving very serious thought to the financing of market gardening. The keynote of every convention is the business side of gardening. Who is going to come out right when there is over-production and prices are low? It is the man who puts his goods up in an attractive manner and guaranteed. Last year there was plenty of celery on the market, but we were getting 12 cents a bunch when the average celery was selling for 8 cents. The 8-cent celery was just as good, but the 12-cent was getting more attention. I was thinking to-day when you were speaking of giving prizes for the product as it stands in the field—that the prize should go to the man who has the best looking product when it is brought to market. I look at it from the finished product standpoint. Looking at it when it is in the field is all right from the scientific standpoint, but the man who puts it up so as to get the most dollars is the man who, I think, earns the prize.

J. W. Rush: I would like you to understand that the men here are rather slack on the market question. The markets are all over the highways and by-ways. I live about five miles from here. There are Italians by the dozen out there waiting for every waggon that comes along. We have no trouble in disposing of our goods, because these fellows come out there and grab everything they can.

H. W. Selby: Do you mean these are hucksters?

J. W. Rush: Yes.

H. W. Selby: I am glad you brought that point in. We have a lot of those Italians, Hebrews, etc., but we are getting tired of raising the kind of food that they eat. They do not pay much for the package. And you notice that the Italian is just about slick enough to take, for instance, apples he buys in this way to his stand, put them up in an attractive manner, and when you go to buy them from him his price is just about double. Is that not a fact?

J. W. Rush: About the package, I never saw those boxes returned to any store. They take anyone's boxes with anyone's names on their waggon, and that is the last you see of it.

H. W. Selby: We had that same proposition at home. We bought a box which cost us 20 cents. We stamped our name on it, and made it redeemable at 20 cents. We sold it right out, and the box was brought back to the store, the customer then getting credit for it. The box had a handle on it, and the grocer would keep it for a day or two and longer—it was handy; next the driver would take it out to deliver his orders; then it was left with the cook; then down to the cellar and used as an ash receiver, and altogether it was in wonderful condition when it came back. But we had to give the 20 cents back on it—it had our name stamped on.

J. W. Rush: We don't get any 20 cents for our box.

H. W. SELBY: We did better than you then. We got 20 cents, but, as I said before, had to redeem it. Now we are getting away from it. We only pay 10 cents for lighter boxes now, and we do not redeem them at all. We want a clean, fresh box every time, and we are getting up to the point now of using new strawberry crates and new boxes for every berry that comes out of our section. The people want to pay the price for it, and we are making money on it.

A DELEGATE: Have you ever tried boxes with lettuce?

H. W. SELBY: Yes, we tried it out, but last year it was a failure, as we only got 10 cents for our lettuce. We tried it out the previous year. Lettuce has been put on our market in barrels with 40, 50 and 60 heads, and in packages of 24 heads. On 40 to 50 per cent. of it we got as much for the packages as for the barrel. The brother here mentioned a minute ago about these markets around the town. I presume that they are waggon or curb markets where you back right up. I can just about picture that in mind. I was in Montreal a few years ago—I think it is the Jacques Cartier Market—where they dump things on tables and on the sidewalk, and it is not pleasing at all. It does not look like sanitation or any of the modern things which we like to think about.

There is another matter which I find is troublesome in some sections, and which I spoke on this morning: the word "co-ordination." I do not know whether this will apply here or not, but it would in Bedford county, Pennsylvania. There is the man who will ship in here to Toronto, and then those goods, after they have been held here twenty-four or forty-eight hours or more, will be shipped right back to some little town or community where they are not making a study of the various markets, but who have been rather leaving it to the trade of Toronto. Why cannot you get the price that they are getting in the village five or ten miles from the place, rather than have to pay the freight, cartage and commission? We overlook those little places. Do you know that in Philadelphia we re-ship 33 per cent. out to other points? We receive apples from one section in Pennsylvania, 125 miles away from us, and ship some of it back to the same point. It is a costly operation, and it is removing from the farmer a lot of the profit which is rightfully his. Of course in my commission end of the business I ship out wherever I can. Now if you are a large gardener you must specialize either in the market or in the garden. I think I can say this frankly, that the commission man will take from you all the products he can get. But for you to ship in here to Toronto and to ship to a man on commission, he is only charging you 10 per cent., how much better that is than to sell it to the man in your own railway station on a cash basis, who, nine out of ten times, is going to make 20 to 30 per cent. on it. The commission man here in Toronto can well afford to sell your produce on a ten per cent. basis.

W. H. F. PATTERSON: Do they do any order business? For instance in the Niagara district in the fruit line about half the business is sold on orders straight. They sell straight to the retailer, eliminating the wholesale altogether.

H. W. SELBY: Wherever that is possible. It takes quite a complete organization to handle it that way. It costs 8 per cent. anyway to handle. That is, in a sense, maintaining your own commission house, and seems possible under what I mentioned before for you to have your Ontario Vegetable Growers put up a stand which will be reputable and which will be a credit to your Association. You will not then be ashamed to say you are a member of that Association. You will be rather proud of your collective style of marketing rather than be ashamed of your individual style. This is all theoretical, of course. I have lots of other thoughts in mind, but they are rather incoherent. I like this way of discussion—that is what made our Cleveland Convention such a success, we had a round-table discussion.

How about that line of transportation? Do you have difficulties in that respect? Everything, I suppose, is done by horse and waggon, and you are in close proximity to your market?

THOS. DELWORTH: Toronto gardening is done that way. Our gardeners mostly live within ten or twelve miles of the city. Very few Toronto market gardeners deal direct with the consumer. Most of us sell to the retailer.

H. W. SELBY: Let me tell you how Philadelphia gardeners are making the motor truck pay for itself. Suppose there is a great demand for lettuce. The retailer will in the morning telephone the gardener: "Lettuce is high, can I take orders for it for delivery later in the day?" That farmer will get his Italian gang out and within three or four hours he will have another load of lettuce out to the city. With the motor truck you can handle this much cheaper than with horses and wagon, and of course more quickly.

J. J. DAVIS: I suppose you can depend on the motor truck to take your stuff to the market the whole year?

H. W. SELBY: We have gone through some snow which has been right up to the axle of the machine. I suppose, however, your storms are very severe here. Do you have very much to market right in the middle of the winter season?

J. W. RUSH: Yes, every day of the week.

W. H. F. PATTERSON: Motor trucks are very much used on the Hamilton market. It seems to me the people in Toronto are very far behind Hamilton people in the market. They have a magnificent market there—they sell in small packages. It is a continuous market, day and night, they use an enormous number of motors—these take three or four people's produce to the market, and just charge them a percentage on the sale.

THOS. DELWORTH: I don't think curb markets are a desirable thing to encourage. They are always unsanitary. The last time I spent a night in Hamilton was market night. I went around about eleven o'clock Saturday night, and I thought those men were earning their money.

W. H. F. PATTERSON: They close up at nine now Saturday nights. In the summer season they have a continuous market night and day from Monday morning at seven o'clock to Saturday night at nine, and they sell the stuff. One man takes from $500 to $1,000 out of Hamilton in one day. Numbers of Toronto people buy in the Hamilton market all the time.

THOS. DELWORTH: Yes, because it is cheap.

W. H. F. PATTERSON: No, it is not a cheaper market. I do not think there is a market where the farmers get better prices.

J. W. RUSH: Years ago, when I was a younger man, they used to make a business of going up to Hamilton on Friday. I would take the night train, I would buy a couple of hundred dollars' worth of stuff, it would get in here about ten o'clock Saturday morning, and I often made $50 or $75 on what I bought from there, so it must have been a cheaper market than Toronto, and as for the amount that they sell, certainly a city like Hamilton, 40,000 or 50,000 population, would not sell as much as Toronto, with 500,000.

W. H. F. PATTERSON: Hamilton is an immense distributing centre, a lot of people from outside go in to buy.

J. W. RUSH: One of these gardeners at Newmarket runs a little truck into the St. Lawrence Market once or twice a week, lately he has been bringing celery, 150 bundles tied up a dozen to the bundle, and he has been in the St. Lawrence Market only twenty minutes when the whole load was cleaned up. It reminded me of the London markets. It is surprising how they grab up good stuff here. the same as in Philadelphia. There is celery coming in now from Armstrong, B.C.; the best celery you get in Toronto is from there. This is brought in 2,500 miles because there is none in Ontario like it, so you see if they grow the right stuff there is a market for it every time, no matter what it is.

H. W. SELBY: Lots of people can pay the right price for good produce carefully packed, so what is the use of catering to the Italians? Have any of you questions on advertising?

THOS. DELWORTH: Do you think it would pay the individual gardener to advertise if his gardens are limited to about four to twelve acres?

H. W. SELBY: I do not believe I could answer you. If they were 225 acres it would be a different thing, but I believe in the height of the season you could call attention profitably to your product by advertising. There is a gentleman, Mr. Hale, Chairman of our Seed Service Committee in the Pennsylvania Vegetable Growers' Association. His gardens are not very extensive, and he advertises to a profitable end. but he only does that advertising when his stuff is plentiful.

THOS. DELWORTH: Do you think advertising would pay in the daily papers in a city like Toronto?

H. W. SELBY: Yes, if you were standing in a popular market and carried out the ideas of standardization. neat packages. etc. Let me show you in our commission house how we are able to carry out a scheme which will make immediate sales. We keep a record who buys certain goods during one year. We have a car of apples coming in—we have a record who used those apples last year. We call up the people on that list and get rid of the stuff to them very quickly in that way. Likewise with potatoes. We have a list of the people who used that farmer's potatoes. We call up the people who used them last year. and if they gave satisfaction you can bank upon them wanting them again. They will pay. possibly. a slight premium over the average market quotation: in any case you get results to warrant you in putting up your goods in the proper manner and in giving them the proper product.

A DELEGATE: What if the apples were not quite as good as they should have been?

H. W. SELBY: The next time the people came back they would want another mark or brand. and they would keep on until they found the right article. This business of market gardening is going to be a case of "the survival of the fittest." We are going to get in America an overflow in the field of market gardening. and it is the fellow who puts up his package right who is going to come out with the profit every time. The potato market with us rose until last Monday it struck 78 cents. Then the market dropped from 78 to 75 cents. This was because the farmers throughout the State were anxious to market at 78 cents rather than put them in storage. When those potatoes dropped to 75 cents we had several thousand bushels in our store which we held at 80 cents. and we sold at that price while the market continued at 75 cents. That was because we had a standard product. The people knew what they were getting in buying that potato.

J. E. BRITTON: Would you advertise in a general way towards increasing the consumption of vegetables?

H. W. SELBY: We had a man here this morning who suggested to my mind a thing which I have often spoken of before. We are raising rhubarb. turnips and celery. but how many people know what to do with it after they buy it? The reason for the small demand to-day as compared with the production is the fact that the vegetable is not properly prepared for the table. In this matter of how we would prepare for a greater consumption of vegetables, Dr. Pearl McDonald advocates training the women how to prepare the vegetable after they buy it, and I am beginning to realize more and more the truth of that contention. Suppose in the spring you were to buy a little advertising space as an association. Rhubarb is a spring vegetable. Advertise to them that rhubarb is a spring tonic, tell them of the medicinal qualities of rhubarb. Mr. Emsley is a man who has knowledge of chemistry and could write up the facts and benefits from eating rhubarb. You could get eminent writers who are medical men and scientists to furnish the facts. How many of you here have eaten stewed celery? I see there is a larger proportion in this convention who have eaten this vegetable stewed than I ever came across in a similar gathering. But do you know I have never suggested stewed celery to anyone but that they, after trying it, have continued eating it, and it is a fine food. But we do not advertise these things. We can't do it as individuals, but we can do it as an Association. That is one of the instances where you can put your "co-operation into operation."

J. W. Rush: I think our Ontario Government here must be somewhat like your Pennsylvania Government in reference to training the women. We have throughout the Province of Ontario a very enterprising lot of women, and they go under the name of "The Women's Institutes," and it is backed up by the Government. One of the principal things of these Institutes is to train women who have not had sufficient training in their earlier days to keep house.

H. W. Selby: I am glad to learn that such a thing is in vogue here in Canada. I do not know whether Dr. McDonald is in touch with that sort of work or not, but we would surely I think sell more vegetables, and consequently have scope for greater production, if the women really knew better how to utilize and prepare that vegetable for the table. Now to show the willingness of the newspapers to take up with that sort of thing. Last year I was in a section of Pennsylvania where they raised the Ewalt apple. This fruit was entirely new to our trade. To introduce that apple I took two barrels, divided them up in small portions of about $\frac{1}{4}$ of a peck each in paper bags, and asked our trade to take them home and make apple sauce from them. They did this, and we could have sold three times as many apples as Bedford county, where they were grown, produced in that year. *The Philadelphia North American* gave us a whole page, and advised the women to ask for a certain kind of apple. There are so many who ask for half a peck of apples, and not for any specific variety according to its use. I came across an apple which is a perfect wonder for baking, the Norton's Melon; and there are other apples, all of which come in for particular purposes and have their place, and I consider it is the case with lots of other products. We have to train people to know what they need. If you will carry out the method of the home hamper through your departmental stores, the sooner we get at that the sooner we will have great results from it. Mr. Fullarton, out at Long Island, tried the hamper specially adapted to four or five of a family, and shipping that hamper with charges collect, and he made quite a success out of it. You could advertise in to-morrow morning's newspapers, giving suggestions to the women on the menu—of course you have not the variety at this season. In the spring and summer season you can advertise to better advantage, and there is nothing that the women like better than suggestions as to what they are to have for their meals. We have tried this out to some extent. Get down to the individual package and suit the needs of the customer and you will find that that will be the basis of successful selling.

SOME RECENT EXPERIMENTS IN THE CONTROL OF CERTAIN VEGETABLE AND FIELD CROP INSECTS.

ARTHUR GIBSON, CHIEF ASSISTANT ENTOMOLOGIST, DEPARTMENT OF AGRICULTURE, OTTAWA.

The Entomological Branch of the Dominion Department of Agriculture has recently been conducting important experiments in the control of such serious pests of the market gardener as cutworms, root maggots, locusts, etc. It is highly advisable, therefore, at this meeting to make a brief statement of some of the results of our work before such an organization as the Ontario Vegetable Growers' Association, in order that the members may profit by the information before the growing season of 1916. The Entomological Branch desires to help market gardeners in every way it possibly can. The growers themselves may also help those of us who are working on insect problems of vegetable and field crops by reporting promptly serious outbreaks of insects and sending specimens for examination and study. A closer co-operation between the entomologist and the grower of crops will certainly result in mutual benefit.

LOCUSTS.

These insects do not every year seriously affect vegetable crops, but there are seasons such as 1913, 1914, and 1915, when locusts are enormously abundant, and at such times important losses take place in market gardens. These insects, particularly the species known as the Lesser Migratory Locust, *Melanoplus atlanis,* have been so abundant in certain parts as to compel the farmers to abandon their farms. In June last, I saw a number of such abandoned farms in several parishes in Quebec Province. In 1914 and 1915, we had excellent opportunities near Bowesville, Ont., and at several points in Quebec Province, to demonstrate the value of poisoned baits to destroy these insects. Our work in 1915 was on a larger scale than that conducted in 1914. At Bowesville, over twenty experiments with various baits were conducted, each on an area of not less than five acres. All of these experiments demonstrated the killing power of the mixtures used, but it is only of a few of those which gave the highest death counts of the locusts that I wish to call attention to-day. The Kansas formula recommended in our Entomological Circular No. 5, is as follows:—

Bran	20	pounds.
Paris green	1	pound.
Molasses	2	quarts.
Oranges or lemons	3	fruits.
Water	3½	gallons.

The mixture is prepared as follows: the bran and Paris green are mixed while dry. This may be done in an old wash tub, or box, or on the floor of an outhouse. The juice of the oranges or lemons should be squeezed into the water and the the pulp and peel chopped into fine bits and added. The syrup may then be poured into the water and when dissolved the whole should be poured slowly on to the bran and paris green, stirring at the same time so as to thoroughly dampen all the bran. The tub or other vessel in which the mixture is prepared should be washed out thoroughly or placed where live stock will not get access to it.

In 1915 certain changes were made in this mixture, as for instance in the strength of the poison used, the possible difference as an attractant between lemons and oranges, and in the amount of water required to make the mixture spread easily. Other materials used as carriers for the Paris green, such as shorts and sawdust, were also experimented with. Promising results were obtained where sawdust was used, but shorts made too sticky a mixture and one which we found difficult to spread properly. Bran makes an ideal spreader, the poison adheres to the flakes and the mixture on the whole is easy to prepare. Sawdust also mixes fairly well, especially where it is used with bran. Briefly, the mixtures which in 1915 gave the best results are as follows:—

Mixture.			Average of dead locusts per square yard.	Cost of application per acre including labour.
1.	Bran	20 lbs.	222	19 cents.
	Paris green	½ lb.		
	Molasses	2 quarts.		
	Oranges	3		
	Water	2½ gallons.		
2.	Same as 1 except that 1 lb. of Paris green was used instead of ½ pound		406	21 cents.
3.	Bran	20 lbs.	514	27 cents.
	Paris green	1 1-6 lb.		
	Molasses	4½ quarts.		
	Water	2 gallons.		
4.	Sawdust	20 lbs.	228	7 cents.
	Paris green	½ lb.		
	Salt	¼ lb.		
	Water	3 gallons.		

Other mixtures, in which half the quantity of bran was replaced with sawdust, also gave promising results.

In applying such poisoned mixtures it should be remembered that the 20 lbs. of carrier are sufficient to treat five acres of crop. Such a quantity is not intended, of course, to cover the whole of the five acres. The mixture is applied by hand, being simply scattered as one would sow grass seed. Scattering the mixture thinly does away with all danger of poisoning to chickens or other domestic animals. The locusts are readily attracted to the mixtures and will hop considerable distances to reach the same. Early morning between four and seven o'clock is the time to spread the bait, and such application should be made before the locusts become winged, preferably when they are about half an inch or a little more in length. Farmers and market gardeners should co-operate and apply the poisoned bait as near as possible on the same day.

Cutworms.

Vegetables of all kinds suffered severely from cutworms during 1915. In Eastern Canada the species which caused most destruction were the Red-backed Cutworm, the Striped Cutworm and the Dark-sided Cutworm. The habits of these species are similar and all are surface feeding cutworms. These and other common cutworms are discussed at length in our recently published 31-page bulletin on "Cutworms and Their Control," which any member of this Association may receive on application to the Chief, Publication Branch, Department of Agriculture, Ottawa. During the past season the poisoned bran remedy with fruit added as recommended for locusts was used in our experiments near Ottawa and outbreaks of cutworms quickly controlled. In one large field of onions where the cutworms were especially abundant and destructive a single application of the poisoned bait stopped the outbreak and no further injury by these insects took place. The 20 lbs. of bran mixture has been found sufficient to treat about three acres. The poisoned bait should be spread thinly in order to destroy the greatest number of cutworms, and when thus spread there is no danger of birds, poultry or live stock being poisoned. A single poisoned flake of bran is sufficient to kill a cutworm. Like the old poisoned bran bait, the new mixture containing fruit juice should be distributed over the land in early evening so that it will be the best condition to attract the cutworms when they come out to feed at night. This new poisoned bait is a cheap, reliable remedy for cutworms and should be promptly used by every grower on the first sign of injury by cutworms. If the cutworms are known to be present in the land in spring it is a wise precaution to scatter the poisoned bait after the ground has been worked and several days before seeding or planting. In widespread infestations of cutworms in 1915 we observed that the eggs had undoubtedly been laid during the late summer of 1914 on weeds, or other plants growing on higher locations and left standing, and that the cutworms which hibernated nearby in their younger stages, migrated in May to other parts of the field where food was plentiful. The importance of keeping down weeds and other useless plants so that the cutworm moths will not be attracted to the land for egg-laying purposes is therefore very important. If in spring the cutworms are noticed to be working chiefly on the higher elevations, large numbers may be destroyed before they begin to migrate by prompt application of the new poisoned bait.

Root Maggots.

We have this year continued our experiments on the control of root maggots and have again thoroughly demonstrated the value of the felt-tarred paper discs to protect cabbages and cauliflowers. In one field near Ottawa, owned by a prominent market gardener, we placed these discs around about 1,600 plants at the time of planting. Before this planting the grower had lost a large percentage of his early cauliflowers, and even after we applied the discs to the second planting of 1,600 plants, many plants in adjoining rows were rendered useless owing to attack by the maggot. Of the 1,600 plants above mentioned practically the whole number were protected from the maggot. This was an excellent demonstration of the value of the disc and will undoubtedly lead many of the Ottawa growers to adopt this form of protection next year. It is practically the only satisfactory remedy which we have for protecting cabbages and cauliflowers from the ravages of root maggots.

Experiments were also conducted with poisoned bait spray to attract and kill the adult flies before they deposited their eggs. This work, however, we hope will be continued next year. In Wisconsin a poison spray which has been used successfully to kill the Onion Maggot Fly is made in the proportion of five grains of sodium arsenite dissolved in a gallon of boiling water into which is thoroughly mixed one pint of molasses. This mixture is applied as a coarse spray of large drops once a week in strips across onion fields throughout the summer. It is claimed that the results show almost a perfect control of the insect at a cost of from 50 to 75 cents per acre for summer treatment. At Ottawa this year we also continued our experiments with various mixtures applied by means of a watering-can to rows of radishes, etc., to destroy the eggs and young maggots. In small gardens three applications, made once a week from the time the plants appeared, of 2 ounces of white hellebore to one gallon of water or fresh pyrethrum insect powder in the same strength, again gave fair results, as did also mixtures containing borax. In one experiment in which borax was used at a strength of 1½ ounces to the gallon of water, only 9 per cent. of the radishes were found to be infested by the maggot, while in a check row close by as high as 60 per cent. were infested.

White Grubs.

In co-operation with the United States Bureau of Entomology, we are making a study of the various species of white grubs which are so destructive to garden

A currant worm attacking the foliage.

and field crops. These grubs feed naturally on the roots of the various grasses, and where grass land is ploughed up and used for agricultural purposes, their natural food is thereby reduced and crops planted on such land are often attacked, particularly if the same is potatoes or corn. During 1915 white grubs caused much damage in Canada. In the United States in Iowa, Wisconsin, Illinois, Michigan and Ohio corn-growers have this year lost millions of dollars owing to the ravages of these grubs. The species of grub which this year was so destructive requires three years to complete its life-cycle, and a warning was recently issued by the entomologists of the United States Department of Agriculture for the year 1918. The grubs of this particular species will be more or less destructive up to the end of May or early in June, 1916. They will then make earthen cells in the ground preparatory to changing to the beetle state. The beetles from these grubs do not leave the soil until the spring of 1917, when they will appear and lay eggs in land covered with vegetation such as where crops as the small grains and timothy are being grown. Land overgrown with weeds will also undoubtedly attract the beetles. In 1918, therefore, such land to which the beetles will likely be attracted in 1917, should not be used for such crops as corn, potatoes, or strawberries. Land in which white grubs are now known to be injuriously present should be ploughed, if at all possible, as soon after the middle of July, 1916, as is practicable. The date July 15th is specially recommended by the United States Department of Agriculture for the above mentioned states and will doubtless apply also to Ontario, particularly the southern portions. The ploughing, of course, is to break up the tender pupal and beetle cells which results in the death of the insects. A plough which will break up the soil is, of course, preferable, but if such an implement is not at hand, the ground should be deeply disked. Chickens are fond of these grubs, and if available should be allowed to remain in the field during cultivation. Hogs are also useful in ridding small areas of white grubs.

THE VEGETABLE WORK AT VINELAND WITH SPECIAL REFERENCE TO SEED IMPROVEMENT.

F. M. Clement, Jordan Harbor.

I was very much interested in Mr. Selby's remarks, especially regarding the packing of vegetables. The whole idea now seems to be a little better package than we used to have. Then the idea of advertising. I cannot answer entirely from the vegetable grower's point of view, but I know in regard to fruit, as I am on a committee for an advertising campaign to deliver the fruit crop this year, and we got results. By doing that in the Niagara Peninsula the farmers were able to market their crop without any loss. They had assistance from the Dominion Government, but still the growers supplied $2,000 or $3,000 towards the advertising scheme.

Until this year the vegetable work has been developed in a more or less haphazard manner, but now we have a specialist in charge, Mr. O. J. Robb, a graduate of the Agricultural College, who will devote his whole time to it.

We are working along various lines, conducting experiments on various methods of production, improving seed by breeding and selecting seed. In spite of somewhat adverse weather conditions, we have this year been able to get away to a good start. The principal work in breeding has been conducted with tomatoes and cucumbers. Many varieties and strains of varieties under various names are on the market to-day, and it is very difficult for the grower to obtain commercial seed of uniform quality of a variety from year to year, consequently a great many are selecting their own fruits and saving the seeds. Pure strains are usually aimed at but on the supposition that the seeds of the first generation will produce more vigorous and thrifty plants and consequently more and larger fruits, an attempt was made this year to compare the pure strains with the seeds of the first generation. Tomatoes were grown from seed selected as follows in 1914:—

Bruce's First and Best x Royal Red.
" " " " x Chalk's Jewel.
" " " " x Earliana.
" " " " x Ponderosa.
" " " " x Livingston's Stone.
" " " " selfed.

Thirty-six crosses were made in all combining these varieties in as many different ways as possible. The pure strains gave an average yield of 727.6 bushels per acre and the first generation seeds of first crosses gave an average of 753.8 bushels per acre, 26.2 bushels per acre in favor of the first crosses. The question of earliness is an important one also but on it no data are available except that Bruce's First and Best x Earliana gave at the first picking a few more tomatoes than either pure Bruce's or pure Earliana.

Following a suggestion of your president last spring, a start has been made in cucumber breeding and selection under glass. Our tests show that the Telegraph, representing the long English type, will set fruit without pollination. This has been your experience also. On six tests made all developed normal fruits, five being seedless and one having a few not fully developed seeds. On the other hand, tests with the White Spine and Fordhook Famous show that from six tests but one fruit set normally and had poorly developed seeds while the others set no fruit at all. This indicates that though varieties of the White Spine type will set some fruit without pollination, to insure fruit in quantity the blossoms must be fertilized. Crosses have been made between these two types and a quantity of fully developed seeds obtained. From them with continued breeding and selection, it may be possible to get a cucumber of the White Spine type that will set without pollination. At any rate the possible result is worth an attempt.

This spring, a planting was made of certain varieties of asparagus for test including Giant Argenteuil, Dreer's selection of Argenteuil, Dreer's selection of Conover's Colossal, Palmetto, Barr's Mammoth, Dreer's selection of Barr's Mammoth, Dreer's Eclipse, Columbian White and a strain selected by the late Mr. Lund. Some work has also been started in a selection of peas with Abundance, Alaska, Gradus, MacLean's Little Gem, Thomas Laxton, Telephone, Champion of England and Horford's Market. The work has not progressed far enough to report on in detail.

Under the irrigation system we conducted tests on asparagus for quantity and quality, the watered plants giving 33.1 per cent. more than the unwatered in quantity; tests for the quick germination and maturity of beets, carrots and onions; tests on celery for quick growing and quality with regular applications of nitrate of soda.

The biggest work and the one you will be most interested in is that of the attempted production of beet, carrot and onion seeds. It was held a year ago that because of conditions prevailing in Europe it was possible that certain seeds would be unobtainable or be very high priced this year. The trouble has not proved to be as bad as it looked, and certain seeds are obtainable, but the effect has been all that could be desired. Why should we not grow our own vegetable seeds? A quantity of onion bulbs, beet and carrot roots were sent us by Mr. Johnston, and we endeavored to store them for use the following spring. The beets arrived in good condition and the onions also. The carrots were slightly frosted in transit and some were lost through decay. The whole attempt, however, has been fairly successful.

It is very interesting to know that though Ontario has more than 55,000 acres planted to garden crops annually, scarcely any direct interest has been taken by breeders and specialists in the improvement of the seeds. Outside of the market gardening and truck farming areas, vegetables have been more or less a side line. Seed, however, must be supplied annually for this area of crop and I am glad that an opportunity has opened for study of the whole question. A very small proportion of the required seed is produced in Canada. Then, too, when looking over the lists of the Canadian Seed Growers' Association and others I fail to find any who are making selections with the view of improving garden beets, onions, celery, carrots, cabbage, and other garden crops. Oats, wheat, corn, beans and such crops are given a prominent place, largely, of course, because of their relatively great importance but partly also because of the ease with which seed is produced. Garden crops, on the other hand, with the exception of tomatoes, peas, beans and corn, are largely biennial or perennial, such as asparagus and rhubarb, and two or more years are required before seed is produced. Another reason why some of these crops are neglected is because they mix badly when grown closely together. Most of our grains will not do this. Peas are a good example and consequently the development of pure strains of this vegetable is a much easier task than with onions, beets, carrots or even tomatoes. It seems necessary first to demonstrate also that seeds of these vegetables can be grown in Canada; that they can be grown profitably; that the product is equal to the imported product and that the present methods of selection for improvement are leading to the desired end.

It already has been demonstrated that seed can be grown in Canada, but not that it can be grown successfully year after year in competition with the European product. Experiments at Guelph and Macdonald College, Que., show that home-grown seed is equal to imported seed, and at Macdonald some pure strains of field roots have been selected. We can then very hopefully expect that in the next few years good results may be obtained from breeding and selection work in garden vegetables.

Returning more to the practical side of the work the question of storing for the winter is an all important one. In connection with the Denia bulbs sent us, some were stored in a dry cellar, some in cold storage, and some were buried in dry sand. Those stored in the cool, dry cellar kept best but still the loss was more than 50 per cent. Even a great many of the bulbs that appeared quite firm and good failed to grow. Some that did send up stalks were not thrifty and the quantity of seed set was very little. The experiment was largely a failure. The few bulbs of Ailsa Craig and Red Weathersfield onions did well and the seed is a good sample. The main onion work, however, was with the Yellow Globe Danvers. All bulbs were carefully graded into four sizes: very small, small, medium and large. One hundred very small bulbs averaged 217 ounces; one hundred small bulbs averaged 294 ounces; one hundred medium bulbs averaged 470 ounces; one hundred large bulbs averaged 700 ounces. In addition to this, selections were made of the best individual bulbs, globular in type, flat in type and intermediate in type. These were grown separately and the seed harvested separately from each individual, to be grown in 1916 in separate rows. The best of these will be used to develop strains or certain types in future experiments. The quantity of seed from the different sized bulbs is not yet available as the seed has not all been threshed and cleaned. This data will, however, be put in the Station report. It is generally supposed that large bulbs will give no more seed than smaller ones and, though all the figures are not yet available, it appears as though the amount of seed produced per bulb is directly proportionate to the size of the bulb. Of the largest onions, 16 were required to give 100 seed stalks; of the medium, 28 were required to give 100 seed stalks; of the small, 36 were required to give 100 seed stalks and of the very small, 38 were required to give 100 seed stalks. This is very important as it largely determines the distance apart the various sized bulbs are to be planted. Our plants were set fifteen to sixteen inches apart in the row with four feet between the rows. But this is apparently a waste of space. Eight or ten inches between the bulbs would have been quite enough. The distance between the rows should be just great enough to facilitate cultivation. Our methods of cultivation were taken entirely from written instructions and articles. The best ideas from these were adopted to our particular conditions. The soil was manured carefully with well rotted farm yard manure and carefully ribbed up the previous fall. The ribbing exposes the greatest amount of surface to the atmosphere and at the same time hastens rapid drying in the spring. As soon as opportunity and general conditions permitted, the soil was thoroughly worked and the bulbs planted on April 14th and 16th. Furrows were plowed about five inches deep and the bulbs placed head down in these. They were then carefully covered with the soil. This left the crown about 1½ to 2 inches below the surface. Cultivation was regular and continuous and as the plants grew they were gradually banked with earth to a height of six inches. This strengthened the stalks so that artificial supports were not necessary.

Wet weather during late July and early August to some extent prevented pollination, but, as a whole, the set of seed was fair and the growth as good as could be expected. The beets and carrots were treated similarly. It is planned if the seed proves as good as it looks to send it out this spring to be tested by growers against ordinary commercial seed. We wish, if possible, to determine the place of Canadian grown seed.

Some of the seeds have already been sown for a germination test. The onions are just breaking through the ground and, a part of the beets are well advanced. Of seven tests made with the beets fifty seeds to each test, 55, 37, 39, 88, 51, 68 and 85 plants have developed, an average of 60.4 from each fifty seeds. Onions are not far enough advanced to report on.

In the tomato selection work, there is nothing of value to report. Selections have been carefully made from twenty-five varieties of earliest fruit from earliest plants, latest fruit from earliest plant, from the most productive plant, from uniform fruiting plants, small fruit, large fruit and from all plants that show desirable variations.

We hope from working along these lines to get the necessary data to enable us to select intelligently for certain results whether it be for earliness, quality of uniformity.

The Station is anxious to co-operate with the members of the Vegetable Growers' Association in seed production and improvement, and we only ask that you test carefully any seeds that may be placed in your hands.

A Delegate: How far apart do you have to grow the different varieties of onions so that the seeds will not become mixed?

F. M. Clement: Ours were placed at least 200 yards, that is the Ailsa Craig was 200 yards from the Yellow Globe Danvers, and the Yellow Globe Danvers and the Denia were about 150 yards apart.

A Delegate: Did you have just the three varieties?

F. M. Clement: Yes.

W. J. Rush: Is that seed to be distributed among the growers?

F. M. Clement: The plan is to test that seed carefully first, then apply to the Secretary for the names of those who are willing to test it. What we want to get is the yield of home-grown seed in comparison with commercial, simply to demonstrate the fact, if possible, that home-grown seed is equal to commercial seed, and we are willing to distribute seed if the next test shows up as good as the last one.

CHARLES BROWN: How do you clean the carrot seed?

PROF. CROW: In reply to that I might say that Mr. G. H. Clark, the seed Commissioner, was good enough to send us a small mill. We cleaned some of our carrot seed. It is what they call a Cutter Cleaner and costs $35. We find it perfectly satisfactory for cleaning carrot and beet seed, and we use it for flower seed also, of which we grow quite a quantity, and it is decidedly worth having if you are going to grow any seeds.

J. LOCKIE WILSON then read a telegram and letter from the Central Canada Exhibition, Ottawa, asking the Ontario Vegetable Growers' Association to appoint delegates to their Fair Board.

The President and Mr. I. B. Farquharson, of Aylmer, were appointed.

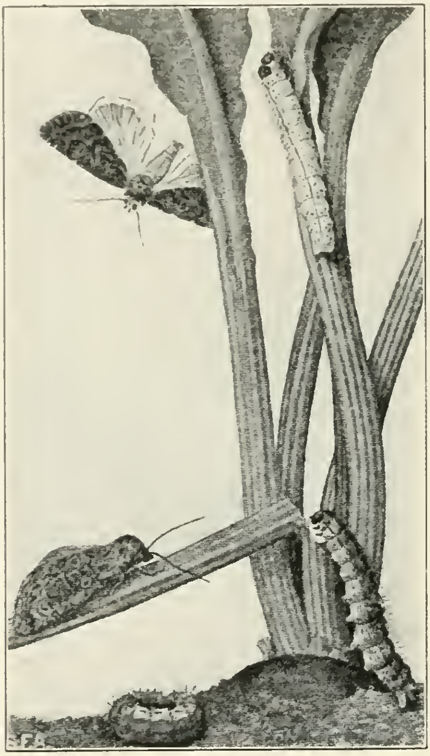
J. LOCKIE WILSON: Valuable information has come to us through the delegates who have attended the American Vegetable Growers' Conventions. One of the chief things that have accrued to us has been the attendance at our Conventions of prominent vegetable experts from the other side of the line, and the thanks of our Association are due to Mr. Selby and Prof. Waid for their splendid addresses.

C. W. WAID: I wish to thank the Secretary and the delegates for their expressions of appreciation in connection with the American Vegetable Growers' Association. We have only been waiting for the time to come when conditions are ripe for a meeting of that Association in this country, and we hope that the time will not be far distant when more of us can come over to exchange opinions with the enterprising gardeners of Ontario.

The most successful Convention in the history of the Association was then brought to a close by the singing of the National Anthem.

CUTWORMS.

The two common cutworms, the glassy worm and moth above, and the variegated cutworm and moth below, are among the most destructive insects to vegetable garden crops. They emerge in spring ready to cut early vegetation. The worms generally work only at night, attacking plants of all kinds.



Cutworms at work.

Moths are chocolate-brown, white and buff, and grayish-brown, white and clay-colored. The glassy cutworm is pale, shining, greenish-white; the variegated cutworm is dull reddish-brown, with black, white and dull yellow markings, a red spot on the last segment. The dark variety is feeding and the pale form lies curled up on the ground.

On cultivated ground cut plants of no use, poison with arsenates, and spread about in bunches.

INSECTS AFFECTING VEGETABLES.

Aphis. Attacks peas, melons, etc. Use nicotine preparations, or kerosene emulsion, two or three applications at intervals of three or four days, reaching under sides of leaves.

Asparagus Beetle. Use arsenate of lead on summer foliage; cut and burn all vines in late summer.

CATERPILLARS. Various kinds attack cabbage, tomatoes, tobacco, etc. Use arsenate of lead, paris green or hellebore; or pick by hand.

CUCUMBER BEETLE. Yellow and black striped; Use tobacco dust as preventive; beetles carry the germs of wilt. Pick by hand the first bugs in early morning.

CUTWORMS. Fat, sluggish, ground worms, brown with dark stripes, cutting through stems of many plants, especially when just or newly set out. Trap under pieces of shingle or flat stones; or scatter about toward nightfall a mash of one quart of wheat bran, one teaspoonful of paris green or of white arsenate, one teaspoonful of a cheap molasses, mixed with enough water to make a mash. Careful search round a newly cut plant early in the morning will usually uncover the marauder near the surface.

FLEA BEETLE. A small, hard-shelled, jumping beetle, which punctures leaves of tomatoes, potatoes and seedling plants. Use tobacco dust or kerosene emulsion on seedling plants; Bordeaux and lead on tomatoes and potatoes.

MEALY BUG. A scale-like insect with cottony covering. It seldom appears in the vegetable garden. Use kerosene emulsion, brushing with alcohol.

POTATO BEETLE. Use arsenate of lead or paris green. On egg plants use lead only, and pick by hand.

SQUASH BUG. A lively, flat, black fellow. Use tobacco dust, or pick by hand to get rid of old bugs and eggs; use kerosene emulsion for the young ones.

SQUASH BORER. Slit stem near base of plant, and destroy the borer. Cover wound with fresh soil.

WHITE FLY. Attacks tomatoes, and vine crops. Not conspicuous until large numbers have propagated. Use tobacco dust as repellent; spray with nicotine preparations and kerosene emulsion.

MILDEW. Attacks cucumbers, melons, and lima beans. Dust with flowers of sulphur to prevent spread. Use regular Bordeaux-lead spray as an effective preventive through the season.

BLIGHT. Affecting cucumbers, potatoes and other things, in various forms. Spray with Bordeaux frequently enough to keep all new growths covered. Dust with sulphur-lead preparations.

ANTHRACNOSE. "Leaf spot" or "rust," attacking beans, tomatoes and celery. Use Bordeaux mixture or summer-strength lime-sulphur; or ammoniacal copper-carbonate solution to avoid stains on foliage and flowers.

SIMPLE TREATMENT FOR POTATO SCAB.

The value of treating potatoes for scab is well known, but most methods are tedious and impracticable when large quantities of seed are to be treated. Growers cannot afford to take the time to dip potatoes in sacks for forty or more acres or even to handle the dipping solution more than once, so they seldom treat more than is needed for the seed plot.

To do away with the tediousness of treating in sacks or barrels, a simple method by which one man can treat and cut enough potatoes in a day to keep a one-row planter busy is as follows: A 150-gallon tank is equipped with a shovelling board across one end. Ten bushels of seed are poured in and immersed in seventy-five gallons of formalin—one pound of formaldehyde to thirty gallons of water. After two hours these are shovelled out on a draining hopper and another ten bushels are immersed. The draining board is set at an angle so as to slope down to the potato cutter. With the seed supply handy and the tanks and cutter conveniently arranged, one man can cut ten bushels in two hours and can thus treat and cut enough stock to keep one planter busy.

Many growers prefer to cut the seed in the field at the time of planting. In such a case the tank may be hauled directly to the field and filled with the solution, one charge being enough to last a day. Care must always be exercised to prevent reinfection of seed after it is treated.

Cost of treating does not exceed seventy-five cents for fifty bushels of seed—less than twenty cents an acre. The cost may be less if all the treating materials are convenient.

THIRTY-SIXTH ANNUAL REPORT

OF THE

Beekeepers' Association

OF THE

PROVINCE OF ONTARIO

1915

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by A. T. WILGRESS, Printer to the King's Most Excellent Majesty
1916

Printed by
WILLIAM BRIGGS
Corner Queen and John Streets
TORONTO

To His Honour Sir John Strathearn Hendrie, C.V.O., a Lieutenant-Colonel in the Militia of Canada, etc., etc., etc.

Lieutenant Governor of the Province of Ontario.

May it Please Your Honour:

I have the honour to present the Thirty-sixth Annual Report of the Ontario Beekeepers' Association for 1915.

JAMES S. DUFF,

Minister of Agriculture.

Department of Agriculture,
Toronto, 1916.

Ontario Beekeepers' Association

OFFICERS FOR 1916.

President—F. W. Krouse, Guelph.
1st Vice-President—Jas. Armstrong, Selkirk, Rt. 1.
2nd Vice-President—W. W. Webster, Little Britain.
Secretary-Treasurer—Morley Pettit, O.A.C., Guelph.

Directors—District No. 1, R. E. L. Harkness, Iroquois; District No. 2, A. McTavish, Carleton Place; District No. 3, M. B. Holmes, Athens; District No. 4, R. Lowey, Woodrows; District No. 5, W. W. Webster, Little Britain; District No. 6, J. L. Byer, Markham; District No. 7, F. W. Krouse, Guelph; District No. 8, Jas. Armstrong, Selkirk, Rt. 1; District No. 9, John Newton, Thamesford; District No. 10, Jacob Haberer, Zurich; District No. 11, C. E. Chrysler, Chatham, Rt. 5; District No. 12, Denis Nolan, Newton Robinson; Ontario Agricultural College, Morley Pettit, Guelph.

Committees:

Revising Committee—Mr. Sibbald, Mr. Pettit.
Honey Crop Committee—Mr. Couse, Mr. Craig, Mr. Sibbald.
Representatives to Horticultural Exhibition—Mr. Couse, Mr. Grainger, Mr. Sibbald, and the Secretary.
Transportation Committee—J. D. Evans, the President and the Secretary.

Representatives to Fair Boards:

Representative for Toronto Exhibition—J. D. Evans, Islington.
Representative for Ottawa Exhibition—M. B. Holmes, Athens, and the President.
Representative for London Exhibition—E. T. Bainard, Lambeth.

Treasurer's Report

For the Year Ending October, 30th, 1915.

Receipts.		Expenditures.	
Balance on hand, 1914	$52 16	Grants to Associations	$288 86
Membership fees	984 25	Expenses, Convention	257 50
Queen Order receipts	1,261 60	Expenses, O. B. A. Committee	68 75
Affiliated Societies' dues	155 00	Subscriptions, "The Beekeeper"	876 38
Ontario Government grant	700 00	Printing and postage	212 64
Honey sales receipts	78 61	Queen Order payments	1,189 68
Sundries	16 89	Office help	76 20
		Office supplies	47 62
		Incidentals	6 96
		Balance on hand	223 92
	$3,248 51		$3,248 51

Examined and found correct,
this 15th day of November, 1915.

D. F. Cashman,
Auditor.

J. L. Byer,
President.

Morley Pettit,
Secretary-Treasurer.

Ontario Beekeepers' Association

The thirty-sixth annual meeting of the Ontario Beekeepers' Association was held at the Carls-Rite Hotel, Toronto, on the 23rd, 24th, and 25th November, 1915.

About 200 beekeepers were in attendance from all parts of Ontario.

The President, Mr. J. L. Byer, occupied the chair.

PRESIDENT'S ADDRESS.

J. L. Byer, Markham.

Since meeting together here a year ago in convention assembled, another season has passed, bringing with it the usual varied experiences in the way of pleasures and sorrows, realizations and disappointments. And while, no doubt, it is true that the lot of some has been more fortunate than that of others in the matter of things temporal, yet I venture to say that there is no one of us but who will feel like devoutly thanking Almighty God that things are as well with us as they are, if we but for a moment think of the awful misery confronting hundreds of thousands of poor unfortunates dying, or at best existing, in the portions of Europe and Asia now being devastated by the terrible war in which most of the nations of the world are now engaged.

During the year just passed the grim reaper has been in our midst and some of our beekeeping friends have passed to the great beyond. Prominently amongst these stands the name of J. K. Darling, of Almonte, a gentleman well known to a great many of us, a man of sterling qualities and Christian demeanor, and a past-president of our Association.

The winter of 1914-15 was disastrous to the bees in some sections and particularly so in apiaries where little or no fall feeding was done. Inferior stores gathered from hard maple the previous season seems to have been the cause of most of the loss, as in every case under my notice where heavy feeding had been done the bees wintered well. Our Secretary estimated that some sections lost as high as from fifty to seventy-five per cent., and while this may have been true in a few isolated cases, careful inquiry convinces me that very few of the men who produce honey as a main line in their business, had very heavy losses; and personally, after taking this thought into consideration, I would be inclined to say that losses last winter were little above the average.

The crop of honey was good from Toronto west, and light from that point east. No doubt there are some exceptions to this, but in the main this estimate will be found to be about right. Unfortunately for us personally our York County apiaries were east of the line dividing the land of good crops from the land of medium to very light ones. Northern Ontario, in the main, gave a very fair crop of honey of No. 1 sample.

Contrary to general expectations on the part of the beekeepers, the demand for good honey has been exceptionally keen, and wherever any effort has been made to obtain prices recommended by the crop committee, the same has been received.

generally speaking. True, some beekeepers got "panicky" early in season and sold for as low as eight cents, I am told. Needless to say they could have obtained at least two cents more per pound by holding for a few weeks—quite an item when the crop runs up to ten tons or more. Early in season the demand for buckwheat honey was very light—in fact many well known dealers would not quote any price. However, the situation is now better, and as the dark honey crop is not heavy, all honey of this grade should move off easily.

Our membership at present is 1,130. 426 came in through the affiliated associations and 604 by single subscriptions. County Associations are, I believe, the same in number as a year ago, viz., 26.

The *Beekeeper* has been given to each member as a premium as in former years—it will be for your executive for next year, to decide whether the same course will again be taken.

The disease situation has been, is at present, and is likely to be so in the future, a question of paramount importance to the beekeeping fraternity, and especially to the members of this Association who comprise the bulk of the main honey producers of the Province. From what I can learn, the situation might be briefly summed up like this: American Foul Brood, at least no more of it than in former years—possibly there is less of it as each year goes by. European Foul Brood gradually spreading—in fact "gradually" is hardly the word to use as this disease travels real fast in the majority of cases. I understand a new centre for the disease to radiate from has been discovered in Haldimand. The general report from beekeepers and inspectors alike, says that we have not enough money to properly fight these diseases; and the appropriations run out early in the season, and after that no matter how urgent the case, inspection is often an impossibility owing to lack of funds. While this is, no doubt, true, in view of the many appeals being made during these troublous times to private and public purse alike, it seems almost useless to try and obtain further grants until conditions become more normal again. Sometimes I have felt like saying with others, "Let the disease go and let the problem be worked out on the principle of the survival of the fittest," but even if we did incline to sympathize with this rather selfish view, the fact remains that during the sifting out process, the unfit will cause a big loss and a pile of work to the fittest. The only thing left is to do the very best we can with the funds at our disposal, and as emphasized a year ago, try in every means possible to educate every beekeeper to be his own inspector.

Bear this in mind. Under existing provisions as we have them, early requests have the preference, so if you have urgent cases near you that need attention notify the Department through Mr. Pettit early in the season.

I understand that during the past season the inspectors were authorized to stop at a diseased apiary and treat the colonies, provided the apiarist paid for this extra work at forty cents an hour. The trouble was that in some cases the beekeeper thought the Department should do all the work gratis. Just how much of this work was done I am not in a position to say, but it certainly does not look reasonable for the beekeeper to expect to have the bees all treated at the Department's expense. I would, therefore, suggest for your consideration that when a man refuses to treat the bees after being shown how the Department should then step in and treat them by the coal-oil method.

The queen order business has again been carried on with an increased patronage as compared with last year. This branch of the work appears to be giving a lot of satisfaction to all concerned, and to my mind it is a splendid method to get many to introduce better stock and thus be in a position to combat

European Foul Brood more effectively, to say nothing of the increased production of honey and other factors incidental to having Italians or Carniolans instead of black bees.

In regard to contributions of honey to the Red Cross Fund, an appeal was sent out that honey might be forwarded. I sometimes think it might have been better had it been sent under the auspices of the Ontario Beekeepers' Association. A quantity of honey has been sent to Toronto, and I know that from our own neighbourhood beekeepers have contributed honey through the Women's Institute. Some of our County Associations have sent contributions of honey.

As to the Horticultural Show, the different societies met this spring and decided that it would not be wise to hold a show this fall. One reason being that it was difficult to secure a suitable building.

We had an intimation from those in charge of the Canadian National Exhibition that the grant we received a year ago would not be given this year, and they asked us to prepare a prize list. That prize list was drawn up by our committee and adopted, and I am sorry that, owing to some misunderstanding with regard to the privilege of selling on the ground, only one exhibit was made, that was by Mr. George Laing.

The President, in conclusion, gave it as his opinion that the Provincial Apiarist was giving too much attention to elementary instruction at the College rather than engaging in the more advanced work that the Association had in mind when its members had urged the Government to establish such a department at Guelph. He expressed the fear that there was a tendency to boom beekeeping and induce too many inexperienced persons to rush into a calling which was not the quick-rich concern that they imagined.

In the discussion that ensued upon this point of the President's address, it was stated in reply that there was plenty of room for more beekeepers if their work was good, and that all classes engaged in the work of producing honey deserved encouragement—novice and experienced man alike. Apiarists, like general farmers, should have the best training possible for their work.

REPLY TO PRESIDENT'S ADDRESS.

F. W. Krouse, Esq., 1st Vice-President, Guelph.

The President mentioned the loss from hard maple honey. We should all look out for that. If any of you are in a district where you get much of that you should by all means see that it is out of the brood-nest before winter. If you have very much of it in the brood-nest you are almost sure to lose the colony of bees. We have quite a lot of hard maple in our district, and every colony that went into winter quarters with mostly hard maple honey died in the spring—not early, but later on. When I examined the hives, I found this honey granulated hard in the brood-nest. When I extracted this honey I noticed that it granulated very quickly. We left the extractor full of honey from Saturday night till Monday, and on Monday it was so thick that it would not run out.

We have had a fair crop in most places, and that is something for which we should be thankful after the very short crop we had last year. Although the crop was not as good as we expected from the indications in the spring and the amount of clover, yet we should be thankful for the crop we received because the weather conditions were bad.

Prices have been good. In my own case I received as good prices as I did a year ago. I have not had to lower the price, and I do not expect to. The dark honey did not sell as rapidly this year as usual. A number of men who have formerly bought dark honey did not buy it this year. One man to whom I have always sold dark honey wrote me that he did not want any. I had to find another market for my dark honey, and I sold it in Winnipeg. Mr. Pettit recommended me to a buyer out there. Since I have sold I have had one or two inquiries for dark honey.

Our membership has dropped off a little, but I think it has kept up fairly well under the conditions.

I think we are getting the upper hand of the American Foul Brood, at least we are in our district. The European Foul Brood is going to come to us sometime, and the proper thing to do is to be prepared and have our colonies Italianized. It has taken a new hold this year in Haldimand County, and no doubt it will spread all over in time.

Mr. F. P. Clare, Toronto: Would you kindly tell us how we are to know maple honey from clover honey?

Mr. Krouse: It is not as light as clover honey and comes in before the clover honey. It comes in quite early, in May. If you have a lot of that honey stored in the brood nest the best way is to work it in the brood or take it out and extract it. I was foolish enough to leave quite a lot in a year ago last summer. That seemed to be about the only honey I got. There was lots of it in my big hives, and I left it there.

Mr. C. Blake, Snow Road: I do not suppose there is much danger of that unless we have a short season?

Mr. F. W. Krouse, Guelph: No. A year ago we had no clover honey in our district.

REPLY TO PRESIDENT'S ADDRESS.

James Armstrong, 2nd Vice-President, Selkirk, Ont.

We have been trying for several years to get something done to protect beekeepers from bees that are shipped in from other countries. Bees are brought in from New York State, and we have been getting them for quite a number of years. I have been expecting some disease to come in that way and we struck it this summer. We have European Foul Brood very bad in some places. I think it is time that we stirred up the Dominion Government to do something in this regard. They should notify the Department at Guelph that there is a shipment of bees coming to John Smith, and that they are coming through at Fort Erie. The inspector of that district could be right on the job and give these bees a thorough inspection. If he found any disease he could destroy them at once or ship them back again. The way the law is at present we cannot stop them from coming in. Last fall this disease got in and we had several county meetings. The District Representative did the advertising and sent out the notices to the beekeepers, and we had three nice meetings in the County of Haldimand. We had an attendance of between twenty and thirty at each meeting, and more queens were bought after these meetings than ever before. All this work was done by the County Association and at no expense to the Government. I think it would be a good plan if every County Association would get to work and do something for themselves. I have been talking along this line for several years, that the beekeepers should try to help themselves first. If you have a neighbor who is not getting on well try and help him. At our annual meeting in October we talked this matter over thoroughly and there was not a member present who was not willing to pay a certain amount to be used in the county for the purpose of heading off disease and cleaning it up. We sent very little honey to the Red Cross from our County. I do not know of more than 100 lbs. which was sent. The request came after the honey was nearly all sold and they did not want buckwheat honey.

MR. J. D. EVANS, Islington: I have been trying to get some measure whereby bees coming into Canada can be inspected. We are now getting a lot of bees without combs—bees by the pound. I do not know how they are going to be inspected. I think there should be a very stringent regulation as to how these come into the country. I think the executive should endeavor to have legislation passed that we should have a thorough inspection of all bees coming into Canada. There is a law providing for the inspection of trees. This Act was passed because it was found that diseases were being brought into Canada on fruit and ornamental trees. Something of the same kind should be done with regard to bees. The trouble with our convention is that there is no place on the programme that will allow us to pass resolutions and get down to business and do something. I moved once before that the executive take certain action to have bees inspected, and if it is in order now I move again that the Executive of the Association be instructed to take such means as in their judgment is best to provide for the inspection of all bees imported into Canada. I greatly appreciated the address of the President.

MR. J. F. DUNN, Ridgeway: I have much pleasure in seconding that motion. It touches on an important point. I think the safest way to get bees is to bring them in without combs, because I do not think there is much danger of infection when they are brought in in that way. I live near Niagara Falls, within nine miles of where all the bees come into this country. Nearly all the trouble we have had has come from the United States. If these bees could be inspected we would be saved all our trouble. I suppose this is a matter that will have to be handled by the Dominion Government and perhaps a strong resolution backed up by this convention may bring results. The bees that came over from the United States came from an area that was supposed to be cured of European Foul Brood by the introduction of Italian queens. I don't want to minimize the importance of Italian queens, because they are our only salvation, but a yard that has been cured of European Foul Brood by the introduction of Italian queens is not a safe yard to bring queens from. In a township not very far from where I live and where the European Foul Brood has never made its appearance, the people came from quite a large apiary state, and the bees were brought from the United States, and as far as Italian bees could do it they were clean, but the disease was there just the same, and it was not long because the country was filled up with black bees. The product ran down from 265 to 60 lbs. in one season. If we can secure this inspection I think we will get rid of a lot of trouble.

M. B. HOLMES, Athens: The ground that has been taken by the previous speakers is good, but I was in hopes that they would touch on another feature in the protection of bees. There has been called to my attention during the last few months in the eastern counties, not my own county but further east. The party who complained to me had eighty-six colonies of bees, and his neighbors sprayed his grain for the extermination of mustard, and as a result he only had eleven colonies left out of eighty-six. Thirty-three colonies died within a week, absolutely. I was asked if there was any legislation by which such wholesale destruction of the property of a beekeeper can be prevented. It occurred to me that while this resolution was going through that fact might be noted, and legislation might be secured to prevent the destruction of bees in the manner I have described. I believe, if necessary, I could get sworn testimony to prove what I say. I am told that the party who did the spraying wished to sell his farm and was anxious to do the spraying, but he was rather fearful that it might injure his neighbor's property.

The Chairman: The Thursday afternoon session is devoted to Poisoned Sprays and Their Relation to Bees," and that might be a better time to bring this matter up. That would be a matter for the local Legislature.

Mr. Chas. Blake: Do not think you will get rid of European Foul Brood as soon as you get Italian bees. You have got to fight it continually from the spring until the fall. I found many hives this season scattered here and there in the hands of up-to-date beekeepers. They would say: "My hives are all clean but you will find some of the disease here and there." I believe it comes from the old-fashioned box hives that are being used by careless beekeepers. One man allowed his box hives to be cleaned out by his own bees and his neighbors' bees carried home the disease. I believe it would be well to prohibit bees from coming in from the United States altogether. I believe that is what has spread it from one end of the country to the other.

The Chairman: This is a resolution that should appeal to each and every one of us. I will repeat it: "That the Executive be asked to take action to have the Federal Government pass legislation forbidding the importation of bees into Canada until they have first been inspected at the border." Carried.

TEMPERATURE AND HUMIDITY IN THE HIVE IN WINTER.

Dr. E. F. Phillips, in Charge of Bee Culture Investigation, United States Department Agriculture, Washington, D.C.

Since the task of discussing the practical phases of outdoor wintering is assigned me for a later session it will be best to confine the discussion of the subject now assigned to the theoretical phases only, without attempting to apply them to the apiary conditions. My colleague, Mr. Geo. S. Demuth, and I have for the past three winters been interested in the conditions of the hive in winter. On this subject we published as a preliminary report Department Bulletin No. 93, "The Temperature of the Honey Bee Cluster in Winter," and recently published a practical discussion as Farmers' Bulletin No. 695, "Outdoor Wintering of Bees." Furthermore on several occasions I have discussed the subject now assigned and some of these papers have been published. This explanation is made to explain a partial repetition at this time, although probably not all present have had access to the papers mentioned. The problem is so important that repetition is excusable.

Canadian beekeepers, like their co-workers in the United States, are losing many colonies every winter. That the present heavy loss can be greatly reduced or even that, barring accidents to colonies, it can all be avoided is an inevitable conclusion. Our previous knowledge of wintering came from trials in the apiary, results obtained at enormous cost and without opportunity for constant observations of the bees. Furthermore this experience is transient since much of the good work is buried in bee journals and now forgotten by most beekeepers. It has, therefore, seemed time for a detailed study of these conditions.

The Source of Heat in the Colony.

It is a well-known fact that bees generate heat during cold weather, so that the temperature of the cluster never drops very low. The lowest temperature that we have found is 57° F. In order to see what the bees do during this period of heat production, we devised a special outfit so that we coud see the inside of the cluster. A colony in winter forms a compact, approximately spherical cluster and on the outside of the cluster there is nothing that one can see that suggests the heavy heat production that must take place. However, a narrow hive was provided, with double glass sides and top, with an air space between the sheets of glass to act as an insulation. The stores were then so arranged that the only place available for the cluster was next to the glass on one side. In the outside space were placed a number of the electrical thermometers which we used and which are briefly described in Bulletin No. 93 of the Department of Agriculture, to which those interested are referred. In the space provided there was not room for a spherical cluster, so the bees formed a hemisphere, the equator of which was against the glass. This showed as a circle of bees on the glass, exposing to view the centre of the cluster.

It was then clearly demonstrated that the cluster is not uniformly compact. The cluster consists, between the combs and sometimes above and below them, of an outer shell of bees packed close together, with their heads towards the centre. The thickness of this ring varies with the weather being thicker when the outer temperature is warm and when less heat production is needed, and becoming thinner with the increase in heat production. This is because when more heat is produced more bees are needed for this work, leaving less for the outer rim.

In order to expose this colony (Colony C) to rapid changes in temperature, the hive was placed on the roof of the building, and while one person watched the bees another read the temperatures in the room below where the instruments were located. A telephone was installed, so that the two persons could be in constant communication, head pieces being used, so that the hands of both observers were free. The observations made on the roof were then given over the telephone and all records were made below. This colony was of course in the light, but the normal cluster was nevertheless observed. The colony was disturbed as little as possible during the observations to eliminate abnormal conditions.

The nearly spherical cluster of bees consists, between the combs and sometimes above or below them, of an outer shell of bees close together, with their heads towards the centre. This ring may be several layers thick. The position with the heads inward is typical, except when condensed moisture drops on the cluster, as it often does in cool weather, when the bees at the top turn so that their heads are upward. The bees in this outer shell are quiet, except for an occasional shifting of position. Inside this rather definite shell the bees between the combs are not so close together, nor are they headed in any one way. Considerable movement, such as walking, moving the abdomen from side to side, and rapid fanning of the wings, takes place inside the sphere, and when a bee becomes unusually active the adjoining bees move away, leaving an open space in which it can move freely. Two bees may often be seen tugging at each other. In addition to the bees between the combs, placed as above described, others are in empty cells of the comb on which the cluster is always formed, always with their heads in. A verification of these statements is contained in the following observations, and the experiment may easily be repeated by anyone: For the purpose of obtaining a colony without combs for another experiment, a hive was opened December 15, 1913, while the outside temperature was low enough to cause the formation of a compact cluster. When the combs were separated the circle of bees in the shell was clearly observed. When a comb from the centre of the cluster was shaken the active bees in the centre of the circle dropped off readily, and those in the outer shell which were somewhat sluggish were removed with more difficulty. After this was done those occupying empty cells in the centre of the sphere backed out of the cells and were shaken off. Finally those occupying cells in the border of the sphere backed out, showing a well-marked circle on the combs. Evidently the bees in the shell, whether in the cells or between the combs, are less active than those in the interior of the cluster. Naturally such a manipulation as this is not to be recommended, except for purposes of demonstration.

It is clear from observations previously recorded that the highest temperatures are those of points in the centre of this shell, and this is to be expected, as the heat is generated here. The outer shell constitutes an ideal insulator for the conservation of the heat, since the bees arranged so close together form small dead air spaces in their interlacing hairs, especially those of the thorax, and afford still more insulation with their bodies. The abdomens of the bees in the outer row are practically separate one from another, and must often be exposed to severe cold. That this method of conserving heat is effective is shown by observations on undisturbed colonies out of doors. For example, on January 14, 1914, there was at 9 a.m. a difference of 68° F. between thermometers 14 (centre of the sphere) and 16 (outside the cluster) of Colony D, which were less than 4½ inches apart on the same level in the same space between combs, and a difference of 75° F. between this couple and the bottom board 4¼ inches below it. What this difference might sometimes be in colder climates may be imagined. Examples of this kind might be multiplied indefinitely from the records of these experiments.

The source of the heat of the cluster must, of course, be the oxidation of the food consumed by the bees. The bee is classed as a cold-blooded animal, in that the temperature of the individual bee is practically that of the surrounding medium. There is obviously, from the records just given, no internal regulation of the temperature of the body, such as is found in birds and mammals, for the temperature of a broodless cluster varies greatly. From the observations made on the various colonies, especially Colony C, it is clear that heat for the warming of the cluster is produced by muscular activity. While, of course, some heat is doubtless liberated by other life processes, this is practically negligible when bees are quiet, as in Colony A, when above 57° F. That higher temperatures may be produced greatly increased muscular activity is required, and in Colony C in cold weather bees in the centre of the shell of insulating bees were seen fanning vigorously and executing other movements, such as shaking and rapid respiration. We thus have the paradoxical condition that bees fan to heat the cluster in winter as well as to cool the hive in summer. Observations of this kind were repeated beyond number, and this theory of the method of heat production is entirely supported by the repeated observation of a humming noise from the cluster during cold weather.

A few details of the observations on Colony C may be of interest. For example, one bee was observed fanning vigorously for 7½ minutes (9.53 to 10.01½ a.m., January 23), while the other bees kept a space cleared for it. The temperature of the nearest thermometer rose 1½° F. during this time. At 9.52 this thermometer was almost a degree cooler that at the time of greatest heat during the fanning. The rapidity of fanning of the wings varied, and toward the end of the time it became so slow that the outline of the wings was distinguishable. After the excessive activity this bee stood in the same place for a time. Rapid respiration may play a more important part in heat production that at first appears. One bee was observed to breathe 21 times in 14 seconds and then cease the rapid respiration. On other occasions 50 or more bees would begin shaking their bodies from side to side.

THE EFFECT OF CHANGES IN EXTERNAL TEMPERATURE ON THE HEAT PRODUCTION.

Another colony (Colony A) was used during the winter of 1912-13 to determine the responses of a normal colony to changes in outer temperature. It also was located on the roof, where the bees were free to fly whenever the weather permitted, and where it was exposed to rapid changes in temperature. It was in a 10-frame Langstroth hive, the entrance being reduced to 3/8 inches deep and eight inches wide, and the colony was not packed or given additional protection. In this hive we placed nineteen electrical thermometers, three on the bottom board in a row down the centre, one in each upper corner and twelve among the combs, distributed in such a way that the cluster could never get away from all of them. Readings were made hourly from 9 a.m. to 4 p.m. through the entire period of observation (September 26 to March 28), except Sundays and holidays, and at intervals additional special series of readings were made every 15 minutes (sometimes every 30 minutes) during the night (5 p.m. to 8.45 a.m.) for periods of several days each. In all 41,413 records were made of temperatures in Colony A.

The reaction of the cluster in heat production, as induced by changes in external temperature is well shown by the records made from noon November 13 to 2 p.m. November 15 (1912), when readings were made hourly from 9 a.m. to 4 p.m. and every 15 minutes at night. From noon on November 13 the outside temperature dropped slowly until 6 a.m., November 15, and the weather was cloudy, so that the bees did not fly. At noon on the 13th the outside temperature was about 69.2° F. and all the points within the hive were then cooler than the outside air, due to the fact that it took some time for the inside of the hive to warm up. At 4 p.m. the outside temperature had dropped to 65.3° F., when it was lower than any of the points within the cluster, which had in the meantime become warmer. From this time until 6 p.m. the next day (14th) the temperature within the cluster gradually dropped as the outer air cooled, until the lowest one (No. 9) was 57° F. (Outside temperature, 48.2° F.). The generation of heat began at 6.15 p.m. at this point, which was to one side of the cluster, and is to be attributed to the movement of the bees in forming a definite cluster. At 6.30 p.m. a rise in temperature was noticed on thermometer 19, at the other side of the cluster. Until 10.15 p.m. the changes in temperature are probably to be interpreted as incidental to the formation of a compact cluster, and from this time until the next day at the close of the series of readings thermometers within the cluster showed a considerably higher temperature than the outer air, or than the thermometers outside the cluster. The maximum in this series was reached at 3.15 a.m. November 15, when thermometer 12 in the centre of the cluster registered over 89.4° F.

After the coldest outside temperature was reached and the outer air began to get warmer (6.15 a.m., November 15), there was a tendency for the cluster temperature to drop. This is somewhat noticeable in the case now being discussed, and is more clearly seen in the records obtained in other series. In general, after a period of cold, when the outside temperature begins to rise, the cluster temperatures drop slowly to meet the outside temperature. The generation of heat is reduced, or even discontinued, only to be increased when the outside temperature again drops, or when it gets high enough to induce greater activity, as in flight. It is found also by taking more frequent readings when the cluster temperature is above about 69° F. that it is less constant than when it is below this temperature, indicating that at temperatures above this point the bees move about to some extent, while between 57° and 69° they are quiet, unless flight is desirable owing to a long confinement.

This series of readings is supported by numerous records taken on this and other colonies throughout the winter, and, since all the observations tend to confirm what was first seen on the record presented here, we feel justified in presenting a definite statement of the reactions of the cluster to outside temperature. It may be added that a careful study of the records of previous investigators fails to show

The outdoor temperature and temperature of the centre of the cluster of bees in colony A from noon, November 13th, to 2 p.m. November 15th. Outdoor temperatures are indicated by the heavy line. Short lines show temperatures of couples on the outer edge of the cluster at the time of first heat production.

a similar statement on this subject. When a colony is without brood, if the bees do not fly and are not disturbed and if the temperature does not go too high, the bees generate practically no heat until the coolest point among the bees reaches a temperature of about 57° F. At temperatures above 57° F. a compact cluster is not formed, but the bees are widely distributed over the combs. At the lower critical temperature, which is for the present stated at 57° F., the bees begin to form a compact cluster, and if the temperature of the air surrounding them continues to drop they begin to generate heat within the cluster, often reaching temperatures considerably higher than those at which they were formerly quiet and satisfied. It is evident, therefore, that the temperature within the cluster is far from being uniform in winter, as has been, in a sense, assumed among practical beekeepers. At the temperature at which other insects become less active (begin hibernation), the honey bee becomes more active and generates heat, in some cases until the temperature within the cluster is as high as that of the brood nest in summer. To sum up, when the temperature of a colony of undisturbed broodless bees is above 57°F. and below 69° F. the bees are quiet and their temperature drifts with the outer temperature; at lower temperatures they form a compact cluster, and the temperature within it is raised by heat generated by the bees.

We desire to state that while the lower critical point, 57° F., appears rather well established, the observations up to the present do not justify too definite a statement concerning the upper limit of quiescence. It must be emphasized that these conditions do not apply when the colony has brood. The rearing of brood in winter causes a marked increase in heat production and constitutes a condition which may become one of the most disastrous that can befall a confined colony.

When the heat production of the colony is explained, we are able to understand to some extent the divergence in the records obtained by other observers. It has, of course, long been known that bees generate heat, and it has been pointed out that during cold weather the temperature of the cluster is often higher than during warmer weather. While the temperatures previously recorded are in most cases abnormal, due to disturbance, the chief difficulty in understanding the phenomena which takes place is due to insufficient observations. For example, if between noon November 13 and 2 p.m. on November 15 only a half dozen temperature records had been made for the cluster (and perhaps without finding the warmest part of it) and the outside air, it would have been impossible to determine the limits of heat production. Most observers have been satisfied with a few observations, and seemingly everyone who has inserted a thermometer in a hive has felt called upon to publish the results, thereby only confusing the problem.

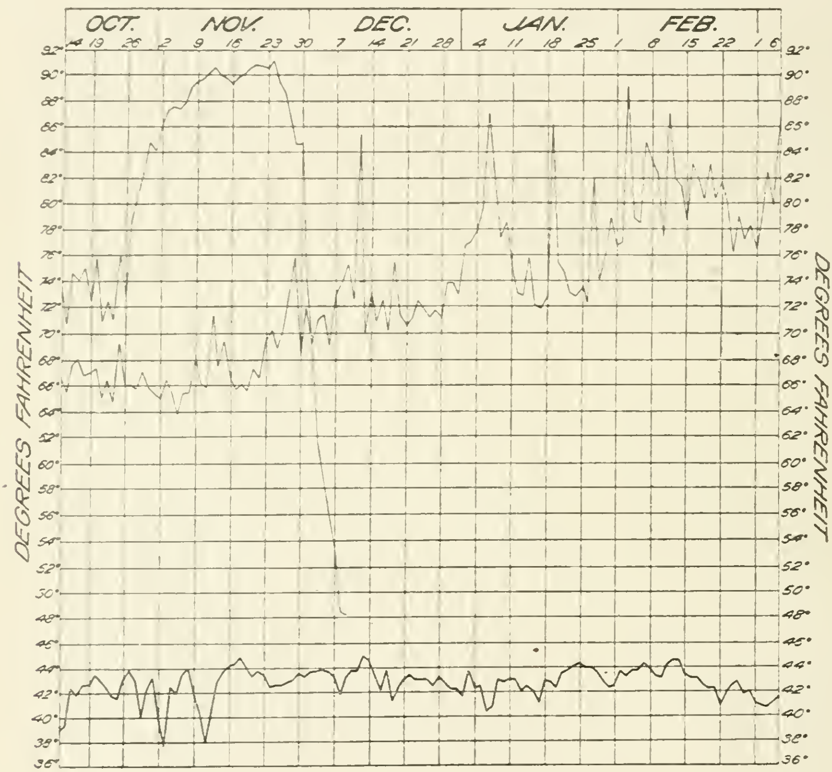
The Effect of Confinement and the Accumulation of Feces.

Before beginning a discussion of the effect of confinement and the accumulation of feces, it may be recalled that during the active summer season the length of life of worker bees is in a sense determined by the work done by them rather than by days or weeks. The greater the necessity for excessive activity the shorter the term of life. We believe that they have evidence to prove that this applies to the winter also, and this belief is entirely supported by the experience of beekeepers everywhere. That bees may come out of winter quarters strong in numbers and vitality, it follows that the work to be done by the bees in the winter should be reduced to a minimum; and the winter problem, as thus interpreted, is therefore to find the conditions under which broodless bees do the least work. The work which broodless bees do in winter consists, so far as has been determined, solely in the production of heat or in activity incident to flying on warm days (if free to fly), and therefore the problem, so far as it is under the control of the beekeeper, is primarily to obviate the necessity for the production of heat. If brood is reared the work of the bees is necessarily enormously increased, and their vitality is correspondingly decreased. So far as evidence is available in our work, the colony is not fully recompensed for this expenditure of energy by an increase in the strength of the colony by bees thus reared.

The colonies to be discussed under this heading (Nos. 1 and 3) were wintered in a constant-temperature room of the University of Pennsylvania, Philadelphia, Pennsylvania, in special 6-frame hives (to economize space and concentrate the colony so that fewer thermometers would be required) with full entrances and were not propolized or sealed at the top. During the regular series of readings the room was kept at a temperature which rarely dropped below 40° F. or went above 45°F., and the average temperature from October 14 to March 6 was 42.67° F. This temperature was chosen as being nearly the one usually considered the best by beekeepers. The foods given these colonies were stored in the combs, just as placed by the bees. There was some pollen available in colony No. 1. On this colony, 24,077 temperature readings were taken.

According to what has been said in the previous section, we should expect bees at such a temperature to maintain a compact cluster and to generate some heat at all times. This was actually the case, the temperature of the interior of the clusters dropping below 64° F. only a few times in either colony.

Colony No. 1, on honey stores, was in the constant-temperature room from October 12, 1912, to March 24, 1913, or 163 days. It was then removed for a flight



Average daily temperatures of the centre of the cluster of bees in colonies 1 and 3, and room temperatures, October 14th, 1912, to March 6th, 1913. Taken from readings made hourly from 9 a.m. to 4 p.m. The room temperatures are indicated by the heavy line.

and put back the same evening, where it remained until March 28. From March 7 at 9 a.m. until March 28 at 4 p.m. readings were made in this colony every 15 minutes night and day, with the exception of the period between 9 a.m. and 7 p.m. on the 24th, when it was out of doors. During this period of three weeks the temperature of the room was changed slowly, being raised as high as 64° F. and cooled to 13° F.

When this colony was first placed in the room for the regular series of readings, after a preliminary confinement, October 12 (the readings were begun Monday, October 14), it maintained a cluster temperature which usually lay between 64° and 68° F., the daily average temperature departing from these rather narrow limits only four times up to November 22. The average temperature is 66.5° F.

During the first five weeks the temperature of the room was less regular than later (due to faulty working of the regulating apparatus), and this doubtless accounts for some irregularities n the cluster temperature. At first the three thermometers in the cluster (1, 2, and 5) gave temperature readings quite close together, while thermometer 6, which was near the cluster, gave readings intermediate between the three thermometers of the cluster and the four others in the hive, farther from the cluster. After November 22 the records of the thermometers in the cluster were more widely separated and the temperature of the centre of the cluster (shown on thermometer 5) tended to rise gradually. It varied constantly, but by December 7 and from then until the end of the month, it averaged between 69° and 75° F. On November 29 and December 12 the cluster temperature rose to over 88° F. From the 1st of January until March 6, which ended the regular series of readings, the cluster temperature became more and more irregular, and on January 20 the cluster moved (probably to accommodate itself to the stores) until thermometer 2 was nearer the centre and showed a higher temperature than thermometer 5. The size of the cluster was gradually decreased by the death of the bees, and all the thermometers except 2 and 6 show a gradual decrease in temperature until finally, from about February 25 to March 6, they are all low and of nearly equal temperature. The two thermometers giving high readings continued to show in general a higher and higher average temperature and to become more irregular (except from February 15 to March 1), the periods of increased heat becoming more frequent. There was absolutely no regularity in these intervals. After February 1 the temperature of the cluster varied between 75° and 91° F., the average from February 1 being 85.4° F.

On March 6 all colonies in the constant-temperature room except two were removed. The colony described above (No. 1) and one other (No. 12), not to be described at present, were left. On March 7 at 9 a.m. the temperature of the room stood at 42° F., and the temperature of the interior of the cluster was about 84° F. The brine which cooled the room was then shut off and the temperature of the room rose very slowly and regularly, until on March 11 at 8.45 a.m. it was 64° F. For the first day the temperature of the cluster was slightly variable, and at 10.45 p.m. thermometer 6, which had been cooler than thermometer 2, showed a rise in temperature (probably due to a shifting of the cluster), and from then on to the 24th they were nearly of the same temperature at all times. On March 8, at 3 a.m., thermometer 2 rose to 87° F. (room temperature 48.5° F.), having previously shown a cooling. The cluster temperature then dropped slightly, showing relatively little variation until at 4.15 p.m., March 9, it stood at 77.3° F. (room temperature 55.7° F.). As the room temperature continued to rise, the cluster temperature increased still more rapidly, until at 8.15 a.m., March 11, it reached 93° F. (room temperature, 64.2° F.). A little brine was now turned on, sufficient to lower the temperature gradually to 58° F. at 9 a.m., March 12, and it again rose to 63.3° at 5.45 p.m., March 15. During this period the cluster temperature followed the room temperature, but remained constantly over 20° warmer. The room was again cooled slowly, and the cluster temperature dropped until on March 16, at 3 p.m., the room was 49° F and the cluster 77.5° F. As the room continued to cool, the cluster temperature increased, the bees responding to the colder temperature, until at 4.15 a.m., March 17, the room was 48° F. and the cluster 88° F. The room then gradually warmed, and again the temperature of the cluster dropped and then again rose with the room temperature, remaining always over 20° warmer. At 6.45 p.m., March 19, the brine was turned on full and the room cooled rapidly, reaching the minimum of 13° F. at 9 p.m., March

20. At no time, however, did any of the thermometers in the hive record a temperature below 33° F. Here it remained constant within 0.1° F. for about six hours, during which time the cluster temperature varied between 86.5° and 89.5° F. (a difference between the room and the cluster temperature of 73° to 76° F.). The brine was now shut off and the room again warmed until 9 a.m., March 24, when it reached a temperature of 44.5° F. During this warming the cluster cooled until at the close it was varying between 72° and 79° F.

As stated above, the colony was now (9 a.m., March 24) removed for a flight and put back the same day at 7 p.m. In the meantime the room was cooled to 33° F. When the bees were put back into the room the temperature of the entire inside of the hive showed great variation and naturally an increase due to the warming up while out of doors and to the activities of a good flight. The points outside the cluster dropped rapidly, but it was midnight, March 25 (31 hours), before the curves of the temperature again appeared normal. The room was slowly warmed to 63.2° F. at 6.30 p.m., March 26, and then slightly cooled to 54° F. at 6 a.m., March 27, and again warmed to 58.5° at the close of the series, 4 p.m., March 28. After the flight the temperature of the cluster never dropped below 89.5° F., and the highest temperature reached was over 95° F. (soon after the flight). Thermometer 6 remained high, but thermometer 2, which had previously been high, now approached the other thermometers, probably due to a rapid loss of bees and to a decrease in the number of bees during flight. It must be recalled that these bees had been confined for an abnormally long time and were subjected to treatment which is at least unusual. After this colony was taken from the room for the last time it was found that thermometer 6 was over a patch of larvæ, and, estimating as accurately as possible, the eggs from which these hatched must have been laid at the time when the room was coldest (March 20-21) and when the cluster temperature was at the highest point. There had been no brood previously according to the temperature records as compared with those of this colony earlier and with those of other colonies, nor was there much evidence of increased heat production due to the presence of brood until after the flight. Probably no extra heat was produced for the eggs, and possibly the hatching of the eggs was somewhat delayed by the low outer temperature. The effects on the cluster temperature which might be expected from a flight, in relieving the accumulation of feces, were not observed, because brood rearing had been begun.

Colony 3 was placed in the constant temperature room October 12, 1912, after a good flight, and readings were begun on Monday, the 14th. In all, 2,165 temperature records were made on Colony 3. The stores provided this colony consisted of honeydew honey, which was gathered in the department apiary and which, since it granulated almost at once, had been removed by melting up the combs which contained it. After this operation it remained liquid. During the summer of 1912 some of this honeydew honey was fed to a colony in the open, during a dearth of nectar, and was stored in new combs above the brood chamber, in which no cells of pollen were to be found. After the second storing the honeydew honey was clear, well ripened, and did not granulate. This colony was also in a six-frame hive, as previously described, and contained five thermometers (Nos. 14-18) among the combs. It is of course well known to beekeepers that honeydew honey is not a good food for winter.

When this colony was first put into the constant temperature room it behaved much as did colony No. 1, except that the temperature varied between 69° and 78.7° F. for the first week, being slightly higher and more variable than that of Colony No. 1. The second week it remained much the same, the temperature, however, varying between 69° and 80° F. From this time on the temperature of the centre of the cluster rose rapidly, never dropping below 79° F. From October 29 almost to the close of the readings. After November 4 the temperature remained above 86° F., and after November 11 it dropped below 89° F., only twice until the end. Thermometer 17 at first read about 4° below thermometer 14, but after November 11 they were close together until November 25, when thermometer 17 began to cool rapidly, due to loss of bees, and after November 30 thermometer 14 cooled rapidly until, on December 9, it showed that no more bees remained alive. From December 2 to 7, inclusive, there was little heat generated, due to the scarcity of bees. It is of interest to observe the records of thermometer 16, near the cluster, but usually outside of it. It at first showed a temperature but little higher than the two thermometers away from the cluster, but on October 31 it began to rise until, on November 12, it reached 80.5° F., when it was doubtless covered by the bees. Even the two thermometers (15 and 18) clear to the back of the hive rose until, on November 13, they recorded 61.5° F. These thermometers showed about the same temperature for about ten days, and then these two and thermometer 16 showed a cooling, since the bees were dying so fast that there were no longer enough to warm up these thermometers away from the centre of activity. It was to be expected that this colony would die, and the experiment was performed to learn the phenomena incident to the loss.

Before summing up the results of these two colonies, Nos. 1 and 3, it may be stated that, so far as the evidence here presented is concerned, the results as far as here discussed are confirmed by records from ten other colonies kept in the constant temperature room, but fed other foods and otherwise different. There is in all of the records no evidence which we can interpret as at all contrary to the views here stated.

It is evident from the behavior of Colony No. 1 that at least one factor entered which gradually caused the bees in the cluster to generate more and more heat until at the beginning of the special series, March 7, the cluster temperature was about 20° warmer than it was at the same room temperature at the beginning of the confinement. It is also seen that during the special series, March 7-24, the cluster temperature always remained at least 20° above the room temperature, whereas from the discussion of bees unconfined (Colony A) we might expect them to cease heat generation when above the lower critical temperature (57° F.). In the case of colony 3, fed on honeydew honey stores, the factor which caused more heat to be produced evidently increased much more rapidly. As stated previously, honeydew honey is a poor food for winter and is so recognized. It contains the same sugars as honey, but contains in addition a considerable amount of dextrin, the particular lot fed in colony 3 containing 4.55 per cent., while good honeys contain only a fraction of 1 per cent. From the evidence at hand it appears that dextrin can not be digested by bees and, whether or not this is the explanation, honeydew honey causes a rapid accumulation of feces which usually results in the condition known as dysentery, in bad cases of which the feces are voided in the hive. In the case of colony 3 the whole hive inside and out, as well as the frames and combs, were spotted badly, the inside of the hive being practically covered. Even with fine honey stores such a spotting is usually noticed after a prolonged confinement, especially in severe weather (or during brood rearing). It therefore appears that the accumulation of feces acts as an irritant, causing the bees to become more active and consequently to maintain a higher temperature. We are therefore justified in believing that the cause of poor wintering on honeydew honey is due to excessive activity, resulting in the bees wearing themselves out and ultimately in the death of the colony. In the case of colonies on good stores the feces accumulate more slowly and the excess activity is not so marked and is induced more gradually. The accumulation of feces due to confinement causes increased activity and this in turn is the cause of excessive heat production, resulting in a reduction in the vitality of the bees.

It therefore follows that excessive activity causes the consumption of more food, resulting in turn in more feces, so that colonies on poor stores are travelling in a vicious circle, which, if the feces cannot be discharged, results in the death of the colony.

While the activity of the cluster is greater at some times than at others, there are not, as has been held, regular intervals of activity at which the colony rouses itself to take food. At no time is a colony kept at a room temperature of 45° F. or less in a condition which can be characterized as inactive. Presumably the reported "intervals of activity" have occurred when the colony made a noise due to disturbance by the beekeeper.

The bees in Colony 3 were compelled to work constantly to maintain so high a cluster temperature. In fact, they did more work than colonies wintered in the open air. Keeping these bees in a cellar protected them from low outside temperatures, but the lack of opportunity for a normal ejection of feces caused a condition more serious than extreme cold weather. We seem to have here an explanation of the fact, often observed by beekeepers, that some colonies wintered in the cellar are in worse condition in the spring than colonies that are exposed to severe cold. Poor food is evidently a more serious handicap than low temperature.

Humidity in Winter.

This subject is one concerning which less definite information is available, although it is one which has been much discussed by beekeepers. One of the chief difficulties seems to be a lack of information concerning the interrelationship of temperature and relative humidity, and it may be well to make some of these points clear.

The Source of Moisture in the Hive.

All northern beekeepers know that under some conditions, especially in the cellar, the atmosphere in the hive in winter may become so laden with moisture that it cannot all remain in the form of water vapor but condenses on the hive and combs. Water may even run from the hive during the winter confinement. Obviously this moisture does not come from outside the hive for this often occurs when the cellar appears dry.

Within the hive the only source of moisture is the food consumed by the bees. Honey not only contains about 20 per cent. water but when the sugars are consumed and assimilated the final products are carbon dioxide and water. Honeys vary in composition but on an average when one pound of honey is consumed there is produced about two-thirds of a pound of water, and since honey is one and one-half times as heavy as water, one gallon of honey when consumed produces approximately one gallon of water.

If we take for example a bee cellar containing 216 colonies and estimate the average consumption of honey during the winter at ten pounds per colony the total honey consumed is 2,160 pounds or 180 gallons. This produces 1,440 pounds of water or 180 gallons, enough to fill six 30 gallon barrels. If these colonies are in the cellar for four months there will be given off one and one-half gallons of water a day and unless there is considerable movement of air within the cellar the atmosphere cannot take it all up as water vapor and condensation will occur.

The Relations of Humidity to Temperature.

Before discussing the changes which take place in the humidity of the hive it may be best to take up some facts concerning the moisture content of the atmosphere as influenced by temperature. It is of course well known that if warm moisture-laden atmosphere is cooled its capacity for water vapor is decreased and moisture is condensed. This is shown in the condensation of moisture on the outside of a glass of ice water. Similarly we have condensation on the surface of the leaves which we call "dew" if the moisture remains liquid and "frost" if it is frozen as it condenses. These phenomena are duplicated in the bee hive and bee cellar.

The problem of the beekeeper is to eliminate this moisture, which leaves the body of the bee in the form of water vapor, without condensation. This has been done in cellar wintering (1) by raising the temperature of the outer air, (2) by drying the air (as by the use of unslaked lime in the cellar) or (3) by causing the air to move so that as the atmosphere becomes laden with moisture it is replaced with other air capable of taking up more moisture.

To determine by weight the actual amount of water in the atmosphere is difficult in ordinary practice and the usual method is to determine the relative humidity, that is the amount of moisture in the atmosphere compared with the maximum which might be held at that temperature. The common method is by the use of the wet and dry bulb thermometers, to determine how much the wet bulb is cooled by evaporation. Then from this data the relative humidity is obtained from prepared tables.

To make clear the relation of the relative humidity to temperature it may be well to choose a few examples. For the first case, there may be assumed a cluster temperature of 60° F. (barometer, 30 in.) in an atmosphere which is fully saturated. In this event the slightest cooling will cause condensation and the wet bulb in such an atmosphere (if it could be circulated rapidly) would show no cooling. No evaporation can occur as the atmosphere cannot take up any more moisture. If, however, the wet bulb can be cooled at this temperature the relative humidity is less as the readings of the wet bulb thermometer are lowered. The temperature to which an atmosphere must be cooled to produce condensation is known as the "dew-point." This is also lowered as the humidity decreases.

If different temperatures are assumed for the cluster (all of which have been observed under different conditions by various investigators) the relative humidity of the warmer atmosphere which will show no condensation when cooled to cellar temperature is given in the following table, (barometer, 30 in.):

Assumed cluster temperatures.		Dew. Point.	Relative Humidity.
Dry bulb.	Wet bulb.		
60° F.	52° F.	45° F.	58 per cent.
65° F.	54° F.	45° F.	48 per cent.
75° F.	58.5°F.	46° F.	35 per cent.
96° F.	66° F.	45° F.	18 per cent.

In this table the numbers are chosen so that the dew-point is practically 45° F. in all cases, assumed as an average cellar temperature. It appears that a given amount of water given off by bees at 96° F. creates a much lower relative humidity (18 per cent.) than the same quantity of water at 60° F. (58 per cent.) because the warmer atmosphere is capable of holding more water vapor and relative humidity is simply an expression of the percentage present compared with all that the atmosphere can hold. However, to maintain a temperature of 96° F. necessitates the consumption of much more honey and this in turn gives off much more water vapor. Consequently with a cellar temperature of 45° F. we should expect much more condensation in a colony with a cluster temperature of 96° F. than in one with a cluster temperature of only 65° F., except that the increased heat would tend to produce stronger currents of air in the hive which might relieve the situation somewhat. Since 96° F. is about brood rearing temperature it is partly indicated why brood rearing during the winter confinement may be highly injurious, as it is usually held to be. It may be stated that a cellar temperature of 45° F. and a cluster temperature of 60° F. might not occur; the other temperatures used in the table might well occur under different conditions.

How Moisture Escapes From the Hive in Winter.

During the summer when nectar is being ripened into honey, great quantities of water leave the hive in the form of water vapor. During this period the hive is being well ventilated by fanning bees so that the atmosphere is changed rapidly and, being warm, is capable of taking up more moisture than is the atmosphere of the bee cellar. In winter when the bees are in a cluster this ventilation by fanning does not occur. The amount of water that must leave the hive is much less than in summer, but on the other hand it either must pass out in air set in motion by changes in temperature, or will condense on the frames, combs and hive and possibly run out of gravity.

If the atmosphere of the bee cellar is heavily charged with water vapor, as is frequently the case, that within the hive must be saturated. The additional water produced by the bees will therefore condense and run out the entrance. It frequently happens that the air inside is saturated while that outside is capable of taking up this moisture again by evaporation, so that there may be no water visible except within the hive, most often on the cover, and possibly also on the bottom board.

If the wooden cover of the hive is loose or if the hive is covered with some absorbent or porous material, the heat escaping from the cluster may cause the formation of slight upward air currents which will carry the moisture out the top in the form of vapor. Out of doors there may be condensation of moisture in the porous packing more rapidly than it can be carried off by evaporation, in which case the packing becomes wet and usually thereby less effective as a non-conductor of heat. With sealed covers the moisture must pass out the entrance and this may also occur in the form of vapor if the outer air is of sufficiently low relative humidity to take up all the water as it comes outside.

In situations where the temperature of the combs and hive does not often reach the point of condensation, or if a low temperature is prevented by packing, a tightly sealed cover can do no harm and many beekeepers report success in wintering bees in such conditions. The attributing of the differences in manipulation and methods to "locality" has been greatly overdone by beekeepers, particularly since they usually do not describe the characteristics of the locality or analyze their conditions to determine why certain things prove best. This peculiarity in the beekeeping literature is probably largely to blame for the discussions on the virtues of upward ventilation. It should be borne in mind, however, that while sealed covers may be harmful in colder regions, upward ventilation is not objectionable in warmer regions.

Effect on the Humidity of Changing the Outside Temperature.

Any change in the temperature of the bee cellar may affect the humidity of the air in the hive in two ways. As the optimum cellar temperature is approached, the heat produced by a normal colony will diminish and this decreases the food consumed and consequently the water produced. The widely varying reports of the food consumed by bees in cellars find their explanation chiefly in the difference in the temperature of the cluster. As the cellar is cooled below the optimum not only is there more water produced, but the cooler atmosphere is incapable of holding so much and there is therefore an augmented cause for condensation.

In this connection it may be of interest to record a few observations made by one of the authors on bee cellars not long since. The first cellar was away from the house, was ventilated by the sub-earth system and was without any artificial heat. The temperature of the air at the floor was 40° F. and in the centre of the cellar 41° F. There was little circulation of air and moisture had condensed freely in the chamber above the cellar proper, under the roof. In this cellar were 98 colonies in 24 stacks. Of these, condensed moisture was seen on the bottom boards of 21 in the bottom tier, 11 in the next tier, 3 in the third and 6 in the top tier. There was no condensed moisture on the floor. The only adequate explanation for the greater number of wet colonies in the lower tiers is the slightly lower temperature at the floor. If now there had been more ventilation provided without greatly lowering the cellar temperature, this moisture might at least have reached the chamber above the cellar before condensing, and doubtless if the temperature could have been raised a couple of degrees all of the condensed moisture would have disappeared from the bottom boards. There might still have been condensation on the covers, where it first appears, but this, too, would doubtless have evaporated at 45° F. with good ventilation.

In a second cellar where the temperature was 45.5° F. at the floor and 50° F. six and one-half feet from the floor, there was no condensed moisture in any of the 93 colonies. Here the ventilation was much more abundant and the cellar was artificially heated. In a third cellar, temperature 40° F. five feet from the floor, there was moisture on several covers but none on the bottom boards. The ventilation was excellent. In a fourth cellar, temperature 52.5° F., no condensation was observed even on the covers. It therefore appears from these few observations that in the two cellars at 40° F. the moisture was more in evidence in the poorly ventilated cellar and that when the temperature was raised to 45.5° or 52.5° F. no condensation occurred. In this connection it should be remembered that the cellar temperature is often higher than that of the outer air, thus giving the atmosphere a greater capacity for water vapor. For example, if air comes from the outside at 0.0° F. into a cellar where it is warmed to 45° F. its capacity for moisture is increased thereby almost eight times (barometer, 30 in.) so that even if the atmosphere at 0° F. is saturated, it is capable of taking up much more moisture when it reaches the cellar temperature. Moist air passing from the cellar will often cause frost to form about the ventilating holes.

The only conclusions that can safely be made from the data on these four cellars is that concerning the capacity of the atmosphere for water at different temperatures. Other factors entered into the wintering of bees in these four cellars so that probably no reliable conclusions could be formed from data as to the food consumed by the various colonies, even if these were available.

In discussing the condensation of moisture in the hive and the various methods by which it may be avoided, one must not lose sight of the fact that little is definitely known as to the effects of such condensation or of a high relative humidity on the wintering of bees. From the experience of numerous beekeepers there is justification for concluding that bees winter better in the drier cellars, but it is not so clear whether this statement would hold true for all cellar temperatures. In most systems of cellar ventilation the object accomplished is not so much to provide oxygen for the bees as to eliminate the exhaled moisture without too great condensation. The amount of oxygen needed to oxidize a couple of pounds of honey per month is not great. Even in a cellar in which a ton of honey is consumed during the winter, as in the theoretical case cited, sufficient oxygen would probably get in without any special provision for ventilation. This is not true for the elimination of the water, however.

In discussing the exclusion of moisture from the hive it is necessary to bear in mind one other hiding place for moisture, usually overlooked. In hives where condensation is common the hive and cover often become saturated and sufficient moisture may be held in this way that it comes through and blisters the paint on the outside surface of the hive. It is clear that on account of this absorption of water by the hive many records of weights on the removal of bees from the cellar fail to give accurately the loss in weight by the consumption of honey and the death of bees. Much honey finds its equivalent in the water in the soaked hive. Before drawing any conclusion as to the honey consumed we must be sure that condensation or evaporation do not affect the weights of parts assumed to be constant. A reverse example of this phenomenon is to be found in some records made of the weight of a hive and combs (without bees) made recently. The hive lost weight constantly by evaporation when placed in a dry room.

Effects of Humidity.

It may as well be stated that we have no data showing the effects of an increase or decrease in the relative humidity on the activities of the bees in winter. We therefore do not know what relative humidity is best, for we do not know whether the moisture is the cause or the effect of poor wintering. From practical experience it may be concluded that excessive condensation is indicative of poor wintering and most beekeepers aim to have their cellars as dry as practical. Whether this is desirable for the warmer cellars remains to be determined.

It is evident that condensation of moisture on the combs of honey is not beneficial since this favors the growth of molds. The damp dark interior of the hive is certainly favorable for the growth of these organisms. It is not yet shown how these are injurious but they can scarcely be assumed to be desirable as food. A still more serious consideration is the fact that honey tends to take up moisture either from a highly saturated atmosphere or from water condensed on the surface of the comb. This dilution of the honey often leads to some fermentation, injuring the honey as a food.

Mr. Alfred Pusey: What do you think is the best temperature for the cellar?

Dr. Phillips: I do not object to telling you some of the things we have tried. This room I spoke of was a constant temperature room. It was cooled or heated as the case might require. The first year we set it at 43° because we thought that was what the beekeepers would require. We found from our other work that the hive temperature should be around 57°, and then they do not have so much work to do. The second year we raised the cellar temperature to over 50°, and then we got into some difficulty over the humidity phase of the question. The third winter we had the bees in a cellar at Washington, and we kept the cellar as hot as we could with the heating system we had. The temperature ranged from 48° to 55°, and the bees wintered very well. I am not going to give anybody advice on the subject of cellar winter temperatures until I know more about the humidity side of the question. If the humidity was all right I would say 57°, but when you raise the temperature so high you make the air very dry, and you have no end of trouble right there. The last bulletin we published we said to outdoor winter bees, because we have not solved that trouble.

Mr. J. D. Evans: I winter in the cellar, and I can winter every hive of bees without any loss. They must have plenty of honey and plenty of bees, and they must have the right kind of honey. I find my bees keep the best and the quietest when the temperature of the cellar is about 42°. If the temperature rises to 47° my bees are in an uproar. My cellar is as dry as this room. If there is any ice or snow on the hives when I put them in in three days they will be dried out. There is a possibility that my bees may suffer from being too dry. I noticed one year when I first put them out they lit on damp banks.

Mr. Alfred Pusey: Perhaps some friend could advise me as to what best to do with fixed bottom boards in the cellar.

Mr. J. D. Evans: I have my bottom boards fastened on with staples. I have an inch strip nailed around three sides, and the hives are fastened to that securely. I want it air-tight, and I want my quilt on top of the bees air-tight.

Mr. W. W. Webster: Do you find that the bees want to change position during the winter?

Dr. Phillips: There is a constant interchange of the bees during the winter. At a high temperature the interchange is very slow. As it gets colder the interchange is more rapid. The bee on the inside will force its way head first through the cluster. Then that bee comes out and turns around and takes its place and another bee is released from the work. The colder it gets outside the more bees become engaged in heat generation and the outside shell becomes more compact in cold weather and the cluster becomes smaller, yet there are still more bees engaged in heat production on the inside. I did not say that the proper cellar temperature was 57. The air surrounding the bees ought to be 57. I would not be surprised but that that is the temperature in Mr. Evans' hives. The air surrounding the bees is what determines their action.

Mr. Morley Pettit: In cellar wintering we always find it an advantage to have the hive temperature higher than the cellar temperature. We manage this by having a chaff cushion on top of the hive. We add this chaff cushion, and the inner cover, which in our case is of cloth, is loosened just enough so that there is room for a little ventilation up through this chaff cushion. By having the hive temperature higher than the room temperature we get a slight circulation of air through that chaff cushion. The bees are in an ordinary cellar, walled up with stone. It is built in a clay bank. We find a cellar temperature of about 42 about right. The thermometer is hung in the middle of the room half way between the floor and the ceiling.

Mr. T. J. Cauldwell: Do the bees require very much air in the winter time?

Dr. Phillips: That depends entirely on the temperature. In temperature where they are clustered tight they give off carbon dioxide very rapidly and of course require oxygen rapidly to replace it.

Mr. T. J. Cauldwell: I have noticed that bees do better buried in snow, entirely buried.

Dr. Phillips: They are very well ventilated under those circumstances. The main ventilation problem is to carry off water evaporation. What I want to do is to get rid of this moisture without condensation. That is why we go to so much trouble in the matter of ventilation.

Mr. F. W. Krouse: Supposing there is water in the cellar, does that affect the bees? I know a man who winters his bees in the cellar and there is water in that cellar half the time. I have helped to carry out the hives and I had to wear a pair of rubber boots and I could not keep the water from going in over the tops.

Dr. Phillips: I should think under such circumstances the humidity would be very high. You could not get any worse condition than that.

Mr. J. F. Dunn: I know one cellar that has a spring of water in it and the bees do well in that cellar.

Mr. R. E. L. Harkness, Iroquois: I think a little moisture in the hive is very beneficial. I think ideal conditions are where the temperature in the cellar is from 42 to 44 and it is fairly dry.

The Chairman: The lower the temperature the less humidity the colony will stand.

Dr. Phillips: The lower the temperature the more quickly you get condensation.

Mr. D'Arcy Scott: Assuming you have a cellar temperature of 42°, how many cubic feet do you require for a colony?

Mr. L. Harkness: I know a man who uses a 10-framed hive, and he will pack his cellar from the floor to the ceiling with these hives, and he tells me that he will have practically no loss. In that case you would simply have the cubical contents of the hive.

Mr. J. F. Dunn: I do not think it makes much difference how many you put in the cellar provided you have good ventilation. We ventilate our cellar by a window which runs pretty well into the ground and then we run an air-shaft up alongside of the house. The proper place to ventilate a cellar is near the floor because the foul air will go to the bottom. I do not know of a better way of ventilating than to have a sub-earth duct about 150 feet long. The air will warm in that duct to about 42° and if you have a stream of fresh air like that coming into the cellar all the time and the foul air going out you will have a well ventilated cellar and you will have no trouble.

Mr. L. Harkness: For several weeks the weather in our locality will go from zero to as low as 20 below. I believe in ventilation but you must be careful in extremely cold weather. I close up my cellar in the winter.

The Chairman: We do not want beginners to think that bees will winter better when there is water in the cellar. It is well to bear in mind that experienced men who have wintered in the cellar have come to the conclusion that a temperature of from 42 to 45, with as little humidity as possible, is the best. I am inclined to think that with some outdoor wintering the bees winter in spite of conditions and I think that was the case with the bees in this cellar which had water in it. I remember a cellar in which there was a running stream and yet that cellar was dry.

Mr. E. Lewis, Cayuga: What should an 8-framed hive weigh when put in a cellar?

Mr. W. H. Kirby, Oshawa: Last fall I had to do some feeding, and I fed with slabs of sugar candy, hard candy. In order to operate on this food the bees have to have moisture. It is better to have a little moisture in the hive but you must have it in the right place and that is above the bees.

Mr. Chas. Blake: If you give your bees first-class stores for the winter they will eat much less of it and they will generate less heat in the cluster and be less disturbed, and consume a less amount of honey. The bees will come through in far better condition.

Mr. Kirby: What ventilation do you give?

Mr. Blake: None, whatever. These cellars are in a sand-bank. If it was clay land it might be different. The bees are not crowded. They have plenty of room.

Mr. Evans: I do not think it is necessary to have sub-earth ventilation. I have a chimney which is about 40 feet high, and I have a window which swings on hinges and which is kept open in all ordinary weather. I have been very much interested in reading some of Dr. Phillips' papers about how the bees warm themselves up. If the bottom boards were off the hives would not the bees have to warm up the air in the cellar?

Dr. Phillips: If the bottom boards are off the air current will carry the heat away more rapidly, but if the cellar temperature is relatively high it does not make much difference.

Mr. Chas. Blake: Somebody asked what should the weight be of an 8 or 10-framed hive. They should weigh at least 55 lbs. without the cover.

Mr. L. Harkness: Bees will winter on 10 lbs. in the cellar but I would advise giving them 25 lbs. I do not think you should disturb your bees any more than possible.

Mr. F. J. Lee, Lee Valley: Last winter, one morning the thermometer at my place was 50 below zero. I had 10 hives of bees which were wintering outdoors, and they wintered better than the ones I had in the cellar. We had 85 in the cellar and we lost 6 of them.

The Chairman: I am glad that Mr. Lee brought out one point and that is that we can winter outdoors successfully where the thermometer goes down to 50 below zero.

HONEY PRODUCTION FROM THE GOLDEN RODS AND ASTERS.

F. W. L. Sladen, Dominion Apiculturist, Ottawa.

An investigation that is being made by the Bee Division at the Central Experimental Farm, Ottawa, into the source of supposedly injurious winter stores in moist hay lands at Amherst, N.S., which the local beekeepers say necessitate the removal of the stores and the substitution of sugar syrup, and also into the whole subject of natural winter stores, which, in many parts of Canada and in some years more than others, are found to produce more or less dysentery or to granulate in the hive, involved, it soon became apparent, a study of the different species of the golden rod and aster, because these produce a large part of the honey stored for winter in most places.

The beekeeper views botany from a different angle to the regular botanist. The latter searches for rare species, and is never so happy as when he has discovered a new one. The beekeeper pays attention only to the common species, and he wants to know whether the bees are collecting much nectar from them, how long they will continue to collect it and what is the quality of the honey.

Some species of golden rod and aster are difficult to separate, and it would only be leading you into a fruitless field of technicalities and possibly of controversy if an attempt were made to point out the distinction between all the different species found in Eastern Canada. It will be much more satisfactory to briefly review the two genera in the light of some bee botanizing that has been done in the neighbourhood of Ottawa, lumping into groups the species that are difficult to separate.

Take, first, the golden rods, known scientifically as the genus *Solidago*. The latest edition of Asa Gray's manual gives twenty-five species of *Solidago* from Eastern Canada. Eleven of these have been found around Ottawa. All are familiar with the erect golden rods having a spreading fern-like inflorescence so common on our roadsides and in meadows and pastures. Examining the underside of the leaves of most specimens of these, one finds that they have only three conspicuous veins or ribs. This proclaims that they belong to the *canadensis* group of which *canadensis*, with its small flowers and nearly smooth stem, is usually the most abundant in dry places and *altissima*, a taller plant with the stem and underside of the leaves down, in moist, rich places.

Fully 75 per cent. of the golden rods around Ottawa belong to the *canadensis* group. Individually the members of this group produce comparatively little nectar, but their great abundance makes them important collectively. During the first two weeks of their blooming period, that is from the end of July until the middle of August, they are quite neglected by the bees if the weather is dry.

Solidago rugosa, another species with spreading inflorescence, but with the conspicuous veins of the leaves numerous and net-like and the whole plant very hairy, is frequently common in moist, shady places.

A very distinct species of golden rod is the narrow-leaved golden rod *S. graminifolia*. The leaves are narrow and ribbon-like and the small flower heads are bunched in little terminal clusters. This species is much complained of as a weed in damp hay meadows in the Eastern Provinces, and the bees have been seen working on its heads, both at Ottawa and at the Experimental Farm, Nepean, N.S. It may be here remarked that it is often hard to discover whether a plant is a large honey producer or not. Bees will often crowd on golden rods and other plants that are producing very little and appear busy on them when other more abundant sources of nectar are first cut off. In plants with tubular flowers, such as golden rod and aster, a very good help in estimating the quantity of honey a species will yield is to squeeze firmly the head so as to express the nectar. Where minute drops of nectar can be thus squeezed out of the tubes the plant is a good honey producer provided the tubes are not so long that the honey is largely or wholly inaccessible to the honey bee.

This test confirms the importance of two late flowering species of golden rod that grow in dry or sandy soil, *S. puberula* and *S. squarrosa*. In these the inflorescence is compact and occupies a considerable length of the upper part of the erect and strong stem. *S. squarrosa* may be known from all other species of golden rod by the abruptly spreading tips of the bracts of the involucre. Two colonies of bees taken on August 25 this year to a sandy plain forty miles north of Ottawa each gathered in three weeks about forty pounds of surplus honey from these two plants. It is estimated that at least three-fourths of the honey came from *S. puberula* which was much more abundant than *squarrosa*. You will note that this honey, of which there are samples in the room, is of a light color and the flavor and aroma are pleasant and distinctly suggestive of golden rod. All this honey was gathered after a frost on August 27th had killed potatoes, buckwheat, corn and bracken. The golden rods were uninjured by the frost. The browning of the tops of some of the plants, which a casual observer might have ascribed to frost, was due to the fact that in a flower head of golden rod the first flowers to open and to wither are those at the top or tip of the stem. *S. hispida*, another late-flowering species very like *S. puberula* in general appearance but with a hairy stem, was also present on the plain and contributed a little of the honey.

Turning now to the asters, to separate the numerous forms of which botanists have been driven almost to despair, Asa Gray's latest edition gives thirty-five species from Eastern Canada. Twelve of these have been found at Ottawa.

In tackling this difficult genus the first thing one should look at is the lower leaves. Are they heart-shaped and stalked? If so, and the flowers are pale blue and rather small, the plant belongs to the *cordifolius* group. These are the commonest asters in the Gatineau Valley north of Ottawa where they grow in dry open ground and carpet the railway bank and ungrazed thickets with their star-like flowers. During a period of continuous warm and sunny weather from Sept. 11th to Sept. 22nd, 1914, following a moderately wet August, the gathering of approximately 12,000 pounds of surplus honey, besides sufficient stores for winter to make syrup feeding unnecessary, was reported by Mr. J. Martineau in his apiary of 300 colonies at Montcerf, about 100 miles north of Ottawa. This nectar came principally from *Aster cordifolius* (*Sens lata*) with a little from *S. squarrosa* and *S. puberula*. The honey was light in color and of good flavor. It did not granulate in the comb and the bees wintered satisfactorily on it. Related to *Aster cordifolius is A. macrophyllus* which also has heart-shaped leaves, but it is a coarser plant with large pale blue or white flowers and is easily known by the fact that the hairs of the branches of the inflorescence are glandular and, when rubbed, are sweet-scented. This species grows on the borders of woods, and heads yielded a considerable amount of nectar on pressure in favorable weather. However, it is not very common in the Ottawa district.

The well-known tall showy species with large blue flowers, purple hairy stem and clasping leaves, growing usually in moist places, is *Aster puniceus*. It has not proved to be a large producer of honey around Ottawa, but it is not so abundant as its conspicuousness would seem to indicate.

Next in abundance to *cordifolius*, and in the immediate vicinity of Ottawa exceeding it, are two or three closely related species with numerous small to medium sized white flowers borne on ascending many-branched stems and having narrow ribbon-shaped leaves. These are *Aster tradescanti* and its allies. They grow most abundantly on low and badly drained land. The bees visit the flowers of the *tradescanti* group quite extensively, and, now that *cordifolius* has proved itself to be not guilty, suspicion rests on these as the source of unwholesome winter stores that are occasionally gathered at Ottawa. In the winter of 1914-15 the bees at the Central Experimental Farm, Ottawa, like those in many other parts of Ontario, wintered not so well as usual on account of food troubles, and in spring the stores in many of the hives were found to be extensively granulated. The source of the granulated and unwholesome stores has been attributed to various plants from maples to aster, but it must be remembered that these food troubles became marked in a winter following an unusually long period of fine weather in the middle of September and it seems likely that some fall flower or flowers yielding nectar during this period was responsible for it. If we can discover that plant it will only be necessary for the beekeeper to note its abundance within two miles of his apiary, and whether weather conditions have been favorable for a flow from it for him to decide to what extent he should replace or supplement the winter stores with sugar syrup to insure safe wintering.

Aster acuminatus, a species with large broadish leaves that grows in woods, secretes abundant nectar under favorable conditions and is a favorite of the bumble bees, but much of the nectar is probably inaccessible to the honey-bee on account of the length of the flower tubes.

Aster umbellatus, with a flat topped head of white flowers, contains nectar and is visited by bees, but it has not proved a common species.

The golden rods, and probably also the asters, come into flower earlier in the north than in the south. At Ottawa the flowers appear about two weeks earlier than in Southern Ontario. When the flow from aster and golden rod is cut short and followed by cold weather, the honey may fail to ripen completely and may remain uncapped, the bees at this time of the year being less inclined to produce heat than in summer. The partly ripened honey may ferment and thus become unwholesome and cause winter loss. Fermentation is more likely to occur in moist coastal regions than in the interior. Another disadvantage consequent on the lateness of the flow from golden rod and aster is that the honey is collected by bees that are to pass the winter and the work ages them and increases the rate of mortality of the bees in the colony in winter and spring.

OUTDOOR WINTERING.

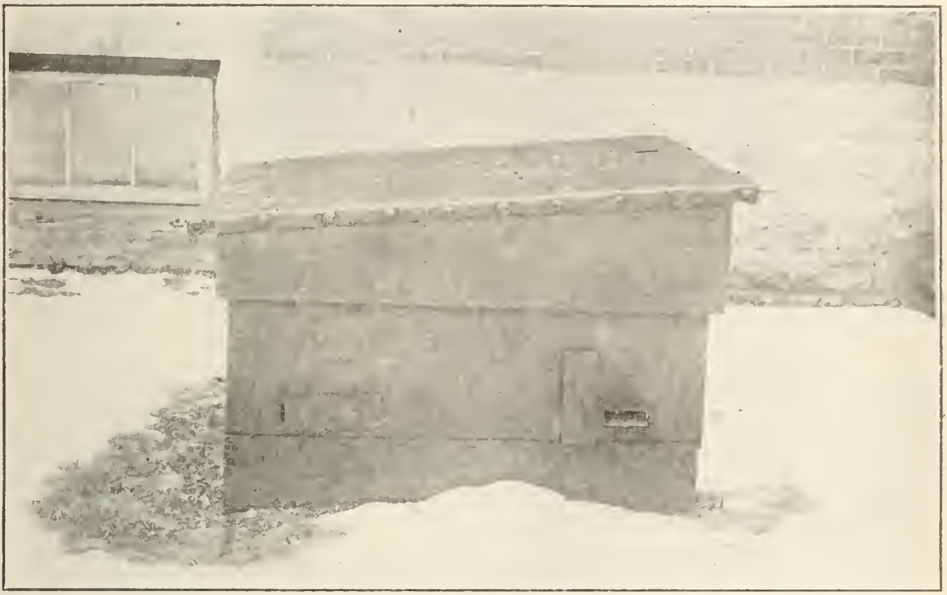
H. G. Sibbald, Toronto.

I cannot think of anything to tell you about wintering bees except to describe the way I do it. It is possible I will forget a great many details, because they do not worry me very much. Wintering is a puzzle to some people, and Dr. Phillips yesterday gave you to understand that in his observations he has found that to be the case. A great many people fail to winter their bees. I have known of many people who have bought nice equipment and started out in good shape and get along all right for a few years, and then a hard winter comes and that is the rock upon which the ship is wrecked, and after a hard winter the bee yard looks more like a grave yard with the hives for monuments than anything else.

I put my bees away three weeks ago: I will probably not see them until next spring. What is there to tell you about that. I am not there to do anything and they are looking after themselves. The only way in which I can make anything out of this subject is to tell you how to prepare the bees for the winter. That is the main thing in wintering bees. There is no use trying to winter half a colony of bees or a small colony and expect them to come out strong the next spring. There is very little use bothering with half a colony of bees at any time. You must have a full colony in the fall if you wish to winter them successfully; if you have two half colonies, the best way is to unite them and make one good, strong colony. It is better to have them all uniform strong colonies than a lot of weak ones.

The only way to keep your bees strong and to winter them properly is to keep them with good queens, and see to it that they are not queenless at any time during the season. If you do that you will have a constant flow of young bees hatching in the hive, and when the right time comes to fix them up for the winter, you will have a strong colony. It is a wise thing to have a good queen in the hive during the winter, ready for the hive. Just before you get them ready for wintering, if they have not a good queen, give them one. The queen is the engine that has to supply the power for the next season.

The next point, and perhaps it is just as important, is the stores. There is no use wasting stores if you have not a good colony and a good queen. Some of the honey that our bees gather is not good honey for winter. That is not true, of



Winter case used by Mr. Sibbald. One entrance reduced as in winter. The other opened as for ventilation in late spring.

course, of all honey, because good clover honey and good basswood honey, and even good buckwheat honey makes good stores if the honey is well ripened, but a lot of other honey that comes in between seasons, for instance the honey dew—a little honey dew—will kill a colony in the winter.

The stores that I use are mostly sugar stores. My method of management during the season leaves the colonies in such condition that there is very little honey below. They use the brood nest for brood nearly all the season, and when the fall comes there is practically no honey in the bottom. I use sugar syrup to feed them, and I give them plenty. There is no use being stingy about it. When you have 20, 25 or 30 pounds in, by putting five more in, you will sometimes save the colony and keep them good and strong. Somebody yesterday said that a colony would winter well on ten pounds, but they will not winter on ten pounds if that is all they have. There is sense about that, and from practical experience I can say it is quite true. If they have plenty of stores they do not use quite as much as they would if they were short of stores, especially if the stores are well ripened and sealed over. When the bees gather tight for the winter and leave the stores at the outside uncovered, moisture gets in. If the unsealed stores are at the outside they will absorb moisture and stores will sour and be poor stuff and the bees will soon have dysentery, and they will start to breed. They seem to realize that they are getting diseased, and they have got to have a new generation, and they will breed early in the winter. That is wrong. They should not have to do that. For every bee they raise at that time of the year they have to keep a certain amount of heat up, and for every bee they raise you will lose four or five. It is not very hard to figure out where your colony will go at that rate.

I like to feed my colonies up to seventy pounds without the board on top, just with the quilt on top. That is a ten frame Langstroth or ten frame Richardson hive. After you have them up to seventy pounds it will not be very long until it will decrease from evaporation. Therefore, I would not quit feeding until they have seventy pounds; I would not mind seventy-five pounds.

In our district we have not as much fruit as you have in the low lake regions of Ontario, where you have the fruit belt. Therefore, I have to provide them with a little more feed in the spring than you have.

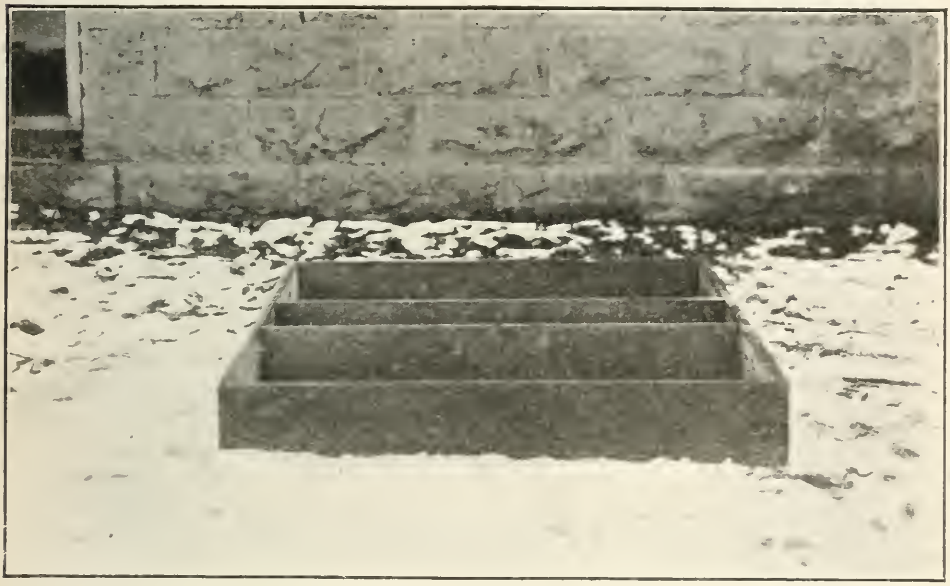
The next thing about wintering outside is to have your bees in a sheltered location. I have wintered bees in a windy open location, but I very much prefer a good sheltered place. I would rather have a natural wood shelter—the south side of a bush, surrounded a little bit by a bush or hedge or something of that kind, that makes a good natural shelter against the north and west winds. If you cannot get that, a good board fence would do. I got a good idea at Mr. Chrysler's bee yard. He nails every other board on the fence, and every other one just slips through the wire to hold it in the winter. In the spring he takes every other board out and that gives ventilation for the summer. A lot of ventilation through your yard in the summer time will help to control swarming. If you have a well-sheltered yard and the bees are well fed up for winter the next thing of importance is the packing.

I have had experience in wintering with a single case, but I prefer four in a case, and I will give you reasons why I prefer them in that way. There is more warmth in the four colonies placed in a case together, and that helps a great deal to keep a nice, even, dry temperature. As a rule you will find four colonies will cluster in severe weather towards the centre, making one cluster out of four, and in that way keep the inside walls nice and warm all the time, and I consider that a great advantage.

There is economy in this method, because you can make the case for four with about the same cost that you can make one single case, and that to my mind is quite an item.

Another advantage of having four in a group is that it gives you very much more room in your yard, and you can go through the yard with a wheel-barrow or anything to take the honey to the honey house, or work in your yard in any way that you might desire. The point is you have more room to work.

This is the stand; I have two boards across the centre making a summer stand for the four colonies. Once you level them, you hardly ever have to touch them again because they will stay there year after year without levelling again. We have four entrances, two on one end and two on the other. The entrance is four inches long and two inches high; that gives a pretty big entrance in the spring for the outside entrance. When this button is closed down, the entrance is about three-eighths of an inch by two inches high. The idea is that the bees will hardly



Stand of quadruple winter case.

Stand with quadruple winter case with hives as in summer.

ever pile up two inches high so as to block that whole entrance. If the entrance was the other way, they might pile up and block the entrance.

Q.—Is there a piece of wood put over the shield to keep the snow from packing down?

A.—No. There should not be any alighting board in the winter, because the snow collects on it and it will freeze and block up the entrance.

Rev. Eric Lewis: Why don't you have the entrance opposite the centre of the hive?

A.—Because there are two hives on this side, and we want to keep the entrances as far apart as possible. The entrance is on the opposite corner of each hive and that leaves much more space between these entrances. This button should be made of hard wood, so that the mice will not be able to cut through it.

Rev. E. Lewis: I do not understand why you have a button at all if you have an entrance three-eighths by two inches?

A.—In the spring and the fall of the year you want a larger entrance; it would not do to have them closed up like that in the spring. I close mine up as soon as I pack them, the first of November, and I leave them that way until spring, but this larger entrance is needed in the spring.

Q.—Do you prefer the hooks to hold the cases together on the outside?

A.—My case is only about a foot high and nailed. I have another section which fits over this one and holds the packing being held with burlap bottom.

Q.—How do you handle the top part when you are working with the bees?

A.—You can lift one side up and put a prop under it and examine the two colonies on that side, and then you can examine the two on the other side by propping it up the same way. If you have a helper you can take it right off.

Mr. Clare: What thickness of packing do you recommend and what material?

A.—I have used sawdust, but I consider that too close, and when it gets damp it won't dry out the same as planer shavings. You can pack with planer's shavings, and if they are damp to start with they will dry out during the winter. Chaff has a fascination for the mice, but of course you can prevent mice getting to it, and it makes good packing. Leaves are recommended by a great many people, but I never found leaves satisfactory. Last fall I ran out of shavings for a couple of cases, and I packed them with leaves, but this spring they were damper and in not nearly as good condition as the colonies where I had used the shavings. With leaves I think you need a little more room for packing. We use planer's shavings with all our hives, and about an inch and a half packing on the front and about three inches on each side. That is not very much packing, and I do not think it takes more than a bag and a half of shavings to pack four colonies around the sides, and five or six inches on the top.

Q.—Do you change the position of the bees in the spring?

A.—No, just leave them in the same position all the year round. The best time to pack bees up is in October—any time in October seems to be about right, the earlier perhaps the better. The earlier they are packed the less chance there will be of any condensation of moisture in the hive, because when the cold weather commences to come, that condensation occurs at the top of the hive. The bees will stand any amount of cold if they are dry. One of the main things to figure on in outdoor or indoor wintering of bees is to keep your colonies nice and dry.

Mr. Krouse mentioned yesterday about wintering in a cellar where there was water. I presume that was a very warm cellar and comfortable otherwise. I tried to winter in a cellar like that one time, but the temperature got low and I had very poor results. I tried three times to winter in that cellar, and I changed it each winter, trying to improve conditions and make it warm and to keep the place drier, but I could not succeed in wintering there.

A very small entrance is required for wintering and the reason that is the case is because it keeps the outside air away from the bees to such an extent that it will not introduce rapid changes in temperature. The evener you can keep your temperature in the hive the better it is for the bees. That might be arranged by having the entrance not too large, because then the inside temperature will not change so often.

To bridge the entrance I have an inch or an inch and a half cleat nailed on the bottom of the bridge; it keeps the packing up. The top of the bridge should be just at the top of that two inch opening; that keeps a two inch space clear across the hive, outside of the hive proper and inside of the case allows for air and room for the bees to get around. Supposing one side of the inner entrance clogs, they can get out the other side and come to the outer entrance. I consider it very important to have a bridge one and one-half inches up from the bottom board of the hive.

Q.—What sized entrance to the hive?

A.—The same as the usual entrance.

Q.—Would not that clog?

A.—No that will not clog all the way across. You have three-eighths inch entrance clear across your hive inside, you have a vestibule— a chamber that is neither hot nor cold—where the bees can come out if they are dying rapidly, and they won't clog the entrance.

Mr. R. B. Ross: Does that bridge go right across the both hives?

A.—No, just one hive; they cannot get from one colony to another. There is a bridge for each colony.

Q.—Do you have any packing under the hive?

A.—No, I do not use any packing under the hive.

Q.—Would it not be better to have packing under the hive?

A.—I have tried that out, but I cannot see any difference.

Mr. E. T. Bainard: Did you ever try a sheet of tar paper

A.—Yes, I have tried that. When the case is on, there is an air space of six inches under the stand; this stand just comes down to about the level of the ground.

Mr. F. W. Krouse: How often do you have to renew these stands that are so close to the ground?

A.—I have not had to renew any yet, and I have had some of them eight years.

Q.—How would concrete do for that stand, I find that lumber rots very rapidly?

A.—Concrete would be all right if you thought you were going to be there forever. I have had to change yards and move around so much that I do not want anything as permanent as that. This will last a long while and you will get your money's worth out of it.

Q.—What thickness of lumber do you use?

A.—Seven-eighths.

Q.—Is your soil sandy or clay?

A.—Clay.

Q.—I find that lumber rots in about two years on some soil?

A.—I do not put stand right on the ground; I always put bricks underneath.

Q.—What kind of lumber do you use?

A.—Cedar, pine and hemlock; it does not matter if it warps a little. They are only three and one-half feet long.

Q.—You raise them a little off the ground?

A.—Yes.

Q.—You are one inch off the ground?

A.—Of course an inch of snow will close that up, and in an ordinary winter no air will get under.

Miss Pettit: How do you pack the hives on top?

A.—We have a section about six inches high at one corner running to ten inches at the other. It is made large enough to slip over the case; just an inch from the bottom I have a strip nailed around the burlap, and the packing is all put in here. The top is made of roofing paper, and I nail two inch strips on about a quarter of an inch apart. I made some of them farther apart, but I found the mice get in. Put them across and then put a roofing paper on and you have a quarter of an inch space between slats which gives ample ventilation for the top of the packing. The air passing in at the bottom and up through the top keeps the packing perfectly dry and will take out any surplus moisture.

Miss Pettit: Do you use packing duck for hive quilts?

A.—No, ordinary burlap sugar bags.

Q.—Do you let the burlap go down over the edge of the hive?

A.—I usually have it an inch larger than the hive.

Q.—Do you find that at the time of rain storms that burlap will act like a lamp wick and bring up the moisture?

A.—I use a little sun cap which keeps the rain from getting in.

Mr. William Elliott: Do you think it any advantage to have the bees cluster to the inside of these four colonies?

A.—Yes, that brings out another point. If you want to winter a small colony, it is far better to put them on few combs and put a division board in. Take, for instance, a small colony that only occupies part of the hive. The other part of the hive being empty, moisture is apt to accumulate on the empty part of the hive, and when the weather becomes quite warm, it will run down and make everything damp and mouldy. If the colony is strong, they will throw off that moisture.

Q.—Give us your idea of a strong and weak colony?

A.—In the fall of the year I have nine combs in a ten frame hive; sometimes I do not have more than nine all the time. Nine combs in a ten frame hive in the fall of the year is all right for the winter. I like to see them in the fall right clean across and all the way down—bees all over the inside of the hive. Then in the winter, I notice that they cluster right on the bottom board; I like a good strong colony.

Q.—You spoke about dampness softening the honey on the outside and causing it to be unfit for use; if your bees are in four hives together, all the outside honey is going to be soft and damp?

A.—A strong colony in this hive and the honey sealed on this outside will be in good condition and the bees will expel all the dampness.

Q.—Why do you leave one frame out?

A.—Just to give them a little more room for ventilation during the summer, and it is easier to manipulate and take the combs out and examine them for queen cells; there are two ways of getting honey out of the combs in spring, one way is to jam the combs tight together, but the bees won't stand for that; they want a big space between each comb. Another way is to separate the combs and give a wider space, and they won't stand for that either; they will take the honey out. You will find that out in the fall of the year if you want them to clean up the supers.

If you put the whole number in they will leave the honey there, but if you put them far apart or too tight together the tendency will be to clean the honey out.

Mr. Robert Fowler: Why do you leave nine combs in instead of ten?

A.—Because they will seal them up inside and have a nice cluster place. The combs down here are not so tight together and it leaves more space for the bees to cluster.

Q.—Are they not warmer in the winter time?

A.—Yes, the more bees you can get together the better. We know that empty comb will soon be filled with bees. They go into the cells and then they cluster on the outside with their backs together and they fill up all the space, and the more space you have there the better for the bees to cluster.

Q.—When do you put your other frame in?

A.—In the spring of the year. If you have the time and the inclination; but you will have a good colony without tinkering with them at all. It is only the fellow who does not winter his bees properly that has to bother about tinkering with them in the spring. If you have lost so many bees that you have only fifty per cent. left in each hive you have only wintered half your bees, and I do not call that wintering at all. You should winter at least ninety-five per cent. of the cluster you put away in the fall, and if you do that you have a big colony to start with and it will not require very much handling to get them ready for the harvest.

Q.—You told us the ideal cluster for the winter is to leave one frame out of a ten frame hive?

A.—That is before they cluster.

Q.—In what percentage of colonies do we expect to realize that ideal?

A.—In every colony in your yard. That is the secret of the business; never neglect any colony in your yard. If you go away for a holiday for six or eight weeks and leave your bees alone you will come back and find a lot of them out of condition, and then it is too late to get them in condition. I stay right with them, and I take my holidays in the winter. In the summer time I am there all the time keeping my bees in good condition.

Q.—What do you consider the best way to unite two weak colonies?

A.—It is a very easy matter to unite two colonies in the fall. I go through a weak colony and take out half the combs. Take the combs that the bees are not on very much. Brush off any bees that are on them and then you will have them all on four combs. Then go to the other colony and do the same with it, and take the queen away from one of them, whichever is the poorest queen. If the queens are equally good take one of them away and then place the combs of the bees in with the other colony. Do not mix them, let them mix themselves.

Q.—Do you find that some of them will go back to their old location?

A.—Very few in the fall of the year. I have done that for quite a while and I find I can take a colony in the fall of the year and move it wherever I like.

Q.—Don't you think it would be a better plan to put one on top of the other for four days and place them together after that?

A.—No.

Q.—I asked an experienced beekeeper and that is what he told me, to place a sheet of paper between them, and I asked him what kind of paper to use and he said an ordinary newspaper, and I said one thickness or two thicknesses, and he said one would be sufficient. I put one on top of the other and I put a sheet of paper over, and to my horror the next morning, there must have been in front of the hive one colony completely dead. They had evidently fought and one colony killed the other. A little later I phoned to this same beekeeper again and he said, try it again and put double paper, and I did that, and the result was that although they were not all dead, there seemed to be extremely few bees. What happened I do not know. But I left the colonies to fight it out, and I hope the better colony won. Was this beekeeper right in telling me to do that?

A.—I would not do it. Was it extremely hot weather?

Q.—No; it was in October.

Mr. William Elliott: I have known the bees to suffocate when a piece of paper has been placed between them. I have united hundreds of colonies of bees by placing a sheet of paper between them. I use any ordinary piece of newspaper, and I have yet to lose my first colony of bees. I do not give them smoke unless I have to.

NOTES FROM THE YEAR'S WORK, 1915.

Morley Pettit, Provincial Apiarist, O.A.C., Guelph.

The first event of the year was the Apiculture Short Course held for two weeks in January at the Ontario Agricultural College. Like everything else of a similar nature the attendance was affected by the general depression, increased in the case of beekeeping by the almost total failure of the honey crop. However, there were between 40 and 50 regularly in attendance, and the course on the whole was very satisfactory. Those who came were there for business, and by interest and questions got the full benefit of every session. Judging by correspondence already in, the interest in the 1916 course will be right up to the mark.

The work with the regular College students continues as usual. This consists of a course of twenty-five lectures and a few laboratory periods compulsory with all first year students. It is possible in these twenty-five lectures to briefly outline the elements of beekeeping, and while very little practical work can be given owing to limited accommodation, care is taken to impress the principles of bee nature and management. This year each first year student is given practical work to the extent of making up a complete bee hive, and it is hoped that with improved accommodation in the future this practical work may be extended.

Wax Rendering.

That large quantities of beeswax are wasted annually for want of proper facilities for rendering it from old combs and scraps cannot be gainsaid. If the beekeeper will carry a 10 lb. honey pail or similar receptacle on his round of apiary work and drop into it, instead of on the ground, all bits of comb, scrapings, etc., he will be surprised at the amount of wax he will accumulate. That this waste of scraps and even combs is only greater in degree than the waste of wax in slumgum through improper methods of rendering may be illustrated by the following account of a typical case.

One hundred and forty-six lbs. of refuse from an ordinary press in the hands of a careful beekeeper was put through a Herschiser wax press, and 20 lbs. of fairly good beeswax extracted. The beekeeper in question stated that at that rate he had been burning in his kitchen stove the price of a good wax press almost every year.

Publications.

During the winter a bulletin on "Natural Swarming and How to Prevent It," was prepared and issued in May as Bulletin 233. This embodies results of co-operative experiments on this important phase of bee-keeping and has been much in demand amongst beekeepers. The Bulletin on "Bee Diseases in Ontario," No. 213, was revised and considerably enlarged. There was also issued a report on "Some Results of Co-operative Experiments on Races of Bees to Determine Their Power to Resist European Foul Brood." These experiments had been conducted co-operatively by beekeepers in the European Four Brood districts since the year 1910, and results indicated that several strains of Italian bees which had been under test, had proved to be quite good resisters of this disease. Resistance is more a matter of vigor than of race or strain. Results of tests show, however, that common black bees are exceedingly poor resisters, and that Carniolans are not generally as good as Italians.

Apiary Inspection and Demonstration.

The inspection of apiaries was carried on as usual, after the preliminary conference of apiary inspectors held at the Ontario Agricultural College early in May. While marked progress is being made in the control of American Foul Brood, European Foul Brood is still spreading. It will be seen that the policy of making this primarily an educational campaign is being pursued, by the fact that 60 apiary demonstrations were held during the season, with a total attendance of 1910, an average of 32.

As was stated in the report of last year the value of this work, great as it is, might be increased by establishing demonstration apiaries, particularly in districts infected by disease, where discouraged beekeepers might be shown how bees can be profitably kept in spite of obstacles.

The full report on the inspection of apiaries will be published in the Annual Report, and members will have an opportunity of reading it at their leisure.

Spring Report.

During the latter part of April report forms were sent to a large number of beekeepers in Ontario. These were filled out and returned, and the following summary of the winter loss, condition of the bees and honey crop prospects for 1915 were taken from them.

Nine hundred and ninety-three beekeepers reported 37,317 colonies in the fall, and 31,310 colonies in the spring, an average of 31.5 colonies each, spring count, and showing a winter loss of 16.1 per cent. It was found by later reports, however, that in many parts of Ontario from 50 to 75 per cent. of the bees had died. This heavy loss was largely due to the unfavorable breeding season of 1914, causing many colonies to go into winter quarters with large numbers of old bees, also to the poor quality of the stores causing granulation and dysentery or starvation. In districts where much sugar syrup was fed in the fall the loss was comparatively small. It seems that either the wintering problem has not been entirely solved, even by the specialist, or he is not putting all his knowledge into practice.

The Honey Market.

In spite of this heavy winter loss and the season not being very favorable in many parts of the Province, the honey market in Ontario has been perhaps more unstable than it had been for a number of years. This is probably due to several causes. First, the beekeepers lost their nerve over the large crop of 1913, and have not regained confidence in themselves nor in the report of the honey crop committee. Then conditions are somewhat unsettled on account of the war, and wholesale houses generally are carrying exceedingly low stocks of all kinds of goods, honey included. This slowness on the part of wholesale grocers to purchase honey has caused still more uncertainty amongst beekeepers, and led many of them to sacrifice their crops, some selling as low as 8c. a lb., although the honey crop committee, for the very best of reasons, set the lowest wholesale price at 10c. So we find that beekeepers have sold their honey all the way from 8c. to 12c. per lb. wholesale, for no other reasons than that some beekeepers are better salesmen than others, and some have risen above the old wornout theory that honey is only a luxury and can never become a staple.

Selling Honey.

When it comes to selling honey Canadian beekeepers have several marked advantages over all others. The first of these is perhaps the fact that the majority of the honey produced in Canada is, as a dessert article properly handled, equal to the highest priced confections, and equal, if not superior, to any other table honey produced in the world. Second, the Canadian market for this honey has scarcely begun to be developed, as witness the fact that honey is almost never found on the tables of public or private dining rooms outside of the homes of beekeepers and their immediate friends or relatives. Third, the Canadian market is protected by an import duty of 3c. per lb., plus $7\frac{1}{2}$ per cent. *ad valorem.* Doubtless other advantages could be named.

But unfortunately, the sale of honey is handicapped in several ways, not the least of which is the prevalent idea fostered by pessimistic beekeepers that honey is a luxury, and never will be a staple. That this idea is quite unfounded is proven by the fact that honey is a sweet with a positive food value, coupled with the other fact that human beings crave sweet and require food. Another handicap to the sale of honey is the utter absence of any effort to call public attention to honey as a food. I mean advertising. There is a trite saying that "If your business is not worth advertising, advertise it for sale." The usual objection to advertising is that if I advertise my honey I may help the sale of the other man's honey. While this is at least a very selfish view, it is also an erroneous one. The point is to have your own brand of honey with the name on the package and in the advertising.

A third handicap to the sale of honey is the lack of pulling together on the part of beekeepers, and on the other hand the lack of confidence in self and product. For instance, in a certain neighborhood, not a hundred miles from Toronto, honey had been retailing at 10c. a lb. A member of the Association in that neighborhood had the temerity to raise the price to that recommended by the Association. His neighbor beekeepers seeing the advantage raised their price, but not to that asked by their leader, but to just 1c. below him. What was the result? They secured the benefit of his increased price, but injured the sale of his honey and turned public sentiment in the neighborhood against him as being responsible for the general increase in the price of honey. I would not like to believe that any beekeepers are intentionally malicious, but frequently their actions in local honey selling have the same results as though they were. My answer to the complaints of such cases which frequently come to me always is, why not get together and buy out the man who is anxious to sell cheap; but almost invariably I find that the beekeepers are afraid. I would not say they are cowards, but they lack confidence in themselves as salesmen and in the honey as an article to be sold.

We have so often been told of the great Canadian West as a market for our honey, that it seems superfluous to mention it again. Many beekeepers throughout Eastern Ontario are practically ignoring the local demand for honey, because of the under-cutting of neighbor beekeepers, and are shipping west to regular customers at good prices.

Quality First.

Marketing unripe honey is another serious handicap. Some beekeepers are not properly equipped with hive storage for honey. No good colony should in an ordinary season have less than two supers, and perhaps best results are obtained by having sufficient super room for the whole crop. This gives the bees time to ripen properly the honey before it is taken from them. It should then be stored in sealed containers as soon as possible. Honey extracted unripe or left exposed to damp atmosphere for any length of time, fails to granulate evenly and starts fermentation usually before it reaches the customer. I have seen a whole crop of extracted honey granulate in 5 lb. pails where every pail had a half-inch of liquid on the surface—a most uninviting appearance to say the least. This was where the beekeeper had only one super for each hive, and was under the necessity of extracting much honey that had never been capped.

Best Honey Package.

The style of package is another important matter. The West seems to prefer granulated honey, while the East, particularly the city consumers, prefer it in a liquid form. During the extracting season the beekeeper is under the necessity of deciding which market he will seek with his honey. If his honey is to go West, he must decide again whether it is for the city or country trade. For the city trade 2½ and 5 lb. pails lithographed are preferred. For the Western farmer trade, the 10 lb. pails are almost the exclusive package. If for local or Eastern city trade, the 60 lb. tin is probably the best. These should be liquified, the honey strained and filled into the selling packages as it goes out to the local dealers or consumers, making sure that it reaches the consumer in a clear liquid state.

There is a bottling business growing up both in the West and in the East. A firm in Winnipeg is buying honey in bulk for bottling, and there are several firms in Toronto and Hamilton, and other eastern cities that are doing the same. I am advising them to purchase in barrels as being the cheapest and most easily handled package. I consider that far too much first quality clover honey is going into 60 lb. tins. If the market were properly developed it would not be necessary for any of our best clover honey to be used in any way except as a table honey. Much of that which goes into 60 lb. tins at present has to be sold to manufacturers to be used where cheaper grades of honey would answer. This is perhaps one of the greatest causes of the low price now offered for honey in 60 lb. tins.

I am not quite sure that wholesale grocers and commission men are the right people to handle honey at all. Honey is rather unique in that it is not perishable, and yet it is perishable. It will keep almost indefinitely, and at the end of that time it is likely to be spoiled, or if it is not spoiled the one who undertakes to liquify and get it into selling packages for the consumer may spoil it. The wholesale grocers to-day are not particularly satisfied with the honey business, and might not object so seriously if they were relieved of it.

Some methods of the Tri-State Honey Exchange of Minneapolis, Minnesota, are worthy of consideration. Honey is purchased from members or other beekeepers at a low wholesale rate. It is bottled and sold and the profits divided amongst the members. The retail stores of the city are canvassed periodically by a man with a light motor truck. He takes with him a stock of bottles of freshly liquified honey, bearing of course the label of the Tri-State Honey Exchange. Where the grocer already has a stock of their honey, he looks it over and picks out any bottles which show granulation replacing them with bottles which are freshly liquified. He also of course, sells more to those whose stocks are low. By this means a constant supply of honey in the best of condition is on the counter of all retail grocers in the city. The name of Tri-State honey gets to be known. It is always the same, flavor, color and everything, so that when a woman buys one bottle of Tri-State honey she knows it will be just the same as the last bottle she had. The experience in Minnesota is that wholesale grocers are giving up the honey business entirely, and it is working into the hands of the Tri-State Honey Exchange. The consumption of honey is being greatly increased, and the honey business is on a much better basis than ever before. Of course, the secret of success of the Tri-State Honey Exchange is that they have a very capable manager who understands business, honey, and men. The only way this could be worked out in Toronto or any other place, would be either by the private enterprise of some one who has sufficient capital and ability to carry it through, or by the co-operation of a number of beekeepers with confidence, first in themselves, then in their honey, then in one another.

For the success of such an undertaking it would be necessary to have an all year round supply of honey. The theory that honey can only be sold in the fall is only a notion which could be overcome by educative advertising and by having a stock constantly on hand. The Dominion Government is spending thousands of dollars advertising fruit, yet I have not heard that any body of beekeepers has approached them with reference to advertising honey. Of course, the trouble is that most beekeepers are unable to sleep if they see the approach of winter and still have any honey on hand: so the dealers get it early at their own price, and then it is too late for the producer to reap any benefit from advertising.

Extracting Machinery.

Extensive tests have been made of appliances for taking extracted honey. Reference has already been made to the importance of having sufficient extracting supers to contain the season's crop. From years of experience I have found it most satisfactory to leave the white honey with the bees until they are practically done gathering. Then by having the right kind of machinery for rapid work, extract as quickly as possible returning the empty combs for any dark honey that may be gathered later. The beekeeper soon learns to know his locality, so as to get this work done in time, and at the same time not too soon to avoid having the white honey darkened on the one hand and having a lot of white honey left to be mixed with the buckwheat on the other. If after waiting as long as it is safe there is still unripe honey in the supers, it is better to return these to the hives to be filled with buckwheat than to extract unripe honey and thus lower the grade of the white honey crop.

For taking off the honey it has been found that the bee-escape is most satisfactory. If there is no brood in the super ordinary Porter bee-escapes placed in boards will practically clear the supers of bees in a short time. Where spacing is not very good in the supers, or where the bees have been crowded for room so that burr-combs are built, it is well to loosen the supers breaking the burr-combs a few minutes before going around to put on the escapes. This will cause the bees to take the honey from the burr-combs and avoid much dripping and daubing when the escape boards are put on.

For rapid work the beekeeper should have enough boards to put under as many supers as he would extract in half a day at least. Starting at the end of the row these should be put under every super in succession. Then as the first escape board is liberated by removing the super that board should be put on the next hive at the end of the line beyond the boards that are in place. The second board when liberated should immediately be put under the hive beyond the first, and so on. Even if the bees are not all out when we start to remove the first super they will be so subdued by their separation from the brood and by their confinement in the super that they will fly out as soon as liberated and may be easily driven off the combs.

For taking in the honey a wheelbarrow should be provided, or if the ground is sufficiently level a hive cart carrying several supers at once. The beekeeper should on no account carry supers of honey to the honey house, as human strength is too valuable these days to be wasted in that way.

The honey-house should if possible be provided with an ante-room into which the supers of honey are first carried and stacked in front of a window with screen and bee-escape. If the supers are piled loosely here the few bees that come in on them will soon fly to the window and go back home. They can then be carried into the extracting room, practically free of bees.

All windows should be provided with screens, but there should on no account be any screen on the door, as bees soon learn to hover around the screen door following in every time and causing trouble.

For uncapping I have found the most satisfactory knife to be one with a straight blade 10 or 11 inches long. I do not know of any honey knife on the market with a blade long enough for satisfactory work on Langstroth combs. If one or two inches longer than the width of the frame, which is 9⅛ inches, the skilful operator can uncap one side of the comb practically at one stroke. The shorter blade with which the manufacturers provide us, makes it necessary to go over the side of the comb twice taking about twice as long. The bent shank of the Jones or Bingham knife, is according to my experience quite unnecessary and only tends to tire the wrist. By standing the Langstroth frame on end and using a knife with a sufficiently long blade and the handle straight with the blade, having this blade heated either by the steam jacket or by previously dipping it in hot water, one can do such rapid work uncapping that any attempt to invent an uncapping machine seems quite superfluous. It is necessary of course, that combs in supers be spaced wider than they would be in brood-chambers to get them nicely bulged for uncapping.

To receive the cappings there has not been anything invented yet to equal the Peterson Capping Melter. This machine presents a flat surface slightly sloping and heated by a hot water jacket underneath. The cappings have begun to melt when they fall from the steam-heated knife onto this hot surface and immediately start sliding towards the lower end where they run off liquified into a wax and honey separator. The melter is kept hot by means of a gas or gasoline stove, and of course, care is necessary to see that the water is not too hot. In fact, it is not necessary for it to boil at all, although a little boiling will not injure the honey seriously as it gets away from the surface so rapidly. The operator requires a scraper to help the melted cappings along towards the outlet occasionally, and although some refuse is inclined to accumulate it is all pushed off and no effort is made to clear it from the honey and wax until it gets into the separator below.

This separator is made of an ordinary clothes boiler with a partition across one end reaching from the top to within an inch of the bottom. As the boiler fills up with wax and honey, the honey runs under this partition, leaving the wax in the larger compartment and nothing but honey in the smaller one. Near the top of the smaller compartment a spout opens into a connecting tube running into the extractor, and from this spout the honey which has been separated from the cappings flows back into the extractor and mingles with that which is being thrown from the combs. It is quite true that if this honey were all kept separate an expert would be able to detect a flavor of the wax, but with ordinary care there is practically no change of flavor due to overheating, and when the small quantity of honey from cappings is mixed with the large quantity thrown from the combs, it is impossible to detect any taste of wax in the article which is prepared for market. At the end of the day's work any honey remaining in the separator is drained out to avoid its being injured by remaining in contact with the hot wax over night. The next morning there is a cake of wax to come out of the separator which will need to go through a wax-press to be in shape for market, but there is absolutely no spoiled honey and no boxes or barrels of cappings to sit around in the way waiting for some convenient day to render them up. I consider the Peterson Capping Melter one of the most important inventions that have been given to beekeepers in recent years.

It hardly seems necessary to dwell on the importance of the power honey-extractor, although I think some beekeepers are making a mistake in putting in four-frame and six-frame extractors to be run by power when they might as well go one better and make it an eight-frame extractor whilo they are at it. Aside from the saving of strength and labor, the power extractor gives you an evener motion and will continue revolving the combs as long as you wish. A mistake made by some beekeepers is not turning the combs long enough. It is probably true that whatever honey is left in the combs is wasted, and perhaps injures the bees by their gorging it when the combs are put back into the hives. After going to the expense of getting a power extractor and getting the combs from the bees, uncapped placed in the machine, and in motion, it seems but a small matter to allow them to run a few moments longer so as to take out practically the last drop. One good expert uncapper with proper knife heated, and combs nicely bulged, will just about keep an eight-frame machine going.

For taking the honey from the machine two methods may be considered, namely, by gravity or by pump. Where the extracting house is on a side hill it is probably best to use the gravity method. Otherwise, the pump is more satisfactory. For best results the pump should be attached directly to the engine or power shaft, and not to the gearing of the extractor as is the common practice. It should then be fitted with a loose pulley for throwing it out of gear whenever the honey gets too low in the machine. Some have objected to the pump on the ground that it churns the honey, filling it with bubbles and causing it to granulate sooner. This can be overcome by not allowing the pump to operate except when it is running full of honey.

For delivery of honey from the pump to the store tanks I have found it very satisfactory to use rubber hose. Being flexible it can be handled and put wherever wanted. It is also convenient to coil up and move to an out-apiary. While the pump sold by the A. I. Root Company, gives good satisfaction it does not lift the honey as high as some might want to raise it on occasions. About nine feet is as high as cold honey can be pumped satisfactorily, but of course, this answers all ordinary purposes.

The question of straining honey has always been a live one, and I am not perfectly satisfied with any device that we have tried yet. For ordinary work where great speed is not required, it is a simple matter to strain it through cheese-cloth or linen, but where several thousand pounds a day are being extracted, it is perhaps most satisfactory to use gravity entirely. For this purpose tall galvanized tanks are made about 30 or 32 inches in diameter and five feet high. There should be sufficient of these tanks to hold two or three days' extracting so the honey could stand in them for that length of time, allowing all particles of wax and bubbles of air to rise to the surface. When these are skimmed off the honey is clear enough for all purposes except fancy bottles. Honey for bottling should always be thoroughly heated and strained just before putting into the bottles so that any particles of wax which did not rise to the surface in time to be skimmed off will be taken out by the strainer at the time of bottling, so that for the extensive beekeeper the gravity clarifier allowed sufficient time to do its work has no serious objections.

Mr. Couse: Not more than a year ago, I went into a leading Toronto hotel, and they had not any honey on the bill of fare. I thought there is no reason why they should not have honey for their guests, and I spoke to the manager and he said, "I cannot put it on at the price we charge for meals." And I said, "What about extract honey; you can get it; you can get two or three pounds of honey for the price of a pound of butter. I will give you a can and you can try it." Of course I expected to sell them honey. I gave them a can of nice honey, and they tried it, and they have had it on their bill of fare ever since, but I have not sold them any honey. However, it shows you that you have got to introduce your product.

Mr. Pettit: Mr. Couse is emphasizing the point that I want to make. I am blaming the beekeepers for not advertising the honey and letting the people know that they have it for sale like any other manufacturer does with his products.

Mr. J. F. Dunn: I live right near a summer resort where from ten to fifteen thousand people come every day, and you would be surprised if I told you how much honey we sell. There was no sale in the beginning, but we got the hotels and the restaurants to put honey on their bill of fare, and if you can show them that they are going to make something out of it, they will keep it. The best way is to have individual two ounce bottles that they can put on the bill of fare.

Q.—How would you liquefy honey. Supposing I was bottling honey and I bought it by the barrel?

Mr. Pettit: Knock off the hoops and staves, cut the honey up in chunks, and liquefy in the usual way.

Mr. Sibbald: We have not many concerns in Canada, that buy honey in barrels, and I would not advise anyone to put honey in barrels.

Mr. Pettit: There are some Canadian firms who buy large quantities in barrels.

Mr. Sibbald: With honey in barrels you are tied to those few firms. With it in tins you have more customers to choose from.

Mr. Pettit: There is too much honey on the market in 60 pound cans every year, nevertheless, as explained in my paper.

Mr. Sibbald: Yes, and it might be well to put more in ten and five pound cans.

Mr. Pettit: Of course you must be sure of where you are going to sell before you put it up in barrels.

Mr. Chas. Challand, Renton: I would recommend putting a good quantity in 60 pound cans, because if at any time you are asked for 10 pound tins, you can repack it, but if you have too much in small tins, you cannot profitably put it from the small pails into the large ones.

Mr. Pettit: The three objections to putting it in 60 pound tins are first, that the West prefers granulated honey in small tins, second, if you melt it up to put in small tins it does not ship safely, and third, it regranulates unevenly giving an unfavorable appearance. Frequently the beekeepers want me to find a market for their honey, and from my experience, I say there is too much honey going into 60 pound tins.

REPORT ON APIARY INSPECTION AND DEMONSTRATIONS IN ONTARIO, 1915.

Morley Pettit, Provincial Apiarist, O.A.C., Guelph.

Only a few changes have been made in the inspection methods from those reported in previous years. As usual a notice was sent to all beekeepers just before the bees began to fly, calling attention to the dangers from robbing and urging them to move to a bee-tight place all hives whose colonies had died during the winter. To those on the disease list a letter and two report blanks were sent early in May, asking them to inspect their own colonies and send in their report. Where disease is again reported they are asked to send in the second report card as soon as the treatment is completed. Bulletin 213, "Bee Diseases in Ontario," was revised and considerably enlarged. Copies were distributed by inspectors on their rounds.

Two new features were introduced to the inspection work this year. First. a different system of reporting was adopted, whereby the inspector entered his report on a form which already contained some information about the beekeeper he was visiting, such as the number of colonies and particularly previous reports of inspection, and his status as a beekeeper, whether good, bad or indifferent. This gave the inspector the advantage of knowing the class of man with whom he was dealing in case he was in new territory.

The other feature was a system whereby it was expected that bad cases of disease might be treated by the inspector at the expense of the beekeeper. It has always been considered that the inspector could only afford to report disease and give instructions for treating, but could not afford to spend the time to actually do the treating operation. In many cases this has not been satisfactory, so the increased service was suggested with the idea that the beekeeper would be quite willing to pay an ordinary mechanic's wages for the assistance of the inspector.

In view of the vigorous efforts that have been put forth by some of the members of the Beekeepers' Association to have bees taxed in order to increase the amount of money available for the inspection, and also in view of the number of requests that come to the Department for an increased grant for this work, it was expected that the beekeepers would be quite glad to avail themselves of this opportunity. What was our surprise then to find that only $19.60 was collected for this kind of work. The beekeepers in many cases preferred to have their diseased colonies destroyed rather than pay 40c. an hour for the job of having them cured up.

In order to follow up known cases of disease, also to give assistance to those who would most appreciate it, the inspectors were given the names of those who had asked for help or had reported disease in spring reports. With few exceptions all such requests received attention.

While the number of inspectors is about the same as last year, the number of local men has been increased. The following acted as local inspectors:—

James Armstrong, Joel Barlow, Chas. Blake, Jno. Coburn, Alfred Denison. J. F. Dunn, J. H. McCauley, Jno. McKinnin, Jno. S. Schrank, and Warrington Scott.

The following might be called trained local inspectors, as they are at present keeping bees in the districts where they inspect, and have had the advantage of an extended course of lectures on bees, and special training for the work at the Ontario Agricultural College:—

Ernest M. Burke, J. C. Duff, R. A. Fawler, R. C. Fretz, Ray Hunter, Eric Hutchinson, Neil Robertson, H. H. Selwyn, and Wm. A. Weir.

Geo. F. Kingsmill and S. A. Stewart worked directly from the office.

Since the inspection methods followed for American Foul Brood are different from those for European Foul Brood, the following charts showing the work done with the different diseases are given separately:—

EUROPEAN FOUL BROOD.

County.	No. of Apiaries Inspected.	Total number of Colonies in Apiaries.	No. of Apiaries Diseased.	No of Colonies Diseased.
Carleton	106	1,054	50	283
Durham	24	167	12	55
Frontenac	14	461	8	152
Hastings	10	96	3	27
Lennox and Addington	40	493	26	164
Northumberland	30	409	20	69
Peterboro'	14	93	8	39
Prescott	40	661	14	181
Prince Edward	12	241	5	118
Renfrew	4	300	2	14
Russell	22	396	4	67
Victoria	25	579	13	98
Welland	50	417	29	120
Total	391	5,367	194	1,387

AMERICAN FOUL BROOD

County.	No. of Apiaries Inspected.	Total number of Colonies in Apiaries.	No. of Apiaries Diseased	No. of Colonies Diseased.
Algoma	3	41	....	....
Bruce	25	504	10	41
Dufferin	19	227	3	9
Dundas	7	34	2	7
Elgin	27	685	2	16
Essex	35	339	5	12
Glengarry	2	105	....	....
Grenville	12	212	3	9
Grey	31	242	15	51
Halton	31	1,036	4	5
Huron	2	7	....	....
Kent	26	309	1	2
Lambton	41	632	17	202
Lanark	23	250	6	16
Leeds	1	22	....	....
Lincoln	7	95	5	19
Middlesex	21	680	5	13
Norfolk	2	41	1	17
Ontario	16	321	8	45
Oxford	26	269	7	14
Peel	35	1,148	9	62
Perth	20	469	8	18
Peterboro'	14	93	2	12
Simcoe	2	175	1	....
Stormont	2	96	1	2
Victoria	25	579	5	16
Waterloo	28	502	11	15
Wellington	29	268	12	81
Wentworth	26	443	5	13
York	73	1,001	31	224
Total	611	10,825	179	921

About half the apiaries visited in European Foul Brood districts were found to be diseased. In many cases the infection is very slight and is under control, the beekeepers being able to produce a crop of honey even though fighting the European Foul Brood. The percentage diseased is about the same as last year. New territory has been covered as the rapidity of the disease prevents working over the same territory a second year. The beekeepers have been warned of the approach of the disease. They have been advised to introduce Italian stock: their attention is directed to whole areas where black bees have succumbed to the disease and where Italians have resisted. Yet what do we find resulting? In practically all districts, disease must actually make its appearance before it will be seriously regarded. Our policy then must remain unchanged—just working on the border of the infected areas, to diagnose when the symptoms appear and advise preventative measures. From past reports it seems that European Foul Brood will spread in time to all corners of the Province. Not being able to check or exterminate it, does not signify failure for our inspectors: but being able to resist the spread and continue beekeeping in infected areas indicates progress against the disease.

The inspection for American Foul Brood covers the same territory as often as is necessary. The inspector planned his trip from the special requests received. He was instructed to inspect as much as possible while in a neighborhood. Time would not permit him continuing his work too exhaustively. If the grant for inspection work were sufficient, every hive in every foul brood district would be inspected, but with the present means that is impossible. If any territory were thoroughly worked it would be at the expense of another district. While curing one locality another would be rotting.

Last year, owing to the failure of the honey crop and excessive robbing a great increase of disease was predicted. The severe winter loss and spring robbing would tend to increase the disease. Yet the percentage of disease reported is only 5 per cent. above that of last year. Bearing in mind the great attention paid to "special requests"—which were prompted by a suspicion of the disease—and the robbing of last summer and this spring, it is surprising the spread of disease was not much greater. Figures scarcely show the real progress made against the disease, as it is the opinion that even though reports of cured cases are remarkably few, that beekeepers are in a better position to-day to rid themselves of Foul Brood—due to the educational campaign—than they ever were before.

The inspectors have employed various means of travelling. Bicycles, horses and motor cars have all seen service. Where train connections are poor, and such is frequently the case, the motor car is the quickest and cheapest conveyance, and even with good connections for short distances it compares very favorably with train and livery hire. The use of more motor cars would greatly increase the efficiency of the apiary inspection.

Apiary Demonstrations.

The summer apiary demonstrations have again been one of the important features supplementing the apiary inspection. This season a special effort was made to have uniformity as far as possible at these meetings. The afternoon sessions of the Inspectors' Conference, held at Guelph, in May, were devoted to demonstrations. One of the veteran inspectors conducted a demonstration before the rest of the inspectors, dealing particularly with the symptoms of the diseases, method of inspecting a colony and giving a colony the first shake for the treatment. His methods of conducting the demonstration were valuable as suggestions for improving the programmes of the summer meetings.

Arrangements for these meetings were started early in the spring. A circular letter was sent to each beekeeper where a demonstration was held last year, asking for suggestions both for suitable places for this year's meetings and also for improvements for the programme. It is gratifying to note that a great many replies contained high words of praise for the last season's meeting and offers of the apiaries for another meeting this year. It has been thought advisable to give all beekeepers the same chance to attend these meetings, so the good things were passed around and new places were, as far as possible, selected.

As winter losses were unusually heavy last winter much interest was anticipated on methods of wintering, etc., so each demonstrator was provided with a small model 4-hive wintering case. The small hives also served to conveniently demonstrate hive manipulations.

The weather of the past season was very unfavorable from the demonstration standpoint. Frequently rain fell on scheduled days for demonstrations and the fine days were too few for the farmers to miss to catch up with their work. On six occasions rain fell all afternoon, compelling the audience to seek shelter indoors. The attendance at these six meetings totalled 82 people. The total attendance at the sixty meetings was 1,910, or an average of nearly 32. That many beekeepers, even when extremely busy at home, continue to attend these meetings season after season, proves the value of the demonstrations.

The following chart shows the apiary demonstrations held in Ontario during 1915:—

APIARY DEMONSTRATIONS IN ONTARIO, 1915.

County.	Place.	Attendance.	County.	Place.	Attendance.
Algoma	Steelton	15	Lennox	Enterprise	30
"	Bar River	45	Lincoln	Beamsville	45
"	Thessalon	30	Middlesex	London	50
Bruce	Walkerton	25	"	Strathroy	30
"	Whitechurch	18	Nipissing	Haileybury	30
Carleton	Stittsville	25	"	Whitewood Grove	20
Dufferin	Grand Valley	30	Norfolk	Renton	75
"	Shelburne	20	"	Walsingham	
Dundas	Iroquois	9		Centre	35
"	Mountain	20	Ontario	Claremont	45
"	Chesterville	30	Oxford	Ingersoll	40
Durham	Pontypool	11	"	Norwich	25
Elgin	Malahide	40	"	Thamesford	45
"	Dutton	31	Peel	Cheltenham	52
Essex	Essex	25	"	Bolton	40
Glengarry	Lancaster	13	Perth	Stratford	30
Grenville	Merrickville	17	Renfrew	Hurd's Lake	30
"	Junetown	20	Russell	Cumberland	32
Grey	Owen Sound	25	Simcoe	Allandale	25
"	Flesherton	30	Stormont	Newington	24
"	Meaford	30	Victoria	Fenelon Falls	12
Haldimand	Cayuga	30	"	Little Britain	25
Huron	Clinton	30	Waterloo	Baden	40
Lambton	Wyoming	40	Welland	Fenwick	20
"	Mooretown	27	"	Ridgeway	40
"	Florence	30	Wellington	O.A.C.	50
Lanark	Perth	11	Wentworth	Vinemount	40
"	Hopetown	24	York	Newmarket	35
Leeds	Athens	50	"	Toronto	65
"	Morton	20			
Lennox	Selby	30	Average..	Total attendance	

OUTDOOR WINTERING.

Dr. E. F. Phillips, Washington, D.C.

I spoke to you yesterday on the question of the temperature and humidity in the hive in winter, which is on the line of wintering. There is still the winter problem. Perhaps a few beekeepers have succeeded in solving it for their own conditions. I want to call your attention to what would happen if every man in Ontario who is earning $1,000 per year was taxed to the extent of $166, yet your secretary informs me that the average loss on bees in Ontario is 16 1-3 per cent., that is a heavy tax, showing that there is still the problem of wintering the bees. There was recently issued by the United States Department of Agriculture a bulletin entitled "Outdoor Wintering," and I think I can do no better than give you the contents of this bulletin. There are some things that we can keep on repeating with advantage, especially on outdoor wintering.

There was recently issued by the United States Department of Agriculture a bulletin (Farmers' Bulletin No. 695) entitled. "Outdoor Wintering of Bees," by Mr. George S. Demuth and myself. In presenting this important subject to this meeting, I can do no better than to give the material included in this bulletin, especially since not all present have obtained this publication. It would have been pleasant to prepare a special paper for your association, but since the essentials of the subject have recently been outlined, it would be useless to attempt a rearrangement simply for the sake of assuming originality. I shall omit certain paragraphs of minor importance.

This bulletin contains a somewhat unusual classification of the causes of winter loss, and I may say in advance that I shall be glad to explain any points which have not been made sufficiently clear.

Causes of Winter Loss.

The causes of the death of individual bees or of a colony of bees in winter, barring unusual accidents, are only two in number: (1) Inadequate stores and (2) excessive heat production. The numerous factors usually given in the literature on the subject as entirely distinct fall into these two classes, except for some which are usually given which the authors do not believe to be operative.

Excessive Heat-generation.—At hive temperatures between about 57° and 69° F. a normal broodless colony of bees does not form a cluster, but the bees remain inactive on the combs. When the temperature of the air immediately surrounding the bees (not the temperature of the air outside the hive) falls to 57° F. or lower, they form a cluster and those in the centre begin to generate heat by muscular activity, while those in the outer portion serve as insulators by crowding close together, usually with their heads toward the centre of the cluster. The innermost portion rapidly acquires a temperature considerably higher than that of the air about the bees before clustering was necessary, often going to 90° F. in normal colonies and higher in abnormal ones. The number of bees engaged in heat production increases as the outer temperature falls and the insulating zone is consequently decreased in thickness but becomes more compact. The entire cluster becomes smaller as the outer temperature falls.

If bees can be kept in an environment such that the temperature of the air immediately surrounding them is 57° F. or slightly above, they are saved much unnecessary and unprofitable labor. To the theoretical objection that bees need exercise, it is necessary only to state that the authors have so wintered bees in a cellar as well as outdoors with wonderfully successful results. If bees are kept in a cellar under best conditions the results are excellent, but it is not proposed to discuss this more complicated phase of the subject here. If wintered outside in a packing case with abundant insulation, any heat generated escapes slowly and the temperature of the air in the hive rarely falls below 55° F. If inadequately protected, the temperature of the hive can not be kept so high and the bees must generate much more heat. In single-walled hives it is common for the temperature of the air around the cluster to fall to freezing or lower, in which event the bees generate an excessive amount of heat and perhaps die when they are no longer capable of the necessary muscular activity. The necessity of packing is thus made clear, and in any locality in which the outer temperature often falls to 40° F. or below it is desirable to protect bees to conserve their vitality. If the temperature should fall to 40° F. only a few times during the winter, this would not be serious enough to make insulation necessary. It is obvious, however, that winter protection is beneficial throughout practically the entire United States.

Necessity of Having Young Bees.—Bees may be compared with minute dry batteries, in so far as their vital energy is concerned. They emerge as adult bees with a certain amount of vital energy, and when this is exhausted they die, not having power to recover lost vitality as human beings have. To withstand the hard-ships of winter under usual conditions, a colony must have many young bees, capable of prolonged muscular work. Obviously the better the wintering conditions, the less necessary it becomes to provide young bees, but even with the most perfect wintering it is desirable that there be plenty of young bees in the fall, so that they will be available for extensive brood-rearing in the spring. This calls for prolonged brood-rearing in late summer. Old bees, which have been worn out earlier and are ready to die, soon succumb from the work of heat-generation.

Danger of Weak Colonies.—In a strong colony many bees in the centre of the cluster may be engaged in heat-generation, and there will still remain many bees to serve as insulators. A weak colony, on the other hand, has less reserves for insulation, and, since heat is rapidly lost, the bees on the inside must generate excessive heat in order that the outermost bees may always be at a temperature of over 50° F. Since the surface of a spherical cluster is proportionate to the square of the diameter, while the volume is proportionate to the cube of the diameter, it follows that a large colony cluster has a relatively smaller surface for radiation of heat than does a small one. Below about 50° F. individual bees become numb, and so long as the cluster remains active the authors have never found normal bees at a temperature lower that the critical temperature, 57° F. In a small colony the inner temperature is often many degrees warmer than that of a neighboring strong colony, which doubtless explains the prolonged brood-rearing of weak colonies in the fall. Most colonies which die of excessive heat-generation are rushed to their doom by the temperature being high enough to start brood-rearing, which is perhaps one of the most unfortunate circumstances which a colony can experience in winter. By all means a colony should be so protected that brood-rearing will not be begun until frequent flights are possible.

Since weak colonies so frequently succumb in winter, it is obvious that a too rapid increase in the number of colonies in summer is unwise. Beekeepers have learned that swarming is to be avoided because of the resulting reduction in the honey crop, and the loss in winter is additional argument against allowing the bees to exercise this instinct freely. It is a common saying among beekeepers that a rapid increase is usually followed by a rapid decrease. It is impossible to get too strong a colony for winter, the error always being in the opposite direction.

Effects of Accumulation of Feces.—It was first shown by the authors that heat-generation causes increased consumption of stores; this in turn causes an accumulation of feces within the bees, which is more rapid if the stores contain a high percentage of indigestible materials, and the presence of feces causes increased activity, often resulting in death from excessive heat-generation. Beekeepers call this condition dysentery if the accumulation is so excessive that the bees are unable to retain the feces. Dysentery causes the death of bees in winter, so far as has been seen, solely by undue activity and excessive heat-production. This detrimental effect is reduced by good stores, but obviously the proper method is to prevent an unnecessary accumulation of feces by preventing a heavy consumption of stores, chiefly by providing a sufficiently high surrounding temperature. Honey-dew honey is especially injurious because of the rapidity with which feces accumulate.

In mild climates, in which there are frequent days when bees can fly and rid themselves of feces, the injurious effects of poor stores are less noticeable, because the feces do not accumulate sufficiently to cause abnormal activity. The accumulation of feces is to be considered as an irritant, causing responses similar to disturbance by jarring or exposure to light.

Influence of the Queen.—In discussions of wintering it is usually stated that to winter well a colony must have a good queen. Obviously a good queen will better prepare a colony for winter by providing a strong colony of young bees than will a poor one, while a colony that is queenless in late summer and fall has little chance of living until spring. A good queen will also increase brood-rearing rapidly in the spring, if the colony has good stores and has been properly protected during the winter. Aside from the important influence on the population of the colony, the queen probably plays no part in wintering.

Spring-dwindling.—If the individual bees of a colony are reduced in vitality by excessive heat-production, they may live until spring, but are unable to do the heavy work then needed to bring the colony back to full strength. The adult bees die more rapidly than they are replaced by emerging bees, and the population decreases. This condition, which can be produced experimentally, has long been known among beekeepers as "spring-dwindling." If this condition is observed, the bees may perhaps be slightly relieved of further unnecessary work by packing to conserve heat and by giving abundant stores, but the proper treatment is to prevent the condition by proper care in the preceding fall and winter. The term "spring-dwiindling" should not be applied to death of bees from other causes.

Lack of Stores.—A common cause of the death of colonies in winter is starvation, which is more certainly due to carelessness on the part of the beekeeper than is unnecessary heat production. The greater the necessity for heat-production, the more necessary it becomes for every colony to have an abundance of stores of good quality. The amount required varies with the length of the winter, and also with the amount of heat which is generated. It is, of course, necessary also to provide or leave stores enough for brood-rearing in late winter or spring, before sufficient stores come to the hive from natural sources.

Comparison of the Colony with a Furnace.

Let us assume that we have a furnace for heating a building so constructed that ashes may be removed only when the temperature of the outer air is warm. If the house has thin walls and many openings, the furnace can not maintain a high temperature in extreme cold weather, the amount of fuel consumed is increased, the ashes accumulate rapidly and clog the furnace, and in a desperate effort to raise the house temperature we should probably burn out the furnace. On the other hand, if the house is well built and heavily insulated, a low fire will suffice, and as a result there will be a minimum amount of ashes. The better the fuel, the less the amount of ashes in either case.

It is permissible to compare a colony of bees as a unit of heat-production with this furnace. If the bees are in a single-walled hive in a cold climate, the colony must generate a great amount of heat, must consume much more honey, and feces will accumulate rapidly. As the bees are unable to discharge their feces until the temperature of the outer air is high enough for flight, the "furnace" is clogged. The bees are "burned out" by the excessive heat-production, and, even worse than in the case of the furnace, the irritation resulting from the presence of feces causes still more heat-production. On the other hand, if abundantly insulated, the heat generated is conserved, the consumption of stores and amount of feces are reduced, and the bees can readily retain the feces until a flight day, in any place in which bees can be kept. The better the stores the less the amount of feces in either case.

We should not expect much of a furnace in an open shed, and we have no more right to expect good results from a colony wintered in a thin-walled hive in a cold climate, or even in a better hive placed in a windy location.

Conservation of Heat and Reduction of Expenditure of Energy.

In outside wintering the heat produced by the bees is conserved by the insulation of the cluster itself and also by the insulation of the hive and packing. In the cellar there is less insulation near the cluster, but the cellar itself replaces the packing, and is in reality simply an insulation. The insulation of the individual hive, of several hives packed together, or of bees in a cellar serves solely to reduce the loss of heat generated by the bees.

The amount of packing that should be used abviously varies with the climate and it is impossible to make definite general statements in a bulletin intended for all parts of the United States. There is one general statement which can be made with safety: The majority of beekeepers do not give sufficient insulation and no beekeeper ever gave a colony too much. The aim of the beekeeper should be to keep the air about the bees at about 57° F., at which temperature there is no condensation of moisture within the hive, even on the inside of the cover, where it first appears. It might be inferred that if double the amount of packing had been used the temperature of the air about the bees would have been too high. This is not the case, for bees cease heat generation when the temperature reaches 57° F., (or even sooner when the surrounding temperature is rising), and the temperature will not exceed 57° F. unless that of the outer air remains higher than that for a considerable period.

Bees well protected and with good stores do not fly from the hive because of the warmth within when the outer air is too cold for them to do so safely. If bees fly at low temperature (45° to 50° F.), it is an indication that they need a flight because of an accumulation of feces from poor wintering, and does not at all indicate too high an inside temperature because of too much packing. In conclusion, the beekeeper cannot apply too much insulating material to a hive.

It has been found that, even with abundant insulation, the temperature within the hive and outside the cluster is greatly reduced if the packing case is exposed to wind. During the winter 1914-15 a record was kept of wind velocity directly over a heavily packed case (with entrances 3/8 inch by 8 inches), and it was found that a wind with a velocity of 20 miles per hour directly on the case reduces the temperature within the hives practically to that observed in an unprotected hive. The beneficial effects of the insulation were therefore nullified, and the proper temperature within the hive was not regained for several days unless the outer temperature rose considerably. Beekeepers have long emphasized the importance of protection from wind, but the results observed were much more pronounced than was anticipated or than has ever been suspected by practical beekeepers. The ideal toward which the beekeeper should work is to keep his colonies during cold weather absolutely protected from wind, for here again the protection can not be too great. It is entirely erroneous to assume, as some have done, that such protection is not essential in well-packed hives.

There are several types of hives on the market in which the insulation is built in, to be retained throughout the year. There is no objection to the packing in the summer, except that such hives are not convenient for moving and in some other manipulations. Insulation in commercial double-walled hives is by means of air spaces or insulation, such as sawdust, chaff, broken cork, or shavings. These hives are better for outside wintering than single-walled hives in any part of the United States, but they do not provide adequate insulation of temperature below about 40° F. Such hives must, of course, be protected from wind, or they are for the time being no better than single-walled hives.

Types of Insulation.—Various materials are used for insulation. Besides those named above, paper, dry leaves, and many other substances are in use. Most of the common insulating materials depend on small confined dead-air spaces for their insulating value, and, in general, the more finely divided the air spaces the more efficient the material. Sawdust is usually condemned, because if moisture escapes from the hive into the packing it is retained and the insulating value is reduced. However, if a colony is sufficiently packed, moisture does not condense, except possibly at extremely low external temperature, and this objection to sawdust is removed. From observations so far made, it appears that the beekeeper may use the materials most easily obtained. If dry leaves are used, they should be packed tight, but sawdust should simply be poured in place without being packed tight.

The Entrance.—The weak place in hive insulation is the entrance. An opening 8 inches wide and 3/8 inch high is abundant, it usually being constructed as a tunnel through the packing. In cold weather this might be still further reduced. The opening should be shielded from the wind, to prevent a rapid loss of heat, for if the wind blows against the entrance the heat stored up in the packing is lost both to the outside and the inside. The only reason for an entrance as large as the size mentioned above is the danger that dead bees will drop from the combs and block a smaller entrance. Since the number of dead bees is greatly reduced in well-insulated hives this is less important, and, furthermore, if the air within the hive is warmed to 57° F. the dead bees will be pushed outside, even in freezing weather.

Method of Packing.—The exact method of packing is not especially important, provided enough insulation is given on all sides. Colonies may be packed singly in any sort of box, or they may be packed in groups of four. Some beekeepers arrange colonies in long rows and apply insulation to the whole row. The placing of several hives in contact has the advantage that the colonies insulate one another. If arranged in groups of four, two facing east and two west, they may be left on the same stand throughout the year and are readily manipulated during summer. If in long rows close together, summer manipulations are impeded, unless the hives are moved after the insulation is removed. Placing colonies in long rows is therefore not advisable. Whatever type of outer case is used, it should be tight, to prevent rain and snow from wetting the insulating material.

A rather common practice is to pack the hive at the sides, top, and rear, but to leave the front unprotected and faced to the south, the object being to utilize the heat of the sun to warm up the interior of the hive and reduce the work of the bees. Any place through which external heat may readily reach the interior of the hive is also efficient as an avenue through which heat may be lost when the sun is not shining. Since the sun shines less than half the time in winter, making no allowance for cloudy days, the weakness of the argument for this practice is obvious. A similar practice is to paint the packing case a dark color to absorb the sun's heat. Considerably more detailed work is needed to determine to what extent this source of heat is of value to the colony.

Time for Packing.—At the time of the first killing frost the beekeeper should promptly remove supers, if any are on his hives. If the bees are not adequately supplied with good stores for winter these should now be given immediately, and, when the feeding is finished, the winter insulation should be applied at once. At this time bees are the quietest of any period of the year. The disturbance incident to putting on the insulation does not do them any harm. After this the beekeeper should have no occasion to open the hive until spring. An outer temperature above

60° F. is desirable at the time of packing, especially if no brood is present. Any day when bees are flying is suitable.

If packing is delayed until late it may do far more damage than to leave the bees unpacked. A colony of bees that is generating heat in response to low temperature is considerably disturbed by the manipulations during packing and the temperature of the inside of the cluster is promptly raised. Frequently, if bees are packed too late (when it is too cold outside), the cluster temperature is raised to brood-rearing temperature, the queen begins to lay eggs, and brood-rearing is usually then continued throughout the winter, unless it results in the death of the colony, as is often the case. Many beekeepers pack their colonies in December with most harmful results. There is probably no place in the United States where packing is needed in which it is safer to wait later than Thansgiving Day. Since more beekeepers make mistakes here than in any other phase of outside wintering, this should be emphasized most strongly. The authors have succeeded on several occasions in starting brood-rearing in December by manipulation, both in colonies wintered outside and in removing bees to a cellar, and it is certain that such winter brood-rearing is highly injurious to the colony.

Time for Unpacking.—If a colony has a good queen and plenty of stores and is well packed, the beekeeper rarely has any reason for opening the hive until spring is well advanced. If he is not sure of the condition of the colony, he may wish to examine it earlier, but this first examination should be brief and the packing may be partially removed and replaced afterwards. If there are any queenless colonies or any colonies short of stores, these defects should, of course, be promptly corrected, after which the colony should remain undisturbed until, as the season advances, frequent manipulations are necessary. It is often best to leave the insulation on until the colonies need more room, which will probably be as late as May 15 in the north. Colonies which have wintered poorly need their insulation longest, while colonies that have been well insulated, either in a cellar, or outside, can, if necessary, stand considerable exposure without much damage, although the work of heat-generation thereby reduces the energy available for building up the colony rapidly.

The time for removing packing may be still further delayed by wintering a colony outside in two-hive bodies, the upper one being well supplied with honey. Since there is more space to keep warm, such a hive should be more thoroughly insulated. If the plan is followed, the beekeeper is sure that sufficient stores are available, and he can probably locate any queenless colonies by a brief external examination. Since wintering in two-hive bodies has not been practised extensively, it should be tried with caution, but reports of this method should be available from all parts of the country and beekeepers are urged to try it on an experimental scale. The plan has much to commend it.

Providing a Windbreak.—It is well established that a windbreak of evergreens is superior to a solid windbreak such as a house or solid fence. The beekeeper can readily determine whether his bees are located in a place where the wind rarely or never blows more than five miles an hour in winter. If the apiary is not so located, it should be moved during the summer to a place in the woods, in a gully, or in some other sheltered place. Bees should never be moved in winter. If it is not practicable to move the apiary, a high fence perhaps 8 feet high, should be constructed on the exposed sides. The more compact the apiary, the easier it is to construct a windbreak, which is an argument for placing colonies in groups of four. Evergreens are slow growing, and a high fence may be used until the permanent windbreak is sufficient. If the apiary is practically surrounded by buildings this may be adequate protection, but such a location is usually not the most convenient for the apiary. A southern exposure is usually recommended as best for winter, for it is claimed that the heat of the sun is beneficial. Since the sun shines only a small fraction of the time in winter in most localities, especially in the East, where there is much cloudy weather, this feature should not be unduly emphasized.

Providing Adequate Winter Stores.

The amount of honey that a colony will need from the time it is packed until it is unpacked can not be closely estimated. The aim of the beekeeper in winter should be to save bees rather than honey, and he can make no more profitable investment than to give his bees more than they can possibly use. Some beekeepers claim that it is best to have the old bees die soon, so as to save stores. The actual consumption in such badly wintered apiaries is probably not at all decreased.

If the bees do not have sufficient stores, they may be given combs of honey, but these should always be given before cold weather, so that a proper clustering space may be formed by the moving of honey, since bees always cluster in empty cells of the comb adjacent to stores.

If honey in combs is not available, the bees may be fed extracted honey, but the usual practice is to feed a thick sugar syrup made of 2 or 2½ parts of sugar to 1 part of water by volume. To this syrup 1 ounce of tartaric acid should be added for each 40 to 60 pounds of sugar while the syrup is being heated to the boiling point to dissolve the sugar crystals The syrup should be boiled 15 minutes. The acid helps to invert the cane sugar, thus retarding its granulation in the combs. If there is any question as to the quality of the stores, it is a good practice to feed about 10 pounds of syrup at the time of packing, in addition to the stores provided earlier, this being stored immediately above the cluster. It is thus used first, and an accumulation of feces does not occur so long as the bees use only the sugar syrup. There is, however, no better food in winter than a good quality of honey. As was stated earlier, honeydew honey causes a rapid accumulation of feces, resulting in dysentery. If this is present in the fall, it should be removed and better stores given. Some fall honeys are singularly injurious, but their injurious effects may be reduced by feeding syrup at the time of packing.

Summary and Conclusions.

Bees need protection from cold and wind in winter practically in all parts of the United States. The beekeeper should give abundant insulation, since it is impossible to give too much and since most beekeepers give too little. Great care should be exercised to protect colonies from wind. Every colony should be strong in the fall, so that heat may be generated and conserved economically. To reach the proper population a good queen is necessary.

Many colonies die of starvation in winter. This can easily be avoided.

The beekeeper can make no better investment than to give his colonies proper care for winter.

If the excessive winter losses are prevented, commercial beekeeping will be greatly benefited. Such a condition is entirely possible when beekeepers come to understand the fundamental principle of wintering.

Mr. H. G. Sibbald: The paper that has just been read is in accord with most of the experiences that I have had. However, I just wish to take exception to one thing. I never use tartaric acid. I used to boil the syrup. I simply boil the water now and stir in the sugar. That is very much quicker and you can feed the syrup in a half hour after it is mixed. You can put a bag of sugar into the water and take it out to the yard and feed it, it makes quite a difference in the work.

Jno. A. McKinnon, St. Eugene: I feed considerable sugar each year. I always buy cane sugar in barrels. I used granulated sugar for part of my supply last year, and I used tartaric acid and some honey. When the tartaric acid was not used in sufficient quantity the syrup granulated and the bees starved. It might be well to utter a word of warning against using clear sugar syrup unless it is perfectly melted. If there is the least bit of sugar left in it it will granulate and the bees will die. I have no disease in my yard and I use some honey in the syrup.

Mr. J. F. Dunn: I have fed sugar syrup for a good many years, and I almost always use tartaric acid. It saves the bees a lot of trouble inverting the sugar. Dr. Phillips said that the chief objection to the double-walled hive was the weight, and he is right. I have double-walled hives that have been in use for eighteen years, they are made of three-quarter inch lumber. Take a hive made out of three-eighths lumber and lined on the outside of the inner wall with asbestos paper, and the inside of the outer wall with a good quality of building paper, and leave an inch or inch and a quarter of space packed with good granulated cork and such a hive only weighs eighteen and one-half pounds; I can hold it out on my hand. It makes a good hive and there is no packing to do. The cover is packed with two and one-half inches of granulated cork and several thicknesses of building paper. Somebody said it was hard to winter a small colony of bees and I agree with him. I am wintering this year, because they have good queens, a few small colonies. I reduce the size of the brood-chamber. I use dummies, and I give a larger entrance than most people. I do not allow any upward ventilation. Nothing but paper on top of them and then pile on the planer shavings, and you can winter a small colony in that way. I am wintering a number this year just with burlap on top and planer shavings over that. I pack with cork dust and they are not affected by the outside temperature.

Mr. Wm. Elliott, Adelaide: I have fed hundreds of pounds of granulated sugar, and I never use any tartaric acid and I never have any granulation. My friend says he always buys sugar by the barrel. I buy it in bags. All the sugar comes from the same source, whether it is in bags or barrels.

Mr. McKinnon: I feed granulated sugar. I have used tartaric acid, hard water, and rain water. I have examined my bees closely for at least four years. I find the tartaric acid won't keep the syrup from granulating. I don't know whether the location has anything to do with it or not, but I find it will candy in my yard six or seven days after it is fed. That is if I feed it up to twenty pounds at one feeding. I picked out some of the candied stuff in one of the feeders and intended to bring it here to-day but forgot it. It was some that was left over from last year and it was as hard as flint. Sometimes in September it has not that tendency to candy. The style of the feeder may have something to do with it. I feed in ten pound tins. I don't know whether that has anything to do with it or not, but one thing I know is that it will candy within three or four days.

Mr. J. H. Burkholder: Experience is the best teacher. I have about 150 colonies. I have fed granulated sugar, and I adopt the same plan as described by Mr. Sibbald. For a number of years back I have boiled the water and then pour in the sugar. I have used granulated sugar. It is the same whether you buy it in the barrel or in the bag. I have more water heating at the same time. The sugar will melt almost as fast as you put it into the kettle if the water is boiling.

I stir it until there are no granules of the sugar left and I have never yet seen any of my syrup granulate. I put nine pounds of water to sixteen pounds of sugar. When the sugar is thoroughly dissolved it will not granulate. I use no acid.

Mr. J. D. Evans: I think the great trouble has been that not sufficient quantity of water is used. I notice that if I use 100 lbs. of sugar and 50 lbs. of water some of it will candy. The best way is to use 60 lbs. of boiled water to 100 lbs. of sugar, and be careful to stir it long enough until thoroughly dissolved.

Dr. Phillips: What objection has Mr. Sibbald to tartaric acid? Does it do any harm?

Mr. H. G. Sibbald: No, I do not know that it will do any harm, but I cut out everything that is unnecessary.

Dr. Phillips: Some people do have trouble with granulated sugar, and unless they can get the sugar converted in some other way it will granulate. If you add more water it makes the bees do the work which the tartaric acid does. The bees will invert the sugar the same as the tartaric acid. It is not cane sugar at the end in either case. It is invert sugar. We put on the water and let it boil till we have two and a half parts of sugar to one of water. It will granulate: the crystals are very small. If the bees do not have time to do all this inverting we will find lots of sugar crystals on the hive bottom in the spring, and that is all wasted.

Mr. H. G. Sibbald: If you make the syrup so very thick that you require to add tartaric acid it makes it difficult for the bees to store it, and they will often refuse to store it when they will take the lighter syrup with more water in it. If Mr. McKinnon will put a little more water with his sugar he will find it will not granulate. As to the time it takes for the bees to invert it I do not notice that very much. I feed fifteen pounds to-day, fifteen to-morrow and fifteen the next day, and it will all be stored and the bees will be quiet in a few days. I do not see that it hurts their vitality very much, because when I go out in the middle of April to examine the colonies the queens are just starting to lay and that is an ideal condition.

Mr. Armstrong: I always make my syrup two-thirds sugar and one-third water. I bring the water to a boil and then add the sugar. I pour it in slowly till it is all melted. It is very important to see that it is all melted. I have been feeding for the last thirty years. I have fed in 5 lb. feeders and in 10 lb. feeders and up to 42 lbs. I have a feeder now that holds 42 lbs. I just make one job of it. If a colony wants 25 lbs. I give it to them, and if they want 35 or 42 lbs. I give it to them.

Mr. H. D. McIntyre, Woodbridge: If you feed them rapidly you will find more granulation.

Mr. Blake: I am told by a confectioner that in making rock candy they make a heavy syrup and then put a string in a bottle and the granulation will form around that string. Would that be the reason the syrup granulates because some granules are left in the syrup.

Mr. R. B. Ross: I have a brother who is a crank on candy making. He does it scientifically. He always uses a thermometer, and in making the interior of soft candies for chocolate creams he has got to be very careful. He says that once the sugar is put into the water it should never be stirred. Of course the sugar is boiled and if any little crystals form around the inside of the vessel he removes these with a wet cloth so that they cannot fall back into the boiling syrup. He says that is the great secret of preventing granulation in making candy.

Mr. H. D. McIntyre: I used to feed the syrup mixed 100 lbs. sugar to 60 lbs. of water, and I never could find any granulation. I have a few out yards within about two and a half miles from home and it does not take long to go to either of them. I had a one-horse land roller and I cut a hole in one end of it and I had a funnel made to fit in that hole. Inside of that roller I put 10 bags of sugar and 600 lbs. of water. I hitched a horse to it, got up on the spring seat and when I got to the yard it was ready for feeding. I have since reduced the water to 550 lbs. and it is all right, and I will give you $5 for any granules you can ever find in it. The one horse drew the 1,500 lbs. with about half the effort it would take if it was loaded on a waggon.

Mr. J. A. Marshall, Binbrook: I have a tank and I put the water in and bring it to a boil. Then I stir 300 lbs. of sugar into that water. I keep stirring until I am sure it is all melted and then I let it come to a boil again before I move it.

The Chairman: I want to endorse what Mr. McIntyre has said. He has got us all beaten in the way of making sugar syrup. If I did not know Mr. McIntyre so well I would have thought he was putting something over on us. I have fed thousands of pounds of sugar by simply bringing the water to a sharp boil, and I have never yet found any granules.

MODERN APIARY EQUIPMENT AND BUILDINGS.

William Elliott, Adelaide.

We have three yards and at two of these yards are honey houses and all the equipment that we think is necessary in each. The honey-house at home is 16 by 24 and it is fireproof, all built of iron. It is so constructed that we can run the wheel-barrow into it with the honey that we bring from the bee-yard. The honey is laid right down in front of the capping tank. In the farther end of the house we have a six h.p. engine which only weighs 450 lbs. Two good men can pick it up and carry it. We have a line shaft which we use for the sake of keeping the engine out of the road. From that we have a belt running to the extractor. All the honey is laid down in front of the capping tank, and the operator stands there with a steam capping knife and a steam boiler to operate the capping knife. All the honey is passed to an 8-frame friction-driven reversible extractor. This is a great improvement over the gear-driven extractor. It runs with as little noise as a sewing machine. The honey is pumped up by a pump and delivered into the tanks.

In one corner of the honey house we have a four horse-power steam boiler and that is used for melting the wax. We have had experience for the last three years with foul brood and we have had to melt 500 lbs. of beeswax in the season. This steam process for melting wax is a big improvement on anything I have yet seen. It is equally as good for melting sugar.

In the other honey house we cannot wheel the honey in and it has to be carried in. It is laid down on the floor opposite the operator where it is uncapped and the tank will hold three days' capping. The honey gate is open at all times. From the capping tank there is a pipe into the next apartment. The floor of this apartment is sunk into the ground two and one-half feet and the honey runs by gravity from the extractor into two large tanks. We use here a reversible extractor which is run by a one horse-power engine directly off a line shaft. These two tanks will hold 2,700 lbs. each. The only danger is the overflowing of the tanks, but if you do not have any bigger crops than I have had the last two years that won't trouble you very much. We have a cement foundation under the tanks which is twenty inches higher than the floor. We have a small set of scales and taps that give us no trouble. We can run for a half a day and there will be no dripping. If you can lay out your honey house to advantage so that the honey will run by gravity, and you will not have to use a pump, I think it is the better plan. Honey that is pumped is apt to granulate quickly.

A MEMBER: Where do you strain it?

MR. ELLIOTT: I do not strain it: it all goes into these tanks. There is seldom any wax. Even if you do strain it there will be a certain amount of wax that will go through. The wax all comes to the top and I take it off. I have tried straining through a cheesecloth. I have tried to get a screen sufficiently fine and I have come to the conclusion that the better way is to let it run into the tank and remain there two or three days. Then the wax will rise to the top and I skim it off.

Apiary of Wm. Elliott, Adelaide, Ont

Next the extracting room we have a steam boiler, and a 500 lb. tank. We put the water into that tank and bring it to a boil by means of steam from the boiler. I generally melt two or three sacks of sugar at a time. The force of the steam going into the water keeps it stirred. I find it is a great saving of time and there is no danger of the sugar burning. I have a workshop in this building and all the necessary tools. I find that for melting wax it is better to have a five horse-power boiler. When the water gets to a boil we keep adding the old combs until it is so thick that we cannot stir it any longer. The wax rises to the top and we have a screen on a hoop so that it bulges half round. We press that down into the refuse and we can dip out 40 or 50 lbs. of wax. We put that into moulds and set it to one side. That does not finish the job because what is left has got to go through a process after that. We have a large tank and we draw the wax and water off together. We throw the day's work into this large tank, and when it gets full we draw off the water from the bottom. We keep piling in the wax until night and by night we will have 100 lbs. of wax in that large tank. We turn the steam hose into that wax until it is all thoroughly melted. We cover it up and it takes nearly three days for it to cool. The sediment goes to the bottom, and it will draw from the sides to such an extent that we can draw the water from the bottom and then by turning it upsidedown we can take off the refuse that is gathered on the bottom.

Q.—What method do you use to get the honey from cappings?

A.—We cannot get all the honey out but by leaving it in the capping box for three days and stirring it occasionally a great deal of the honey will drip out. But there is a certain portion of it left in. You cannot turn the hose directly into that, because if you do you will dilute the honey to such an extent that it will not be saleable. A capping melter is good, but I am inclined to think that it might overheat the honey. Of course there is some loss in the plan I adopt.

Mr. C. E. Chrysler: In melting your syrup do you have to make allowance for the condensed steam?

A.—I measure it out two to one and I allow the steam for the extra.

Mr. Bainard: By using the steam you just add from three to four pounds of water.

Q.—You have never used a press for pressing your capping?

Mr. Elliott: No, I never tried that. I have thought of it a good many times.

Mr. Clarke: I use just an ordinary piano stool screw for the press, and by pressing it you can get every bit of honey out of the wax. Use some burlap so that the cappings won't get out at the sides.

Mr. Armstrong: After running it through a capping melter after you pressed do you find that all the honey is out of it?

Mr. Clarke: I never tried that.

Mr. Armstrong: I have serious doubts about your squeezing all the honey out. I think you will get more honey the other way.

Mr. Armstrong: We have two capping melters here in the exhibit and either one will leave the honey ready for table use.

Mr. Pettit: I would like to say a word with reference to the Peterson capping melter. We are careful not to let the water boil in the melter. The honey goes right in with the rest and the percentage of heated honey is so small compared with the bulk of the honey coming from the extractor that the change in flavor is not noticeable.

A Member: What about the color?

Mr. Pettit: It does not affect the color.

Mr. T. J. Colwill: To what temperature do you raise the water?

Mr. Pettit: We have the melter over a gasoline stove. If we find the water beginning to boil we turn the flame down a little.

Mr. W. A. Chrysler: How is the honey taken off the hive?

Mr. Pettit: With bee-escapes.

Mr. Chrysler: If you use too much smoke the honey will have a smoky flavor.

Mr. Elliott: I have been using a ventilated bee escape board for twenty years with a good deal of success. I use a double screen, one on each side seven-eighths of an inch apart. I tried it with a single screen in the first place, but found that the bees would feed honey through the single wire to the ones above or below. I found that the double screen was very successful. I used two escapes in each board in case one might get clogged. When I manufactured these I also had another object in view. I believe in cleaning out my super-combs at the end of the honey season. At first I set them outside in the evening so that the bees would start and clean them out in the morning but there was always an uproar and my horses were in danger. I found by setting this on top of the colony of bees, piling them five or six high, and then drawing this slide so that the bees could get up through the opening and clean them out. Usually in two days' time they would be cleaned out. I have used that method for twenty years.

A MEMBER: What is the quickest time that they will clean out a super?

MR. ELLIOTT: I have seen them all cleaned out in twenty-four hours. I place five or six empty supers on top and allow the bees to come from the bottom and clean it out. We generally allow forty-eight hours, and by that time we will find them all cleaned out.

REPORT OF COMMITTEES.

J. K. DARLING—IN MEMORIAM.

Moved by M. B. HOLMES, seconded by F. W. KROUSE: "Whereas this Association since its last meeting in Convention has learned of the death of J. K. Darling of Almonte;

"And whereas, the late Mr. Darling was for many years an active and honored member of this Association, occupying, as he did, the various posts of director, vice-president and president with great credit to himself and with lasting benefit to this Association;

"And whereas this Association bows in sorrow on receipt of the sad intelligence that we shall meet our friend and co-worker no more in our assemblies, nor feel the warm grasp of his hand in friendly greeting again on the shores of time;

"Therefore, be it resolved, that the Ontario Beekeepers' Association in Convention assembled, take this the first opportunity of giving a united expression of sorrow, and that the sincerest sympathy and condolence of this Association be tendered the widow of the departed as she sits in the shadow and gloom pervading her home and longs for the touch of the vanished hand and the sound of the voice that is still. And we unite in the hope and expressed prayer that the consolation promised by the Master of Assemblies may be fully exemplified in this sad bereavement.

"And be it further resolved that this resolution be engrossed in the minutes and a copy be sent the widow and family of the late J. K. Darling at their home at Almonte."

Carried by a standing vote.

REPORT OF HORTICULTURAL EXHIBITION COMMITTEE.

MR. W. COUSE presented this report as follows: Up to the time we learned that the military were going to occupy the exhibition buildings we fully intended to hold an exhibition this year. We worked up almost to the last and then found that we could not get the buildings. That was one reason why there was no exhibition this year. Another reason was that they did not secure more than a twenty per cent. apple crop this year, and Mr. Hodgetts felt that the exhibition would not be very big, and taking that along with the fact that we could not get a suitable building, we decided that we would discontinue the show for this year. The intentions are to continue the exhibition as soon as conditions will allow. Six hundred dollars of the funds of the show was voted to the Red Cross Society.

Moved by Mr. R. LOWRY and seconded by Mr. J. A. MARSHALL, that the report of the Horticultural Committee be accepted. Carried.

REPORT OF THE CROP COMMITTEE.

GUELPH, Canada, Aug. 5th, 1915.

The Crop Committee of the Ontario Beekeepers' Association met on Wednesday, August 4th. Three hundred members reported from all parts of Ontario showing an average of fifty-five pounds per colony. There is about an average crop and the quality is excellent. The buying power of the public is below the average, however, and it is likely that prices will range slightly lower than those recommended by the committee last year. In fact, some honey has already changed hands at prices recommended below.

Selling should be brisk at these prices as the market is clear of old honey and the high price of sugar is causing householders to turn to honey as a substitute for canned fruit; considering that it requires no preserving but can be stored in a dry place regardless of temperature without even removing it from the tin. One case was reported where berries were allowed to waste and sixty pounds of honey purchased to save the expense of picking and canning the berries.

The prices recommended by the Committee are as follows:

No. 1, Light Extracted, wholesale, 10c. to 11½c. per lb.
No. 1, Light Extracted, retail, 12½c. to 15c. per lb.
No. 1, Comb, wholesale, $2.00 to $2.75 per doz.
No. 2, Comb, wholesale, $1.50 to $2.00 per doz.

These prices are f.o.b. in 60 lb., 10 lb. and 5 lb. tins; the former being net weight with the tin thrown in, the two latter being gross weight. The difference in time and trouble of filling the small tins about equalizes the price. In selling to the wholesale merchant the lowest wholesale price should be asked; while the retail grocer should pay the highest wholesale price. The retail price to the consumer might vary according to the quantity he takes in any one purchase and whether he supplies his own package.

Signed by the Committee:

WM. COUSE, W. J. CRAIG,
H. G. SIBBALD, MORLEY PETTIT, *Sec.-Treas.*

WHITE HONEY CROP REPORT.

Ontario Beekeepers' Association, Guelph, August 1st, 1914.

County.	Reports	Number of Colonies. —Spring Count.	Pounds* White Honey.	Average Number of Pounds per Colony —Spring Count.
Algoma	3	67	3,920	58.5
Brant	9	741	55,444	74.8
Bruce	17	770	32,955	42.8
Carleton	6	190	9,885	52.0
Dufferin	4	304	16,378	53.8
Dundas	2	102	6,000	58.8
Durham	7	304	4,920	16.1
Elgin	22	891	54,340	60.9
Essex	11	144	13,478	93.5
Frontenac	3	171	5,500	32.1
Glengarry	3	413	23,075	55.8
Grenville	2	48	4,800	100.0
Huron	1	280	10,850	38.7
Kent	2	19	950	50.0
Lambton	14	495	33,780	68.3
Lanark	9	302	5,744	19.0
Leeds	12	516	7,628	14.7
Lennox	9	218	5,800	26.6
Lincoln	19	611	24,095	39.4
Middlesex	38	2,601	203,701	78.3
Nipissing	2	150	4,010	26.7
Norfolk	4	188	2,900	15.4
Northumberland	7	438	9,100	20.7
Ontario	13	435	14,604	33.5
Oxford	13	671	45,765	68.2
Parry Sound	1	14	1,500	107.0
Peel	13	641	54,848	85.5
Perth	16	817	64,166	78.5
Peterboro	5	77	2,216	28.7
Prescott	4	575	35,264	61.3
Prince Edward	7	223	7,750	34.7
Russell	7	350	18,430	52.6
Simcoe	26	1,727	77,488	44.9
Stormont	6	216	12,625	58.4
Victoria	8	361	9,930	27.4
Waterloo	10	93	4,635	49.8
Welland	18	519	25,479	49.0
Wellington	17	776	31,545	40.6
Wentworth	11	495	26,280	53.1
York	27	1,154	81,550	70.6
Totals	298	19,107	1,053,328	55.1

* A small percentage of the honey reported is sold in comb honey sections. As a colony managed for comb honey will produce about half as much as one managed for extracted honey, the Committee has multiplied the number of pounds of comb by two before adding in with the extracted.

DARK HONEY CROP REPORT.

The Crop Report Committee of the Ontario Beekeepers' Association met on Thursday, Sept. 9th, to consider the crop of dark honey. It was found that 105 members had reported 116,400 lbs. from 5,807 colonies; being an average of 20 lbs. to the colony. This is about double of last year's average. The Committee advises members to ask 7½c. to 8½c. per lb. wholesale, depending on the size of package and the quantity sold in one order. No buckwheat honey should be retailed for less than 10c. per pound.

The local demand for white honey is exceedingly good as many people are buying honey to put away instead of canned fruit, and the prices recommended by the committee are being realized.

Wholesalers are cautious about buying all lines of goods, including honey and naturally have made an effort to buy as low as possible. A few large orders have been filled at a slightly lower figure than recommended, but these orders were for ton lots.

There is yet a large quantity of light honey unsold, but the market is firm and a great many of the smaller beekeepers report their crop all sold at prices recommended by the Committee. All considered the Committee feels that honey need not be sold below prices recommended.

Signed by the Committee:

Wm. Couse, W. J. Craig,
H. G. Sibbald, Morley Pettit, *Sec.-Treas.*

Mr. H. G. Sibbald: I believe the demand for honey in the west has been exceptionally good—better than we expected, and a great deal of honey has gone west. The money situation has improved and the war is not affecting prices as much as we thought it would. The demand for honey has been very good. The people are eating more honey than they did formerly. I would like to see the honey all cleaned up at the prices we set.

Mr. W. Couse: You forgot something. The Committee met early in August and we were all within a cent of what we thought should be asked. I have not sold any honey under 11c., and I think the majority are keeping that price.

There was a suggestion made that we attempt to ship honey to France or the Red Cross Society. We do not yet know what honey has been sent. I had an idea that if we could send honey in small tins it would be a great benefit. I have an order from France right now for honey on account of the honey that has already reached France. They sent back for more honey, and it looks to me as if there is a market open there for our honey.

Mr. F. W. Krouse: They asked us to put it up in ten or sixty pound tins, and there was no chance of putting it in small tins.

Mr. Morley Pettit: We first discussed putting it in one-pound tins. We knew they had been buying from New Zealand in that form to be used in the rations handed out to the men who were fighting in the trenches. What we were asked for was honey for use in the hospitals. This honey was to be forwarded by the Red Cross Society. We were told by people connected with that Society and also by a military man who had returned from the front, that the larger packages were most satisfactory for hospital work, because honey would be used in large quantities, and if they opened a sixty pound tin it would be all served out in a short time. I have not discovered any way of finding out how much honey has been contributed in response to that appeal. Not very much went to Toronto headquarters. But word has been coming to me from one source and another of contributions made by county associations and individuals, and that leads me to believe that quite a large quantity has been contributed.

Moved by Mr. Krouse, seconded by Mr. Holmes, that the report of the Crop Committee be adopted.

REPORT OF EXHIBITION REPRESENTATIVES.

Canadian National.

Mr. J. D. Evans: As usual we have had some difficulty with the exhibition authorities. A year ago we had a most satisfactory arrangement. They gave us \$600 and we put up a good exhibit. This year I saw the manager and his assistant, Mr. Rogers. The manager said, "You will not get \$600 this year." I said to him, "If we do not get the \$600 we must have the right to sell honey." It was agreed that exhibitors should be allowed to sell in tins. They did not want any glass sold because it gets broken up on the grounds. The authorities agreed with me that exhibitors would have the right to sell in quantities of half pound tins of extracted honey and five sections of cartons. It is unfortunate that nothing a committee does is final. We had about \$325 for prizes. Later on the Executive proposed to charge exhibitors \$100 apiece. The intending exhibitors did not let me know of this. I never knew they proposed to charge a fee until I came to the exhibition. Only one man, Mr. Lang, exhibited. The others all very properly backed out. I do not know that Mr. Lang had to pay \$100. I am very sorry that the exhibitors did not let me know that they made this charge, because I would have made a strenuous objection. I think it would be a good idea if for one year all exhibitors withdrew and they did not have any honey show.

Moved by Mr. W. W. Webster, seconded by L. Harkness, that the report be adopted. Carried.

Ottawa Exhibition.

M. B. Holmes: As your representative at the Ottawa Fair my ambition has been to get a fair percentage of the amount offered for prizes, and I have been successful; but I think there is always room for improvement. This year there was slight friction owing to the fact that a grocer made an exhibit along with the rest. I did the best I could to persuade the management that that was not a proper thing to allow, and that the prize list was intended to encourage beekeepers and should be offered to producers only. The management suggested making a special class for grocers, but I told them it would not be a good plan, and I thought the prizes should be offered to producers and producers only.

Moved by R. Lowry and seconded by Mr. Bainard, that the report be adopted. Carried.

Western Fair, London.

Mr. E. T. Bainard, Lambeth: Our great trouble has been in getting exhibitors to take hold and make an up-to-date exhibit. This year we had a new class and we got one or two to come in. To make up the prize list we got money from the Association and also from outside, and I hope that next year we will be able to make a creditable showing.

Moved by Mr. KROUSE and seconded by Mr. WEBSTER, that the report be adopted. Carried.

MR. W. COUSE: I think we should know whether Mr. Lang had to pay the $100.

MR. LANG: No; I did not have to pay that much.

MR. COUSE: Did you have to pay at all?

MR. LANG: That was left to the Association.

REPORT OF THE SECRETARY FOR 1915.

MORLEY PETTIT, O.A.C., GUELPH.

The total number of memberships in the Ontario Beekeepers' Association received during the year ending October 31st, 1915, is 1,130. Four hundred and twenty-six of these memberships came in from affiliated societies, and the balance of 704 by single subscriptions. There have been no new county associations formed during the past year, but the Norfolk Association has come back into affiliation, and the Peterboro Association has dropped out, making the number of affiliated societies the same as a year ago, viz., twenty-six.

The following is a list of the affiliated societies with their members:

	Members.		Members.
Brant	13	Lincoln and Welland	39
Carleton	10	Middlesex	31
Elgin	18	Norfolk	11
Essex	15	Northumberland	9
Glengarry	10	Oxford	24
Grey	12	Prince Edward	9
Haldimand	11	Russell	18
Halton and Peel	22	Simcoe	11
Huron	18	Stormont	7
Kent	11	Victoria	22
Lambton	20	Wellington	33
Leeds	18	Toronto	16
Lennox and Addington	5	York	13

It will be seen by comparing this with last year's list that several of these societies have increased their membership, namely: Haldimand, Lambton, Leeds, Lincoln and Welland, Middlesex, Norfolk, Oxford, Russell, Wellington and Toronto. Great credit is due the secretaries of these Associations for the results they have shown in building up the membership.

The queen order business was continued during the year. Two hundred and sixty-four members purchased 1,778 queens at an average price of 70c. each.

Last year 247 members purchased 2,143 queens. That is, a larger number of members in 1915 ordered a smaller number of queens, sending in 457 individual orders as opposed to 346 orders in 1914. This meant that the secretary had 111 more orders to handle this year than last. But as an increasing number of members are being persuaded to purchase pure-bred stock, the object sought is being attained. The service will be continued in 1916.

The Treasurer's Report was also read.

Moved by R. LOWEY, seconded by F. W. KROUSE, that these reports be adopted. Carried.

SUMMER PROTECTION AND SWARM CONTROL.

F. W. Krouse, Guelph.

I do not take my bees out of the winter cases at all. I leave them in the winter cases with four inches of packing around them. I merely take off the top cushion so that I can put on my supers and handle the bees.

I claim that this protection around the outside of the hive keeps the bees in an even temperature. I cannot give you any of the scientific points in connection with temperature. From observation and from results I do know that bees do better in the packed case than they do where they are not packed.

In the first place the queen spreads her brood much faster in a packed hive than in an unpacked hive. You would be surprised how quick you will have brood right to the outside, whereas in an unpacked case you would have a very small brood nest. Of course where you leave your bees packed until quite late that is a different thing. I am referring more particularly to beekeepers who keep their bees in the cellar and move them out in the spring, but where they are packed and left packed until it is time to put on the super there is not so much difference. But even when they take the packing off we have days that are fine and cold days when the cluster will draw together. If the cluster draws off very much there is always some of the brood that will perish.

I can make a nucleus much earlier in the season. I make all my increase by nuclei and I can do it much earlier in the season and have no worry about the weather getting cold and the bees perishing or the brood getting chilled. I can assure you that it is quite a comfort where you have 8 or 10 or 15 nuclei, and the weather happens to turn cold and continues cold for three or four days, to feel that your bees are all right. I have made nuclei when I did not feel so comfortable. That was when I had taken them out of the packing. I have lost several nuclei in that way because there were not enough bees to keep it covered and they chilled.

You can get your combs drawn out much earlier in the season. What I mean is, if you haven't all full drawn combs and the colony needs room sometimes when you put the foundation on top of the hives and the weather is not warm enough the bees don't do anything with it. They will gnaw holes in it and destroy it. Last summer I had one yard of bees that had to go on full-sheet foundation. I put the supers on the same day and in the yard there were only thirteen colonies packed and the balance were on summer stands. This is the yard that I worked on shares, and the man who owned it always puts the bees in the cellar. They are eight-framed hives. A year ago we had no honey. The bees that were not packed were a sorry sight the first time I went out to look at them. Practically all the sheets of foundation were spoiled. There were holes in them, and most of them were gnawed away from the top bar. The ones in the cases, however, were different. Out of the thirteen that were in the cases twelve drew out their combs. There were nice straight combs and partially filled with honey. I do not know why they should gather more honey than the bees on the summer stands, but they did, and it was proof to me that it was better to have the bees packed. I never had it so clearly demonstrated before as in that particular case. I do claim that you can get more honey from bees that are left packed through the summer than you can where they are unpacked. I have tried it out in different yards, and the bees in packed cases have always come out the best. It is quite an item to find from 20 to 50 lbs. more honey per colony in favor of the packed hives, and that is sufficient proof to me that that is the best way to keep bees in the summer time.

You get brood-rearing much later in the fall. The queen keeps on quite late, and the hive will go into winter quarters with lots of young bees. I claim that one of the main points in wintering bees well is to have plenty of young bees and lots of stores. This year when the buckwheat flow stopped my brood-nests were full of brood from side to side and I think that is very important. I do not know whether you would get this condition where you have not buckwheat because the queen would not lay if there was no honey coming in.

Swarm Control.

If you have an even temperature you will not have so many swarms. I claim that when the temperature goes up and down a great deal you will have more swarming, but where you leave the hives in their winter packing the temperature is more even. We all know that in icehouses and cold storage plants the packing is kept all year around so as to keep out the heat and the cold, and it is the same way in leaving the packing on the bees, to keep the temperature even, and the bees do not seem to be so inclined to swarm. There ar three reasons why I think my bees do not swarm so much as others: One is the summer protection, and the other is the deep hive that I use in my outyard. It is twelve inches deep, and a ten-framed hive the same as the Langstroth colony, only deeper. The third reason is the young queens. Where you have young queens and packing and deep hives you will not be bothered very much with swarming.

I do not know what I can say about swarm control, as I have not had very much trouble with it. All I do to prevent swarming is where I find the queen using the whole brood-nest or is crowded I lift up one or two combs and put them on top, or put them in a colony that is not so strong. By doing that you strengthen the weaker ones and keep your yard even and have all your colonies in shape for making honey. By putting in one or two empty combs in the place of the combs you take out you leave the queen room to lay and as long as the queen has room to lay there will be little trouble about swarming. I do not do anything more than that to keep down swarming, and I do not go through all my colonies, I could not. I go to the yard once a week and pass through it and note the colonies that I think want attention, and I attend to these and the others are left.

Mr. Weir: What amount of packing do you require around the hives.

Mr. Krouse: I use four inches of packing. I have tried different things, sawdust, planer shavings, cork granules, and I find that cork granules are by far the best. I also tried forest leaves. I understand that in the tests made a few years ago that a dead air space was found to be better than packing.

Mr. J. F. Dunn: Sawdust is considered one of the poorest of insulators, about 50 per cent. Planer shavings about 65 or 68 per cent. Some people do not consider forest leaves as good as planer shavings, but I understand they are rated a little better. One reason why planer shavings is better than sawdust is because it makes one dead air space, if there is such a thing. Next comes asbestos and tar felt that they use for wrapping around water pipes to keep them from freezing. That is something like 80 per cent. A mistake that some beekeepers make is they buy the cork at the grocery stores about Christmas when the grapes are all sold. That is away ahead of any other packing, but re-granulated cork is just like dust and is much better. It is $34 a ton. If you want to pack five or six hives send 40c. for 23 lb. sack. It will cost the same express as a larger quantity. I line my hives with asbestos. One inch of cork dust is just as good as four or five inches of planer shavings.

Mr. Krouse: Cork is far the best. There is nothing at all equal to it.

Dr. E. F. Phillips: I have just been making some tests, and I am afraid some erroneous conclusions might be drawn from some of the statements that have been made. I went to the Bureau of Standard, which is our Physical Department, and they told me that many of the tables that had been issued regarding insulation, value of material, etc., were entirely erroneous. They gave me some of their tests. They had twenty different insulation materials, and there was not twenty-five per cent. difference between the best one and the poorest one of the lot. We made tests of one of the highest testing insulating materials as compared with ordinary sawdust, and there was not twenty-five per cent. difference between the two. One and one-half inches of the best material we could get and was not as good as two inches of sawdust on actual test. I give you that for what it is worth.

Mr. J. H. Burkholder: Do you advocate the use of a double-walled hive?

Mr. Krouse: Yes, that is what I use.

Mr. Burkholder: Do you advocate leaving that packing case on all summer?

Mr. Krouse: Yes I leave it with four inches of packing all the time.

Mr. Burkholder: Are there any ants in the part of the country you live in? If there were you would have more ants than bees in the summer. I have considerable trouble with ants. They will get on top of the quilt.

Mr. Krouse: Don't you have that same trouble with your unpacked hives?

Mr. Burkholder: Rarely ever.

Mr. W. W. Webster: I pack my bees the way Mr. Krouse suggests and last summer I had trouble with the ants. They closed up one entrance completely. I took some coal oil and made a little hollow at the entrance and poured that down. After two applications there was no further trouble with the ants.

Q.—When you leave your hives packed all summer how do you manage to keep them dry?

Mr. Krouse: The roof is built so as to telescope over your case and there is one and one-half inches down on the side, and when that is hung on top of your super there is only about eight inches to the weather, when two supers are on there is scarcely any water that will get into the packing. Certainly not enough to do any harm. I have had them piled up with five supers and still my packing was all right. Even with a few days rain everything has been dry inside.

Q.—Is the case around the super of any value to you?

A.—Yes it is of value until you put your second super on.

Mr. Lowey, Woodrows: Speaking of ants. I have had them by the million. I brush them off. I think they get on the boards for the warmth. Of course when you open the hives a great many will work in and annoy the bees.

Rev. Mr. Lewis: I have been in Africa and in India where they have the soldier ants. These ants march four abreast, and if they once get into the house you have to look out. In Africa and India they can absolutely keep the ants out by using ashes. Would it not be possible to set the hives on ashes and that would prevent the ants from getting near them. All you need to do is to sprinkle the ashes on your door-step in Africa or India and that will absolutely prevent the ants from coming in.

Mr. Lowey: Moth balls will keep ants away.

Q.—Do you group your hives together or have an individual case for each hive?

Mr. Krouse: I have an individual case for each hive.

Mr. Chrysler: It may be asked why the packed case is better than the unpacked one, and why it will decrease swarming to a certain extent? In all parts of the Province of Ontario we have changeable weather. Very cold nights and warm days, and that is one reason why I think the hives should be protected in summer time. If the bees get started in the supers and the honey is coming in good, and you get a few cold nights, the bees will go down and re-cluster in the brood-chamber. The cause of swarming is the improper employment of the bees. They may be up in the supers but they will be driven down by cold weather and also by the hot sun in the daytime. If you put a comb on top of the cover the sun will melt it and remember that the combs just under the cover are not protected from the heat and on a chilly night they are not protected from the cold, and when it gets very hot or cold the bees are driven down and that constantly causes swarming. Where I had large covers I have made an average of 150 lbs. per colony in an outyard. I think it is very important to have protection against hot days and cold nights in the summer time.

Mr. Morley Pettit: What Mr. Chrysler has just said corresponds with the experience of a very successful beekeeper with whom I was associated in my early days in producing comb honey. He had on the comb honey super a cushion of chaff about three or four inches thick. On top of that cushion of chaff was a telescope cover which projected out far enough to shade the super. He had the insulation on top and the shade for the sides. These covers were heavy and not convenient to handle, but they certainly had the great advantage of insulation which was valuable in comb honey production?

Mr. Weir: What would be the weight of your hives, packing case and brood chamber included?

Mr. Krouse: All the bees I have shipped I have left them packed just the way they stood in my yard, and they go at 110 lbs. in the spring, when there is quite a bit of honey in them. One man could not lift them very well, but two men could pick one up quite easily. If I am in the yard when they swarm I get my helper and put the swarm back in again.

Mr. Chrysler: Why do you want to lug them around?

Mr. Krouse: They are all right as long as you don't have to move them. I have a yard of bees to move. The farm where I keep them has been sold, and the man who bought it wants to build a barn right where my bees are. In that case the packed hives are not quite as handy to move as the unpacked hives.

Q.—Do you use a double or single floor?

Mr. Krouse: I started out to pack the stand the same as the sides, but I found there was no difference in the results and I do not pack them now. I just use the single floor. The bottom is apt to draw up moisture in the fall and the packing gets wet and soon rots.

Mr. Weir: Do you always give four inches of insulation?

Mr. Krouse: I would not want to make it any less. If I made any change I would make it more. I do not see why one should try to lessen it when we know they do so well with four inches.

Q.—When you are feeding your bees for winter how do you ascertain what they have?

Mr. Krouse: In all the packing except the cork I can handle them just the same as if they were on a summer stand, but if you have cork packing you cannot lift them because it runs so quickly. Mice cannot live in cork packing. It is too fine. If you use chaff the mice will work in.

Q.—Do you just guess at the condition the bees are in or if they want more feed?

Mr. Krouse: Where they are packed in cork I look through them from the top. In taking out the last honey I mark my colonies for winter stores. If I think they are short I mark on the outside what I think they want, and I use judgment as to the kind of weather we have in the meantime, so as to know whether they are likely to carry in any more stores. If I mark a colony for 50 lbs. I always feed it 5 lbs. more. I figure it is good business to put in the extra five pounds.

Q.—Do you keep in ten frames or nine?

A.—Ten all the time.

Q.—Do you have them all filled with stores?

A.—No, they won't be nearly full.

Q.—Why do you change your mind so quickly and add the extra 5 lbs. of feed?

A.—Just to be sure to have plenty.

Q.—What becomes of that 5 or 10 lbs. in the spring if the bees don't eat it?

A.—If you have any honey in the hives it will be around the outside and the syrup will be stored in the middle and it will be gone. I never yet saw any syrup in any of my colonies.

Q.—Do the bees always start to eat the stores from the centre of the hive?

A.—No, but they will cluster where you put in the last feed.

Mr. G. A. Deadman, Brussels: I hope you won't get the idea that 20 lbs. extra to the hive is because you pack them. I know a man in Owen Sound who had packed hives, and he gave up the business because it made too much work in the summer time. I get more honey from unpacked hives than I do from the packed ones. You get your buckwheat honey from the unpacked hives just the same. The packed hives are too heavy to handle. It is all very well if you have but a few hives, but where you have 300 colonies then you don't want the packed hives. We use a double-walled hive with only a 2-inch air space.

Mr. Krouse: The packed hive is not so heavy as some people seem to think. With the bees and all it only weighs 110 lbs. It is built a half-inch longer and the lid does not weigh more than 8 lbs. I use that lid to set my supers on. It answers that purpose very well, and I find that I can lean up against these hives when I am working, and it is just like sitting in a chair.

Mr. J. L. Byer: I know that a great deal could be said on both sides of this question. I believe that if more packed hives were used there would be less swarming. Our bees in York county are mostly kept in packed hives. I have one yard where I use single-walled hives, and we have more swarming there than in any other yard. This yard is near Orillia, and I think it is on account of the cool nights. The bees in that yard will swarm and swarm. I am convinced that if packed hives were used in the more northerly counties there would be less swarming. If I were going to start this yard over again I would use the packed hives. On the question of work, I would call Mr. Deadman's attention to the fact that his hives have to be packed every fall, and where they are left all summer it saves all that trouble.

Mr. Krouse: I can take my car in the fall and pack my whole eight yards in one day. If I did not leave them packed during the summer time I could not do that. I start out in the morning and go from one yard to the other, and put on my cushions and I am home again at night. I have nearly 500 hives.

QUESTION DRAWER.

(Conducted by JNO. A. MCKINNON, St. Eugene.)

Q.—If you were going to start an outyard of 100 colonies how close would you go to a neighbor who had about the same number of bees, and still expect him to be your neighbor? There being no excessive honey-flow at any time.

A.—If I were starting an outyard I would not want to have that number of colonies any closer than three miles. I think five miles would be better. If I were starting out a yard where there were any bees at all I would not start them closer than three or five miles. There might be some difference in some locations. I think 100 colonies is sufficient in any one location.

Q.—Do you advise the use of queen-cell protectors?

A.—I used to use queen-cell protectors, but this year I have not used any and I think I get on better without them.

Q.—How did you overcome that?

A.—I had a surplus of queen-cells all the time. I used to distribute the queen-cells on the tenth day, but this year I did not do it until the eleventh day and then they were just ready to emerge from the cells. When the queen is fully matured they won't destroy that baby queen, but they will destroy her if she is in the pupa stage.

Q.—How do you place your cells in your hives

A.—I just take out a little of the comb with my finger and press the cell into the side of the comb, and the bees will catch it in there.

Q.—Can you get cement-coated nails in Canada?

A.—Yes.

MR. DUNN: Take common nails and a couple of pounds of shellac in a tin dish, put the nails in a dish and shake them up. You will have the cement-coated nails without paying the extra price.

MR. KROUSE: I do not pay any more for the cement-coated nails than I do for the ordinary ones.

Q.—What is the best way to unite?

A.—There are different ways to unite. I generally have about 400 or 450 nuclei to unite every fall. I just bring them together and unite them—that is all there is to it. I do it on a cold morning when the bees are clustered together. I lift the frames from one hive and put them in another. I do not mind if there are a few bees killed. If one had two very valuable colonies, possibly it would be better to use a sheet of newspaper between them.

Q.—When do you unite?

A.—I begin in September and finish about the 15th of October.

Q.—What do you do with the queens?

A.—I dispose of them. I sell queens.

Q.—Do you smoke them?

A.—No; I do not use anything. I just put them together. Bees that have been queenless for a week haven't much fight in them, and they will unite with any other colony. Take a colony that has a virgin queen, and a colony that has a laying queen, and try to put them together and you will only have one out of the two. They will fight it out until there is only one colony left.

Q.—Do you always put the queenless nucleus with the nucleus that has a queen, or do you unite the queenless nuclei and then give them a queen?

A.—I nearly always put them into a new hive, and I think that has something to do with it. They are less apt to fight when they are put into a new hive and in a new location.

Q.—Is it advisable to change heavy pollen combs for new foundation?

A.—If the pollen was hard in the comb I think it would be.

Q.—Does a queen raised in August or September prevent swarming the following season?

A.—According to my experience she does not. They are just as apt to swarm the next season as not.

Q.—Would a queen raised in an earlier month prevent swarming?

A.—No, there is more in the strain than in the queen. If you have a strain of bees that won't swarm, all right, otherwise they will swarm. It is in the blood.

Q.—What is the best way to get rid of surplus honey in the brood-chamber at the beginning of the white honey-flow?

A.—I really do not know the best way. I generally put supers on the colonies during fruit bloom, and I use half depth supers and what surplus honey goes in there I use in making nuclei later or for raising queens. I get rid of my early honey in that way.

Q.—In brief, please inform a beginner how to make nuclei.

A.—In order to make nuclei the brood should all be sealed over. Nine days before you expect to make your division place your brood combs over the excluder and use Italian bees. They will stay better whenever they are put. You can make your nuclei in the morning. Give a laying queen or a virgin queen. It might be best to plug the entrance to the hive for 24 hours. They are more apt to stay.

Q.—You speak about giving this nucleus, after making it up, a virgin queen. If you have a virgin queen three or four days old, how do you introduce her?

A.—I close the entrance and leave it closed. Just as soon as the bees find that they cannot get out they get demoralized and will gorge themselves with honey and go around in there as if they were crazy. Then, you run in any kind of a queen and she won't be hurt. All you have to do is to take the grass out of the entrance and run the queen in; then leave it closed for a while and everything will be all right. Virgin queens are rather hard to introduce: in fact, it does not pay me to bother with them. I would rather use queen-cells. You do not have to use smoke, because the nuclei are just formed and they are demoralized.

Q.—When do you start to make them, and what protection do you give?

A.—I start about the first of June, and they do not require much protection. I use a two and three-division hive, making two and three apartments.

Q.—What is the best protection from wind in the apiary?

A.—I think natural protection is the best when you can get it.

Mr. Dunn: There has been quite a bit said about high board fences and taking a board out for ventilation. Around my yard I have a lattice fence 8 feet high. I have gone out there when the wind has been blowing 22 miles an hour, and although the wind was blowing around the yard you could not tell which way it was blowing. It was just a nice breeze.

Q.—How can you get swarms and honey from the same hive?

A.—In a good honey season you can get swarms and honey from the same hive, but you will get more honey if you do not allow them to swarm. Even in a good year you can get good honey by not allowing them to swarm and make your increase later on, but of course you will have to feed. I did not make any increase before the first of August. I had more than I knew what to do with, and I divided my colonies in two and I had to feed sugar syrup.

Q.—Will laying worker eggs hatch and raise drones?

A.—Yes, laying worker eggs will develop into drones, but a lot of larvæ die in the larvæ stage. I have seen a lot of that larvæ that look like European foul brood, in fact it looks so much like it that you could not tell the difference.

Q.—Is a beekeeper subject to a business tax or ordinary taxes?

A.—I do not think so, not in our county.

Q.—What is the best way to introduce a queen?

A.—I just ran the queen in on the comb and put the comb back in the hive in 15 minutes. If a colony swarmed I hived the swarm, and then go to the old brood-chamber and cut out the cells and introduce a laying queen, and inside of 15 minutes I would have a laying queen in the parent colony. Then I would hive the swarm alongside the parent colony and leave it there till evening. Then I would go out and pinch the head off the old queen in the swarm and leave them there all night. The next morning I would place the swarm on top of the parent colony.

Q.—That would be the present year's queen you introduced

A.—Yes. I tried to introduce two or three by the smoke method and I lost them all.

Q.—You have the advantage of taking your queens right from the hives. They had been laying a minute or two before.

A.—Yes, but that did not make any difference. I sent down to Mr. L. H. Robey of West Virginia and got six queens, and inside of a half hour after I had these queens out of the post office they were on the combs, and I did not lose one.

Q.—How would Dr. Phillips deal with a case of European Foul Brood if he were inspector?

Dr. Phillips: I could answer that question very easily if I had a case in my own yard. From the standpoint of an Inspector it is necessary to size up the beekeeper more thoroughly than the disease. In the case of a thorough-going beekeeper who has discovered the disease in the earlier stage I see no objection to the use of the re-queening method. I have seen it used, and I have used it myself. I feel rather sorry for the inspector who has to decide some of these problems. If he goes into the yard of a beekeeper who is not well informed and whose judgment he cannot trust, it is his duty to recommend more stringent action and not even intimate to the beekeeper that there is an easy way, because there is too much danger in the de-queening method. I can tell you what I did recommend in the case of an amateur beekeeper. I found 17 colonies, two of which were queenless. Fifteen had European Foul Brood in advanced stages. I am satisfied the other two would have had European Foul Brood if they had queens. The first intimation was to get Italian queens. I do not see any use in trying to treat European Foul Brood in any other way. I recommended ten Italian queens and the shaking of the bees from ten colonies on to drawn combs absolutely dry and the Italian queen was introduced at that time. Then, waiting a week or so until the brood emerged from the combs that have been taken away and piled up on the remaining five. Then treat three or four of these hives in the same way. Dry combs without honey, without pollen and without any brood, and introduce an Italian queen. By that method this amateur beekeeper who had no experience whatever succeeded in eradicating disease. These combs were absolutely new. I felt perfectly justified in making that recommendation to this amateur, who was bright enough to do as I told him. He happened to be a relative of mine. As probably a good many of you know, in the bulletins issued from the Department we do not recommend too strongly the simpler methods, because these bulletins go to people that we know nothing about. Some of them are absolutely the worst kind of beekeepers, and if we were to recommend nothing but the de-queening method it would end disastrously in over 50 per cent. of the cases. When the Inspector goes to the apiary he has a chance to size up his man. That is the reason why in our bulletins we give the de-queening method and say this treatment is recommended only to the expert beekeeper.

Q.—Is it advisable to use good comb that is filled with pollen in the brood nest?

A.—Yes, I would say it is.

Q.—How would a house apiary compare with a packed hive for summer use to control swarming?

A.—I haven't any use for them. I think they are pretty much out of date.

Q.—How do you prevent robbing after extracting?

A.—I try to prevent it getting started. If it gets started the best way is to plug the entrance and leave what robbers are in the hive until everything gets quiet. If the robbing starts in the morning, and is getting bad, move the colonies that are doing the robbing fifteen or twenty feet to one side and put empty hives in their place. Inside of twenty minutes all the robbers will be buzzing around the empty hives. Then I plug up the robbing colony and put them back on their stand and cover them up for the day. Then I am out bright and early the next morning to see that they do not get started on me.

Mr. Krouse: This year I had one colony that were inveterate robbers. One morning I came out and they were robbing pretty lively. I had no trouble in locating where the robbers came from, and I changed the two hives. I took the hive they were robbing and put it where the robbers came from, and I never had anything work so nicely. They went on robbing for a while but they soon settled down.

A Member: About seven years ago I tried that, and they still carried the honey from one hive to the other.

Mr. McKinnon: There is a time when the robbers are so determined that they will rob from their own hives. The best plan is to remove one of the colonies out from the bee-yard.

Q.—Do you think it profitable to shake as late as October first for American Foul Brood? When is it necessary to feed syrup?

A.—If the beekeeper has lots of full-sealed combs of honey I do not know but what it would be profitable to shake as late as October 1st.

Mr. Pettit: When you would have to feed them to get them to build comb it is very likely not profitable to do that, because where you compel bees by feeding to build comb late in the season you draw on their vitality to such an extent that you jeopardize their chances of wintering. Then their chances of gathering pollen after that are practically gone, so that they haven't the pollen they will need for early brood-rearing. In addition to that you have the risk of their contracting the disease again, because by leaving the bees there you always run that risk in treating for American Foul Brood. You go to the expense of feeding these bees up and you run the risk of their not wintering after all. I would say positively where you find colonies diseased with American Foul Brood too late in the season for them to build combs brimstone the bees.

Wm. Elliott: Last season after the honey season was all over I found some 41 or 42 colonies of bees in my yard, with only one or two, or perhaps a dozen cells. I could not stand the idea of putting these into the winter and knowing the disease was there. I wanted to know that I had no disease, and, acting on the advice of a friend, I delayed shaking until the 25th of September. I had something about 40 good strong colonies. I placed the can of 5 lb. of sugar syrup so that they would start to draw out starters, and in four days I reshook onto the full sheets of foundation, again placing in a 5 lb. can of sugar syrup. I kept supplying right along, and at the present time out of that number of bees I have only 16 colonies. I think it would have been better to have destroyed the comb and bought bees next spring. I have only now 16 colonies and they have cost me $4 a piece and that is all I have out of 42 colonies. They simply disappeared. I cannot tell where they have gone. The season of the year being cold they lost vitality fast.

Mr. Krouse: I have had some experience in shaking bees for American Foul Brood. I shook in October on solid combs of honey, and I put one empty comb on the side, and what honey they had with them they stored in that comb. In one or two days I took out that comb without using smoke or anything. I jerked the bees off it quick and put in another full comb of honey and I had only one that contracted the disease again, and they always came out in good condition.

Mr. Pettit: In the hands of a careful beekeeper that method might be all right, but it is a risky method to recommend to the general beekeeper.

Q.—Is it better to feed syrup than honey?

Mr. McKinnon: In some cases I think it would be if the syrup was properly made.

Q.—Will bees destroy a virgin queen if brood or eggs are added before the young queen commences to lay?

A.—I do not think so.

Q.—How do you trap a skunk? When do you start queen-cells for home use?

A.—I have trapped skunks in my yard. I generally leave a heavy cover against the hive so as to make a runway for him to pass through and I set a trap in the runway. They are easily trapped. They will walk over a trap in broad day-light. I usually start queen-rearing in May during fruit bloom.

Q.—Is it in the interest of beekeepers to make more and more beekeepers? Give reasons.

A.—There might be such a thing as having too many beekeepers. There are a number who start in the business who do not stay with it. It is only people who like bees who will stay in the business.

Q.—How should foundations be arranged with other combs to get good new combs?

A.—I usually put it on during the fruit bloom and allow the bees to draw it out then. Put it on strong colonies. I would not mix them. If you put foundations between two drawn combs they will draw out the cells of the combs and they won't draw out the foundation.

Q.—Why do you think they draw it out better in the super?

A.—They do not leave that space between the bottom bar and the bottom edge of the comb. They will draw it right down to the bottom bar in a good honey flow.

Q.—Can comb honey be liquefied without destroying the comb?

A.—I do not know of any process that would liquefy comb-honey. I do not think heat would do it.

Q.—What are the principal outside indications of swarm fever?

A.—They will hang out in front of the box. It is pretty hard to tell whether a colony is inclined to swarm or not without looking through the colony. You have to look to the brood-chamber to be sure.

Q.—What is the best hive cover?

A.—That is a matter of opinion. Different covers will suit different beekeepers. I like a hive cover with a space between the cover and the frame so that you can put some packing there in the spring.

Mr. Evans: The hive cover I use is simply made of boards at each end between the two boards there is nailed 1½ in. strip. This cover is heavy enough so that it won't blow off. There is always an air space of 1½ in. to keep the sun from beating down on the top of the hive. Use 3 in. nails to nail the boards together. I haven't any difficulty in getting boards 18 in. wide. It costs me 40c. for the material. I do not like to see covers with stones on top to keep them from blowing off.

Q.—What is the best way to get pollen out of the extracting combs?

A.—I do not know any way of getting the pollen out except using the combs in the brood nests. If they are piled in a shed sometimes they get mouldy. I use these pollen combs as extra brood chambers for breeding and get rid of them in that way.

Q.—Will they use that pollen after it gets dry?

A.—Yes, but not if it is mouldy.

Q.—Would you cut the pollen comb out?

A.—That is not a good plan because you get too much drone comb.

Q.—Raising queens and re-queening?

A.—That is a pretty broad subject, and we have already touched on Queens and re-queening. If the bees are trying to supersede they will accept the virgin queen, and the virgin queen will destroy the old queen. If they are satisfied with their old queen the virgin will be destroyed.

Q.—Would you destroy an old queen in the fall if it had done well all summer?

A.—No, I would not destroy a good queen because she was a year or two years old. I would want to keep an extra queen as a drone mother. As a rule, I re-queen about one half of my yard every year. Two days after the old queen has been removed they will accept the new queen.

Q.—If you were re-queening would you get drones earlier by having a two-year-old queen in the hive?

A.—Yes, I think you would. If you get drones earlier in the hives with a two-year-old queen, is not that an indication that you will have earlier swarming?

A.—Not if they are handled right later on. It is no indication of swarming.

Q.—When is it easiest to find black queens? A.—I re-queened 25 colonies this fall in October, and I had no trouble in finding 10 queens in an hour in strong colonies. I would take out two outside combs, and I nearly always found the queen on the third centre comb. I did not look at any other comb. I got the outside combs out of the way and then I looked at the third comb, and if I did not find the queen there I looked at the next one. The queen is easily found when the bees are chilly. If you give them three strong puffs of smoke in October when the nights are cold that is the easiest time to find black queens. If you are compelled to do it in the summer time get up at five in the morning. That is the best time.

Q.—Why cannot the cork-packed hives be lifted the same as those packed with other materials to ascertain the quantity of food the colony needs?

A.—Because the cork runs down under the box.

Q.—An effort is being made at Washington to improve the quality of buckwheat honey. Would it not be beneficial to us to have the chemical departments of our experimental farms take up this work?

A.—I think it would if we could get a better price for our buckwheat honey.

Mr. Chrysler: All honey is known by its flavor, and it would be simply a fraud to change the color.

Q.—How can you tell the difference between European and American Foul Brood?

A.—I have had experience with both, and I would advise the gentleman who asked the question to get Bulletin 213 from the Ontario Department of Agriculture. That covers the whole ground of these two diseases.

POISON SPRAYS AND POISON BAITS IN THEIR RELATION TO BEES.

L. Caesar, Provincial Entomologist, O.A.C., Guelph.

Spraying With Poison During Bloom.

On this important subject of the danger of killing bees by the use of poison sprays or poison baits, I shall first discuss what in my belief is the most important point of all, namely: the spraying of fruit trees with a poisonous mixture when they are in full bloom. Prof. F. M. Webster, formerly of Ohio, has shown clearly that such spraying is ruinous to the bees*. I believe almost every entomologist and every beekeeper agrees with him. Unfortunately my time is so taken up with investigation work at that season of the year that I have seldom been able to travel around and see for myself how much, if any, spraying was being done during the blooming period. My experience this year, however, shows that there is more of it than I had expected. In the Niagara district I happened to visit a certain locality to see when the bloom would be off, so that I might be ready at the proper time to spray for the codling moth and apple scab, and to my surprise I found two men spraying apples and pears though the latter were in full bloom. I notified them to stop, which they promptly did with apologies. They were inexperienced growers and not deliberate sinners. I suspect, however, that there are a few experienced growers who spray just when it suits them though the law clearly states that no poisonous spray must be applied to trees when in bloom under a penalty not exceeding $25. Beekeepers will, of course, have to lay their own complaints where there is infraction of such law. It will be well for them to visit the orchard in question, take a witness along, make notes on the amount of bloom, see the spraying done and discover, if possible, the mixture used so that there may be no loophole of escape. So much for compulsion.

As to the matter of whether there is anything to gain from spraying during bloom, I may simply say that if they spray then it usually means that they will have to re-spray to accomplish the end in view, namely, obtaining clean fruit. This is because at such a time there will be many late blossoms not open and so these will not be sprayed; moreover, the presence of the blossom makes it very difficult to cover the part just beneath it which develops into the fruit and which must be covered with the mixture to keep off fungus diseases like apple scab. Hence it is not merely for the sake of the bees, but also for the sake of economy and the obtaining of the cleanest fruit that I, along with all other entomologists, in the Spray Calendar recommend that fruit trees be sprayed just before bloom

*Bulletin 68, Ohio Agricultural Experimental Station.

and again immediately after bloom or when almost all the bloom is off. We have observed that if we wait until all is off the early blossoming trees and is nearly off the later the bees will have by this time deserted the orchard for other flowers. It is my belief that nearly all the poisoning of bees is done by the breaking of this law against spraying during bloom. Every fruit grower, therefore, should as a matter of justice to beekeepers, and in the long run to himself, because insects are essential to the proper setting of fruit, voluntarily refrain from spraying when the trees are in bloom.

Sweetened Arsenical Sprays.

Let us now pass on to the use of arsenical sprays containing molasses to sweeten them. Very little has yet been done by farmers or fruit growers with such sprays, but we have at least three pests that in some localities are very destructive, and that cannot be controlled satisfactorily in any other way than by a sweetened poison spray. These pests are the two species of cherry fruit-flies that often cause over seventy-five per cent. of the later cherries like Montmorency to be maggoty, and the apple maggot that in a few places ruins most of the apples. The time of application of the sweetened sprays for these pests is not until some time after bloom is over. For the cherry fruit-flies the first application is given when Early Richmond cherries are just showing the slightest sign of a red blush, and the second about two weeks later. Cherries nearly ripe are not sprayed. Only two applications are given. For the apple maggot three applications are given if the season is wet, and two if it is dry. The date of the first of these varies with the locality but is in July, and the second usually early in August. No spray is put on apples nearly ripe. It will be observed that at these dates the orchards under ordinary conditions would be deserted by the bees. However, someone will say that the bees would be attracted to the sprayed trees and get poisoned. I have watched this point for three years and in seven orchards sprayed by myself and assistants. I have also asked them to observe and we have not yet seen a bee feeding on a cherry, apple or any other tree sprayed with such a mixture. Further, at Mountain, on the farm of Mr. J. P. Smith, I mixed up the mixture day after day for over twenty acres of apples. His bee hives were within about 100 feet of where the mixing was done, yet no bees came to the molasses or paid any attention to it though many flies were attracted and became a nuisance. In addition there is the fact that such sprays have been used in Italy, France and South Africa for many years for the olive fly, and there have been no complaints of injury to the bees, so far as I know, where the ordinary cheap molasses was used, though where honey was added to the mixture, and in some cases where sugar was used instead of molasses, bees have been attracted. Only three weeks ago Prof. Lounsberry, of South Africa, told me that the sweetened poison pray was just as common in South Africa among growers as the codling moth spray in North America; so they evidently do not fear injury to the bees there. I confess that at first I believed that such sprays could not be used because of the danger to the bees: hence it was a great relief to me to find that the bees were not attracted by them. I mean of course where molasses was used, and we do not recommend any sweetening but the cheapest of molasses.

Sweetened Poison Baits.

Let us now pass to the sweetened poison baits. These, especially the so-called Kansas remedy for grasshoppers, are coming into great favor. They are remarkably efficient against cutworms and army worms as well as against grasshoppers. A modified form of them or else a sweetened poison spray may soon prove to be the best remedy against cabbage and onion maggots.

The Kansas remedy is composed of 20 lbs. bran, 1/2 lb. Paris green, 2 or 3 ground up lemons or oranges, 1/2 gal. molasses and 2 or 3 gals. water. For grasshoppers the mixture is scattered so thinly over the ground that 4 lbs. are sufficient for an acre. For grasshoppers it is put on between 5 and 7 a.m. and for cutworms and army worms after sunset. These are times of the day when bees are not likely to find it and it will be dry in both cases, and so have lost most of its attractiveness before they would normally have begun feeding. However, here again we have plenty of good evidence that the bees are not enticed to feed on it. I have myself made this mixture up and applied it on a considerable scale, and have no proof that bees are attracted to it. Furthermore, I had an assistant at Guelph place molasses and bran around the College apiary at a distance of about twenty feet. Only two bees in the course of about an hour alighted near it and these apparently did so for some other reason than the mixture, because they almost at once flew away again. The mixture was then held in a vessel near the hive until the bees, possibly to emphasize the fact that it had no special attraction for them, stung the assistant and caused his withdrawal.

I wished, however, to be still more sure of my ground, and so wrote to Kansas to Profs. Dean and Hunter who were the chief advocates of this remedy, and asked them if the bee men of that State had made any complaints. They said that they had not done so, and that they themselves had no evidence of danger to the bees though many tons of the mixture had been used. Prof. Hunter stated that now that I had called his attention to the matter he would investigate carefully. He did so the next year and the following extract from his paper shows the result:

"Two years ago, during the extensive use of the poison bran mash against the native grasshoppers, the question was frequently asked as to what effect the poison would have on bees, when distributed through a large alfalfa field where bees from large apiaries were at work. Last summer, Prof. Caesar, of Guelph, Ont., wrote me that similar inquiries came to him from apiarists. Under date of July 24, Prof. Caesar writes:

"'The beekeepers of Ontario are alarmed at the supposed danger to the bees which they believe attends the use of your remedy for grasshoppers. I used this remedy this year and saw no bees feeding on it. I should, however, be very pleased if you would kindly let me hear, as soon as possible, whether bees have been poisoned by it to any extent in Kansas.

"'Yours sincerely,
"'(Signed) L. CAESAR.'

"In order to satisfy ourselves even more fully on this subject, Mr. George H. Vansell, our Apiary Inspector, undertook a series of experiments to determine whether the bees would feed at all on the poison bran mash; and, if so, under what conditions, and with what results.

"First, to determine whether the bees would partake of the poison at all, small piles were placed on the running board of the hives. Here, the bees did not go out of their way to come to the piles, but those which ran against it, stopped and began to lap up the mixture quite greedily, sometimes starting off, to return to lap again. Such were retained, and all died within three hours.

"A number of the bees were confined in a bell-jar with this poison. After a time, the bees came down and sipped the mash contentedly; they would then fly to the top of the jar, to return again for more of the mixture. All those confined in the bell-jar partook of the mash and died; but on the running board of the hive only 15 of those that passed over it during an hour's observation stopped to taste it. When the bran mash was scattered about a few feet from the hive, not a single bee halted to taste the substance.

"Second, the bran mash was distributed in a sweet-clover patch where bees were unusually abundant, and not one was observed feeding or in any way being drawn toward the mixture. It was also distributed freely among rotting peaches on the ground where bees were feeding in large numbers, with similar results.

"Last year, the poison was placed around in small piles among apiaries of 38 stands of bees and the honey systematically taken from the stands. This usually makes bees more active in feeding. Even under these conditions but a single bee was observed feeding on the mash. These attempts at feeding the poison bran mash to the bees were repeated morning, noon and night, and no evidences were observed which would tend to show that there was any appreciable danger to the bees from the distribution of this poison.

"Furthermore, against the insects for which this poison is used, it is most effective when scattered early in the morning or late in the evening. Before the working hours of the bees began the poison would, then, be too dry for them to feed upon.

"From this it would appear that when the poison mash confronts the bees, they will partake of it and perish; but that the use of the mash in field work is not attended by danger to bees."

I think that this is as near conclusive proof as can be obtained that you need not worry over these sweetened poison baits.

This is, I believe, all the information of any importance that I can give you on this disquieting subject of the use of poison baits and sprays. I feel satisfied that any further observations or experiments conducted will bear out the correctness of the statements here made. I should be glad to see your Association conduct careful experiments and prove the facts to your full satisfaction.

Mr. J. L. Byer: One principle has been overlooked by Prof. Caesar in the matter of spraying fruit trees. He said the spraying done at Mountain was in July. At that time it is altogether probable that a strong flow of nectar was on. We all know that when the honey flow is on you cannot put anything out that will attract the bees. You can put these baits in our alsike fields and the bees will not look at them. That same argument would apply to the alfalfa fields in Kansas. We all know that during a dearth of honey flow the bees will hustle around, but when there is a strong honey flow it seems to be natural for the bees to go to the flower, and you cannot induce them to look at anything else. You can almost put this stuff over the hives and they would not look at it, but they will touch these poisonous sprays when there is absolutely nothing else in the fields for them to get. Two years ago in our own locality a bait was put out for grasshoppers during a dearth of honey and the bees did go to the poisoned bait. That is the only way to try out this experiment. You must try it when there is an absolute dearth of nectar. Do not think I am trying to controvert what has been just said. I am trying to put you right on a position that I believe has been overlooked.

Prof. Caesar: Fortunately, I did have that point in view. I was satisfied at the time we were spraying the cherry that it was a time when there was abundance of bloom from wildflowers and other plants, and I knew the bees had plenty to feed upon. But at the time of spraying cherries that is always the condition of the country, flowers are in bloom. The same thing applies when we spray for the apple maggot.

Q.—Sometimes that is the very worst time for the honey flow. There is no honey at all about the 10th or 15th of August in some places.

A.—That spray dries in a minute or two and it was only put on very lightly.

Q.—We would like to know whether there has been any prosecution for violations of the law this spring.

The Chairman: None that I know of.

Mr. Pettit: I do not know of any prosecution.

Mr. Clarke: Being a fruit grower myself and in touch with a large number of fruit growers, I know some who have many orchards rented, and they tell me they would pay the fine rather than discontinue spraying. I am told the minimum fine is $5.

PROF. CAESAR: One dollar is the minimum and the maximum is $25.

MR. CLARKE: For my part if I wanted to spray when the trees were in bloom I would not consider $1 or $5 or $25 if it was necessary to continue spraying, because I know the application of the spray would add a great deal more than that to the value of my crop. Sometimes weather conditions are very unfavorable before the blossoms come out, and sometimes the machinery will break down. I had that happen to me this year, and I had to send for repairs, and the blossoms were out before I received them and I had to go on with the spraying while the bloom was out. I did not use any poison. I do not think the poison at that time is of any value. I think if the fruit growers would leave out the poison there would be no harm. We use the Bordeaux mixture or lime sulphur. I had the opinion that it was harmful to use the poison spray on the blossoms, and I think we should have it definitely settled whether it is harmful or not. If it is harmful then the fine should be much larger, and we, as beekeepers, should see that it is enforced. If we did that we would get rid of a lot of the work that is going on at the present time. Some men will persist in using it until they are forced to discontinue.

MR. WM. KROUSE: Has a beekeeper any right to go to a farmer's house in order to find out whether he is using poison or not? It is a delicate thing to go on a farm and look into a barrel in which the spray is mixed to find out whether there is any poison in it.

THE CHAIRMAN: I do not know whether the gentleman is here who spoke about the bad results from the spray that was used on the mustard. He asked the question at the first session whether anyone else had disastrous results from spraying mustard? Unless we can educate the farmer in regard to these matters I am afraid we will get into trouble. Our bees go out and get honey from his place, and if we try to dictate to him we will likely get into trouble.

MR. SMITH: I do not think the beekeepers need to worry about poison in the spray. There is only one case that I know where there is any danger. I live in a section where we grow a lot of fruit and a lot of spraying is done. I am a beekeeper and there is only one time of the year that I know of when there is any real danger, and that is when they are spraying grapes for the beetle. That is early in the year when the bees cannot get any honey from the bloom. and when they have very little to work on. I believe that spray does attract them. In my section several beekeepers complained this year and said they met with very heavy losses. Their hives were reduced to such an extent that it took them all season to recruit.

PROF. CAESAR: I heard of that damage that was done when the grape vine was being sprayed. I looked into that matter and I was of the opinion that there was nothing in that. I was told that I was to blame for the using of the sweetened poison. To the best of my knowledge I have never recommended any sweet poison for that beetle. I recommended nothing but Paris green and arsenate of lead. There is nothing to attract the bee in that.

RESOLUTION.

It was moved by Mr. J. L. BYER, and seconded by Mr. J. W. CLARK, that the Provincial Apiarist be requested to conduct a test as to the effect of poisoned baits on bees.

The motion carried unanimously.

Mr. Ross: Don't you think it would be well to raise the question of increasing the fine for violation of the present law in reference to the spraying of fruit trees?

Mr. Byer: In our neighborhood a farmer was spraying and he said that sooner than stop he could afford to pay the fine.

Mr. Ross: Is there any question that great damage is done to the bees when poison spray is used on full apple bloom?

The Chairman: None whatever.

Mr. Ross: If there is no question about the damage why not have the fine so heavy that people will not violate the law?

The Chairman: Where a poison spray is put on full bloom there is no question about its doing harm. Some years ago when I had only a few colonies of bees some boys at the College were sent out to spray with instructions not to spray the trees in full bloom, but they did not carry out their instructions and they sprayed right along, and my colonies went down to practically nothing. Inside of four days you could shovel them up off the ground.

Mr. McIntyre: In my neighborhood there are a number of fair-sized orchards, and in the last two years, when the apple blossoms were in full bloom, I could not walk through my yard without stepping on bees. I knew these men were spraying but I could not tell what they were using. but I always attribute it to the poison used in the spray.

Mr. H. G. Sibbald: I have had plenty of evidence from beekeepers that there is a great loss when the trees are in full bloom. A great many beekeepers know that there is a great loss when the apple trees are sprayed in full bloom. I have heard it said that the fruit men would rather pay the fine than stop the spraying. I am going to move that the minimum fine be increased from $1.00 to $25, and that we ask the Government that the maximum fine be $100, and that a committee be appointed to wait on the members of the Legislature and present that resolution.

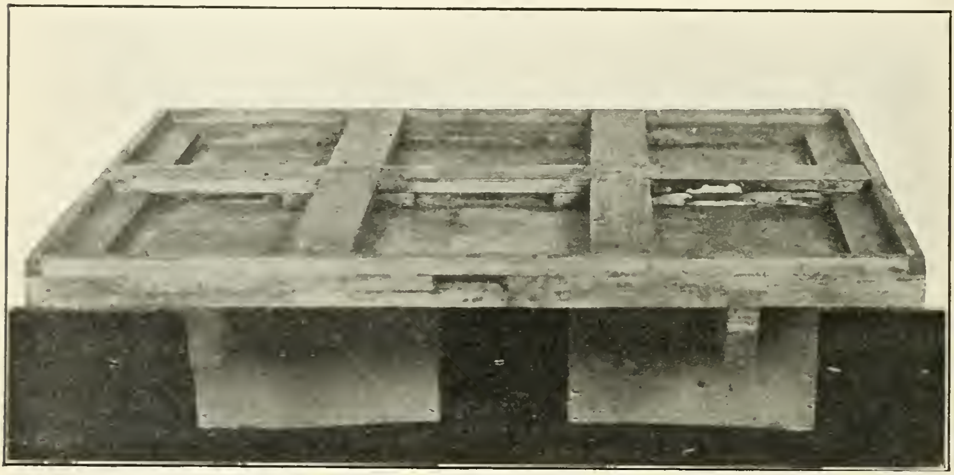
Mr. Ross: I second that motion. For one or two men who will advocate spraying trees in full bloom you will find fifty who will say that it is harmful. Therefore, I have absolutely no hesitation in seconding this motion. I think it is something in the interest of the beekeepers.

Mr. Clarke: Being a member of the Fruit Growers' Association of Ontario I am deeply interested in fruit growing. We know that the bee is our best friend, but there is one thing I would like to have settled before that motion is carried, and that is to have absolute evidence that the poison does injure the bees. We have a number of beekeepers who think it does injure the bees. There are a number of beekeepers who think it does injure the bees. If this fine is increased and there is a law suit, then the fruit growers will get evidence on the other side, and the judge would simply throw the case out. I think we should first settle it by experiments in Ontario that spraying in full bloom is dangerous. I think it would be better to leave this motion for another year until this is definitely settled. I do not think it is necessary to use any poison when the blossom is in full bloom. Unfortunately a great many have the mixture made up with the poison in it and they go on using it after the trees are in full bloom.

Mr. McIntyre: I think if these gentlemen lost $500 every year for a few years they would want that law changed and the minimum fine made $100 and the maximum $1,000. I have had the bees laid out all over the yard. Not the old bees but the young bees. The old bees carry home a load of honey that has been poisoned and they do not die in the hives. They are well enough to turn around and start out for another load, but they never come back. I have had colonies reduced to almost nothing when the spraying has been going on. It gets your strongest colonies. If it comes to a case in court the only thing a beekeeper has got to do is to take a few of the bees to a chemist and he will be soon able to prove his case.

A Member: When the Act was passed was not there sufficient evidence produced to convince the Legislature that it was necessary.

Mr. Sibbald: At the time the Act was passed the Committee of the Legislature summoned a committee from the beekeepers and from the fruit growers, and from the evidence given they came to the conclusion that the law would not do anybody any harm. It would not do the fruit man any harm because he could spray after the blossoms fell off and it would answer the same purpose. The evidence went to show that the bees were poisoned by spraying the blossoms in full bloom. If this question is laid before the Legislature in January Mr. Clarke can ask that the fruit men be heard and we can produce evidence to show that our bees are poisoned by the spray.



Stand used by Mr. Deadman for having extracting combs cleaned by bees of one colony.

Q.—Does Mr. Clarke believe that a good shower of rain in fruit bloom will be a detriment to the blossoms?

Mr. Clarke: It depends on how long it lasts.

A Member: I have always been under the impression that a heavy rain was a detriment to the fruit setting. If the heavy rain is a detriment then a shower of rain must be harmful.

Mr. Clarke: If we get a rain so that the bees cannot work on the blossoms then it is bad.

Mr. Ross: I do not think there is any question about the high mortality among bees from spraying trees when they are in full bloom.

Mr. Clarke: This Act has been in force for a good many years and I have yet to hear of a single conviction.

Mr. Sibbald: A member of this Association had a man convicted; his farm was near Collingwood.

The Chairman: The motion is by Mr. Sibbald, seconded by Mr. Ross, that a deputation be asked to wait on the Minister, that the fine be increased from a minimum of $1 to $25 and a maximum of $100. Carried.

On motion by Mr. SIBBALD, seconded by Mr. MARSHALL, the following committee were appointed to wait on the Minister of Agriculture for the Province of Ontario and urge upon him the increasing of the fine for violation of the Spraying Act: James Armstrong, Mr. J. D. Evans, Mr. H. D. McIntyre. Carried.

DEMONSTRATION WITH SOME APPLIANCES ON EXHIBITION.

G. A. DEADMAN, BRUSSELS.

I am going to speak on two subjects only. The first is "The Best Way to Clean the Combs after They Come from the Extractor." Some beekeepers say to put them away just as they are. We like to clean them.

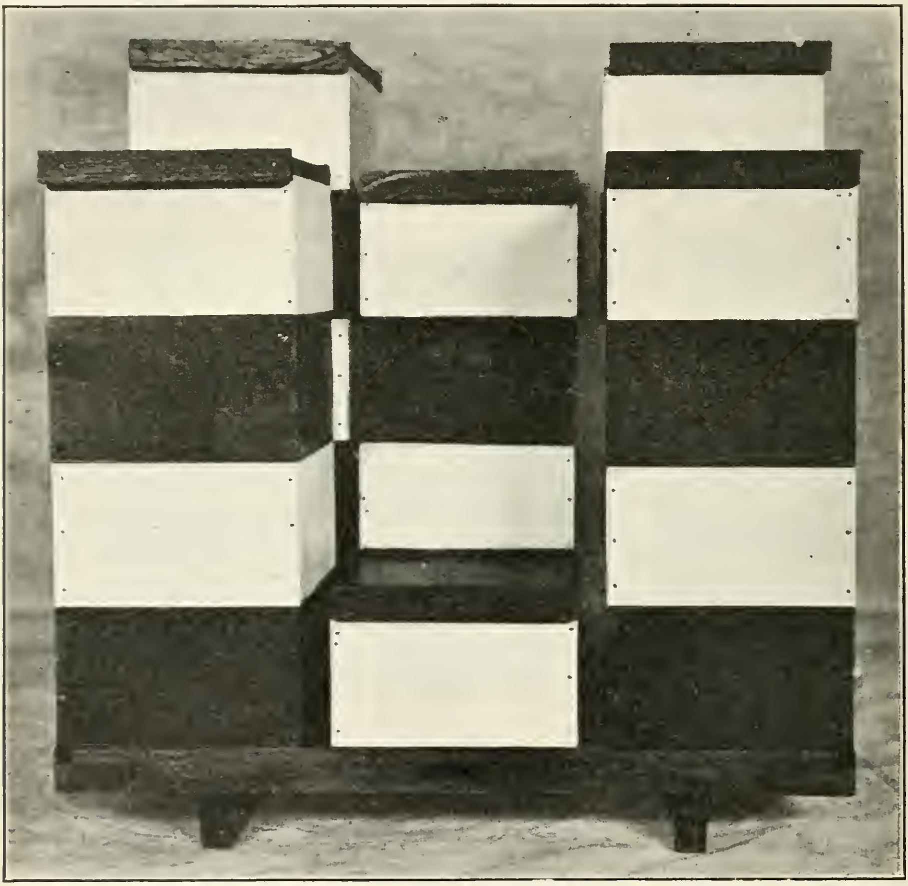
I want to explain how some people have these combs cleaned. There are various ways of doing it.

A hive containing a strong colony of bees is placed in the centre front of the stand or platform. Then five supers (more or less) are placed on each of the four corners, and five more directly behind the hive containing the colony of bees which are to do the cleaning of the comb. The entrance is very small because robbers are inclined to try and get into the hive. We put the supers on five or six high. put as many on as you can. You make this stand out of matched lumber so that the bees cannot get up from below. Take a strong colony that is able to cover a couple of supers and place in the centre. When we first began this we used to have one colony of bees do all the cleaning up.

The only precaution you have to make is to see that the strips are wide enough so that the bees can get into the supers. The bees get underneath and commence at once to clean up, and instead of storing the honey in the individual hive they put it in this one super or two or three. The honey will be first class. You will find some sections completely filled but not capped. If you have some sections that you cannot sell you can make them into first-class sections by a plan like this. You must be careful not to have the entrance too large. If we have a number of combs to clean up we make 8 or 10 of these stands.

MAKING SUGAR SYRUP.

We are all interested in that subject. I presume there are very few beekeepers who do not feed their bees. The best way to make sugar syrup is not by stirring it or heating it. I would not recommend this plan for a beekeeper who is only feeding a few colonies. The way I got to do this first was from making sugar syrup in connection with a drug store. Instead of making it by heating the sugar and water we just simply put it through a percolator. A percolator is very much like a funnel except that it does not come down in the same way. Instead of doing it in the same way that it is done in the drug store, because there it is done on a small scale, we take a 600 lb. barrel. All we use is water and sugar. Before putting the sugar in the barrel we bore a quarter inch hole near the bottom of the barrel. You must protect the sugar from falling into that hole and in order to do that we get strips a couple of inches wide and put them across the barrel so as to keep the sugar from getting to the bottom. Over these strips we put clean sugar bags and we make a kind of an arch so that when the syrup gets down there it will have free access out of this hole. After that is all done we pour in the sugar and then add the water. You speak of under-draining, and say that it works while you sleep. It is the same with this method of making sugar syrup—it works while you sleep. This year we simply took two barrels and we put five bags of sugar in each barrel. You pour on the water slowly at first, but after it is going nicely you put on as much water as is required. Be careful not to put on too much water at once. If there are six inches of water over the sugar it will do no harm for a while, but when it gets down half way in the barrel you must then be careful and keep the sugar covered only, because the water will work down too fast and spoil the work. Keep adding the sugar and see that it is kept level. You have a tin to catch the syrup as it comes out and you must see that it is emptied at intervals and that it does not overflow. In this way we can make up



Stand for cleaning combs. A colony of bees is seen in front centre, supers are stacked on other spaces. Bees from colony get to them from underneath.

800 lbs. of syrup in a day. We begin feeding about five o'clock p.m., and we can feed the 800 lbs. in one day. We fed about 5,000 lbs. of feed this year. You should feed the syrup warm. You should not feed cold syrup. In order to do that you can make some on the stove and that will help to warm up the other, and in that way the work is divided. Syrup made in this way will not granulate, but it is as thick as you require it. I never tested it for its specific gravity, but I know it is just right for the bees.

Q.—Do you use cold water?

A.—Yes, cold water; and it is not necessary to measure it. All you have to do is to pour in the sugar and the water. It will take about one hour from the time you put in the water until the syrup is coming out. You just have one thickness of the burlap under the sugar. You must be careful not to have the syrup run too fast because you will get too much water.

MISS PETTIT: Do you fill the barrel right up at once?

A.—Yes, and we never let it get lower than half way down in the barrel. We keep putting in more sugar and water.

Q.—Do you put the water in at once?

A.—Yes, just as soon as the sugar is in. After the syrup once starts to come it will run a steady stream, and you must be careful to see that it is not running too fast. It takes about 36 or 48 hours for a colony of bees to empty a feeder containing 20 lbs. of feed. This year we had about 150 feeders and we used 1,000 lbs. of feed the first day. It took 75 of these feeders and we had 75 ready for the next day. Some people say that it is a great trial to feed syrup, and that is true if you feed in the ordinary way; but when you use sugar syrup in the way I have described it makes the work very light. For a feeder we use a comb-honey super and we leave the bee space all around. It is just an ordinary box about five inches high and the bottom is covered with paroid and a little strip to keep the paroid on, and we wax around the corner. Of course, you can use boards for the bottom if you like.

Q.—Do you use a float?

A.—We put in some oat straw. That will keep the bees from getting drowned.

WIRE QUEEN-EXCLUDER.

W. J. CRAIG, BRANTFORD.

It is for the purpose of getting your opinion on this queen excluder that I am before you at this time. Most of you are aware of the fact that on account of the war the zinc market is in a peculiar position and it is almost impossible to get zinc. This put us in the position of making enquiry to find out if there was anything else that would be suitable for a queen excluder. This substitute that I now show you has been recommended, but before putting it on the market we want to have the opinion of the beekeeper. We make it the full width of an 8 or 10-frame hive and it is made of ridged steel wire. These reinforcing wires make it perfectly ridged. We would like to have your opinion as practical beekeepers of this excluder.

MR. H. G. SIBBALD: I like the idea of your excluder better than the one that is manufactured of 3 or 4 wires. When we first used the zinc excluder it was not by any means perfect because the air could not pass through freely. I like the openings in your excluder all right. I do not suppose those wires will bend. I would like to ask as to the difference in price.

MR. CRAIG: I have not got the exact cost, but I am under the impression that we can produce this queen excluder for very little more than the price of the zinc excluder at the present time. It is all made of steel wire.

MR. McINTYRE: Could that be made with wood on one side only.

MR. CRAIG: I do not see how it could be. The wood frame serves to bind the wire, and is almost essential to it. It gives the bee space on the one side.

MR. CLARKE: I think these wires will bend in handling unless that excluder is handled very carefully, and if one of those wires was bent slightly the queen would be able to get out. I would suggest an extra bar through the centre.

MR. CRAIG: These wires are reinforced by cross wires as you see.

MR. CLARKE: If there was another cross-bar it would remove all possibility of the queen escaping.

JAS. ARMSTRONG: I have run across a great number of these excluders and I have met all kinds of beekeepers, and I have yet failed to see one of these wires bent or rusted.

MR. CLARKE: I think it is a better excluder than the zinc excluder.

MR. PETTIT: We have had the queen excluder made by the Root people in use at the College for five or six years, and we find it very satisfactory. This excluder appeals to me very strongly, provided it will stand up as well as the other. That is a matter for test. I think the manufacturer should go ahead and make them and send them out to be tested. I would not be afraid to buy some and put them out for actual test in the apiary.

MR. CRAIG: It would be cheaper for us to make them with a wooden slat in between than with the wire.

BEEKEEPING TERMS.

Afterswarm.
Alighting-board.
Artificial swarm.
Beebread.
Bee-culture.
Bee-disease.
Bee-escape.
Beeglue.
Beegum.
Beekeeper.
Beekeeping.
Beehive.
Bee-journal.
Beemoth.
Beespace.
Beesting.
Beeswax.
Beeway.
Bee-yard.
Bottom-board.
Box-hive.
Brace-comb.
Brood-chamber.
Brood-comb.
Brood-nest.
Brood-rearing.
Burr-comb.
Cell-protector.
Cellar-wintering.
Chunk-honey.
Closed-end.
Comb-foundation.
Comb-honey.
Division-board.
Double-walled.
Drone-brood.
Drone-cell.
Drone-comb.
Drone-trap.
Extracted honey.
Extracting-house.
Field-bee.
Five-banded.
Foulbrood.
Foundation-fastener.
Granulated honey.
Hive-stand.
Hive-tool.
Honeybee.
Honey-board.
Honeycomb.
Honeydew.
Honey-extractor.
Honey-house.
Honey-plants.
House-apiary.
Movable-frame hive.
Multiple winter-case.
Nonswarming.
Outapiary.
Outdoor wintering.
Outyard.
Packing-case.
Pickled-brood.
Queenbee.
Queencell.
Queen-excluder.
Queen-rearing.
Queenright.
Queentrap.
Queen-and-drone-trap.
Royal jelly.
Section-folder.
Section-holder.
Self-spacing.
Shade-board.
Shaken swarm.
Shipping-case.
Single-walled.
Slumgum.
Spring dwindling.
Thin-super.
Three-banded.
Travel-stain.
Wax-extractor.
Waxmoth.
Winter-case.
Wire-embedder.
Worker-brood.
Worker-cell.
Worker-comb.

There has been much divergence in the way that compound terms used in beekeeping are spelled, and it seems desirable that a convention as to the spelling of them should be established. The above list is approved by Dr. E. F. Phillips, in charge of Apiculture Investigations for the United States Government, also by Dr. C. C. Miller, the foremost writer on Apiculture in America, Mr. C. P. Dadant, Editor of the "American Bee Journal," Mr. E. R. Root, Editor of "Gleanings in Bee Culture," and myself; and it is suggested that these terms be written as here indicated.

MORLEY PETTIT,
Ontario Provincial Apiarist.

INDEX.

Forty-Sixth Annual Report

OF THE

Entomological Society

OF ONTARIO

1915

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by A. T. WILGRESS, Printer to the King's Most Excellent Majesty
1916

C. Gordon Hewitt, D.Sc., F.R.S.C.
President of the Entomological Society of Ontario, 1913-1915.

To His Honour SIR JOHN STRATHEARN HENDRIE, C.V.O., a Lieutenant-Colonel in the Militia of Canada, etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present, for the consideration of your Honour, the Report of the Entomological Society of Ontario for 1915.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1916.

CONTENTS

FORTY-SIXTH ANNUAL REPORT

OF THE

Entomological Society of Ontario

1915.

To the Honourable James S. Duff, Minister of Agriculture:

SIR,—I have the honour to present herewith the Forty-sixth Annual Report of the Entomological Society of Ontario, containing the proceedings of the Fifty-second Annual Meeting, which was held at Ottawa on November 4th and 5th, 1915. This meeting has been generally recognized as one of the most interesting and successful in the Society's history, and was attended by entomologists from nearly every province of the Dominion as well as from the United States and South Africa.

The reports of the various officers and branches of the Society, together with the papers and addresses presented at the meeting are embodied in the following pages.

The Canadian Entomologist, the Society's monthly journal, has been regularly issued and has now completed its forty-seventh volume. A special feature of this volume is the series of papers on Popular and Practical Entomology, which have appeared in each issue throughout the year.

I have the honour to be, Sir,

Your obedient servant,

EDMUND M. WALKER,

Editor.

Biological Department,
University of Toronto.

Entomological Society of Ontario

OFFICERS FOR 1915-1916

President—MR. ALBERT F. WINN, Westmount, Que.

Vice-President—PROF. LAWSON CAESAR, Dept. of Entomology, Ontario Agricultural College, Guelph.

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Curator—MR. G. J. SPENCER, B.S.A., Demonstrator in Entomology, O. A. College, Guelph.

Librarian—REV. PROF. C. J. S. BETHUNE, M.A., D.C.L., F.R.S.C., Professor of Entomology and Zoology, O. A. College, Guelph.

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Editor of "The Canadian Entomologist"—PROF. E. M. WALKER, Toronto.

Delegate to the Royal Society of Canada—Mr. F. J. A. MORRIS, Peterborough, Ont.

FINANCIAL STATEMENT

For the Year Ending October 31st, 1915

Receipts.		*Expenditures.*	
Balance, 1913-14	$492 32	Cork and pins	$129 99
Dues	85 50	Printing	1,249 01
Subscriptions	439 30	Expense	27 90
Advertising	42 71	Salaries	250 00
Government grant	500 00	Library	77 35
Reports and back numbers	263 01	Annual meeting	86 60
Cork and pins	157 99	Annual report	112 00
Bank interest	9 68	Insurance	26 00
		Bank exchange	7 84
		Balance on hand	23 82
	$1,990 51		$1,990 51

Auditor: J. E. HOWITT.

Respectfully submitted,
A. W. BAKER,
Secretary-Treasurer.

LIST OF MEMBERS

Ontario.

Addy, Paul H. .... Jordan.
Astwood, J. C............ Port Arthur.
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Baker, A. W.............. Guelph.
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Dunlop, James .... Woodstock.
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Snazelle, Chas. .... Thornloe.
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Watson, Dr. A. H. R..... Port Hope.
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Williams, J. B. .... Toronto.
Wood, S. T. .... "
Wright, W. H. .... Guelph.

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Chapais, J. C. .... St. Denis.
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Bentley, Lettice .... Lethbridge.
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Hippesley, Mrs. W. W..... Winnipegosis.
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Baird, W. W............. Nappan.
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Cann, E. Mabel .... Yarmouth N.
Conrad, Ethel M. .... Halifax.
Craig, I. C. .... Amherst.
Creighton, G. .... Halifax.
De Wolfe, L. A........... Truro.
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Distant, Mary S. .... Halifax.
Dustan, A. G. .... Bridgetown.
Gilliatt, F. C. .... Granville Centre.
Good, C. A. .... Truro.
Goodwin, Alberta .... Stewiacke.
Henrion, Miss C. .... Halifax.
Jennison, Mary .... Truro.
Lindsay, Harriet E. ...... "
MacPherson, Dr. Hugh... Antigonish
McGregor, Anna .... South River Lake.

NOVA SCOTIA. *Continued*

McKay, Dr. A. H. ..... Halifax.
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Moses, Agnes ..... Brooklyn.
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Payne, S. H. ..... "
Perrin, Joseph ..... Halifax.
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Shaw, Prof. P. J. ..... "
Shipton, J. W. ..... Moschelle.
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Smith, M. Lois ..... Truro.
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Whitehead, W. E. ..... Kentville.
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Williams, C. M. ..... Nappan.
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Young, M. E. ..... Middleton.

SASKATCHEWAN.

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Hutchinson, H. ..... Starblanket.
Johnson, G. S. ..... Moose Jaw.
McCulloch, A. J. ..... Regina.
Neville, S. J. ..... Cottonwood.
Willing, Prof. T. N. ..... Saskatoon.

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Abriel, T. ..... Nakusp.
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Anderson, J. R. ..... "
Bain, T. H. ..... N. Vancouver
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Blackmore, C. H. ..... Victoria.
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Collins, H. W. ..... Grand Forks.
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Davidson, J. T. ..... Vancouver.
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Evans, H. H. ..... Okanagan Centre.
French, P. E. ..... Salmon Arm.
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Fulton, G. H. ..... Port Haney.
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Hanham, A. W. ..... Duncan's Station.
Hill, Tom ..... Vernon.
Hoy, B. ..... "
Hugh, W. ..... Victoria.
Hunt, E. C. ..... Creator.
Jackson, W. ..... Creston.
Kyte, R. J. ..... Notch Hill.
Leach, D. H. ..... Salmon Arm.
Lyne, W. H. ..... Vancouver.
Matheson, J. B. ..... Kelowna.
McCubbing, C. ..... Salmon Arm.
McKenzie, K. ..... Kelowna.
Middleton, M. ..... Nelson.
Mitchell, D. ..... Tappin.
Palmer, L. L. ..... Vernon.
Palmer, R. M. ..... S. Cowichan.
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Reed, E. Baynes ..... Victoria.
Robertson, W. H. ..... "
Robinson, E. H. .....
Ross, A. H. ..... Nelson.
Rowland, A. ..... Vancouver.
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Russell, D. ..... Lavington.
Russel, M. W. ..... Kelowna.
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Taylor, L. E. ..... Kelowna.
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Treherne, R. C. ..... Agassiz.
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Winslow, R. M. ..... Victoria.
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Cresson, Ezra T. ..... Philadelphia, Pa.
Felt, Dr. E. P. ..... Albany, N.Y.
Howard, Dr. L. O. ..... Washington, D.C.
Webster, Prof. F. M. ..... "
Wickham, Prof. H. F. ..... Iowa City, Ia.

LIFE MEMBERS

Bethune, Rev. C. J. S. ..... Professor of Entomology, Ontario Agricultural College ..... Guelph.
Fyles, Rev. Dr. T. W. ..... Ottawa.
Reed, E. Baynes ..... Director of the Meteorological Station ..... Victoria.

The Entomological Society of Ontario

ANNUAL MEETING

The Fifty-second Annual Meeting of the Entomological Society of Ontario was held at Ottawa on Thursday and Friday, November 4th and 5th, 1915. The President of the Society, Dr. C. Gordon Hewitt, occupied the chair. Among the members present were: Dr. H. T. Fernald, Amherst, Mass.; Mr. A. F. Burgess, Melrose Highlands, Mass.; Professor C. P. Lounsbury, Pretoria, South Africa; Dr. Hugh Glasgow, Geneva, N.Y.; Rev. T. W. Fyles, Ottawa; Dr. C. G. Hewitt and Messrs. Arthur Gibson and J. M. Swaine, Entomological Branch, Ottawa; Messrs. R. C. Treherne, G. E. Sanders, J. D. Tothill, E. H. Strickland, N. Criddle, G. Beaulieu, W. A. Ross, J. R. Gareau, C. E. Petch, R. N. Chrystal, and L. S. McLaine, Field Officers of the Entomological Branch; Prof. L. Caesar, Prof. E. J. Zavitz, and A. W. Baker, of Guelph; Prof. W. Lochhead, E. M. Duporte and T. Rankin, of Macdonald College; Prof. W. H. Brittain, Agricultural College, Truro, N.S.; Tom Wilson, Vancouver, B.C.; F. J. A. Morris, Port Hope, Ont.; A. F. Winn, Montreal; J. C. Chapais, St. Denis-en-bas, Que.; H. G. Payne, Kentville, N.S.; H. G. Crawford, Wilton Grove, Ont.; Rev. Father Leopold and Professor Letourneau, of La Trappe, Que.; Chas. MacNamara, Arnprior, Ont.; and Sir James Grant, Prof. E. E. Prince, Dr. T. Torrance, Dr. C. H. Higgins, Dr. F. T. Shutt, W. T. Macoun, R. H. Campbell, H. T. Gussow, W. Ide, D. Johnson, F. W. L. Sladen, V. Kitto, A. E. Kellett and J. I. Beaulne, Ottawa.

THURSDAY, NOVEMBER 4TH—MORNING SESSION.

The President: In opening our general session, I should like to welcome you all to Ottawa. This is an unusual meeting for a number of reasons. It is not the first meeting we have had in Ottawa—but it is an unusual meeting in that we have here for the first time all the officers of the Entomological Branch. Secondly, it is an unusual meeting as we have with us, and are honored by the presence of, Mr. C. P. Lounsbury, the Government Entomologist for the Union of South Africa. The surpreme nature of his visit prevented the appearance of his name on the programme, but that will not release him from taking part in our deliberations. He will probably have something to say later on. I, as President, did not prepare anything in the nature of an address for this meeting as we have a rather long programme. In the course of the proceedings I shall probably have a little to say regarding the progress of our work and of entomology in Canada generally. We have a certain amount of business to complete before our real session begins and I will now call upon the Secretary to read the Report of the Council.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for the year 1914-15.

The Fifty-first Annual Meeting of the Society was held in Toronto on Thursday and Friday, November 5th and 6th, 1914. The meeting of the Council was held in the Biological Building of the University of Toronto, and the general meetings were held at the Royal Canadian Institute. The President, Dr. C. Gordon Hewitt, occupied the chair during the sessions.

The annual meeting of the Council was held on Thursday morning. Numerous business matters were discussed and a recommendation was made to the Society that the next annual meeting be held in Ottawa.

On Thursday afternoon the Reports of the Directors on the insects of the year were read. Dr. Hewitt then delivered the Presidential address on "The Rise and Progress of Applied Entomology in Canada." Prof. Caesar then delivered a paper on the "Insects of the Season in Ontario."

On Thursday evening in the Biological Lecture-room of the University Prof. J. H. Comstock, of Cornell University, delivered the Public Lecture on the "Habits of Spiders." The lecture was extremely interesting and was extensively illustrated with magnificent lantern slides.

The business meeting of the Society was held on Friday morning at 9.30. The reports of the various officers and branches of the Society were read and adopted. The remaining time of the morning and afternoon meetings was occupied with the reading of the following papers:

"The Work of Fabre," Prof. Lochhead, Macdonald College, Que.

"Injurious Insects of Quebec in 1914," Prof. Lochhead. (Read by title.)

"Injurious Insects of Southern Quebec," Mr. C. E. Petch, Ottawa. (Read by title.)

"Outbreak of the Army-worm in Canada in 1914," Mr. Arthur Gibson, Ottawa.

"The Army-worm in Ontario in 1914," Mr. A. W. Baker, Guelph.

"Mountains and Hills," Dr. Fyles, Ottawa.

"Variation in colour in the bristles of the Hedgehog Caterpillar, Isia isabella," Mr. Arthur Gibson, Ottawa.

"Locust Control in Eastern Canada," Mr. Arthur Gibson, Ottawa.

"An Imported Red Spider attacking fruit-trees," Prof. Caesar, Guelph.

"The Entomological Record, 1914," Mr. Arthur Gibson, Ottawa.

"Forest and Shade-tree Insects of the Farm," Mr. J. M. Swaine, Ottawa.

"Cherry Fruit-flies," Prof. L. Caesar, Guelph.

The Canadian Entomologist, the official organ of the Society, has been published regularly each month. The forty-sixth volume of the magazine was completed in December, 1914. It consisted of 446 pages and was extensively illustrated. This is the largest volume to date.

The Annual Report of the Society contained the proceedings of the annual meeting and formed a valuable edition to our entomological literature.

The regular meetings of the Society were reduced in number owing to military activities at the Ontario Agricultural College. The meetings were chiefly of a business character, but during the year the following papers were read:

"Some interesting points in the Army-worm Outbreak of 1914," Mr. A. W. Baker.

"The Study of Entomology," Prof. L. Caesar.

"Laboratory Methods in Collecting, Preserving and Dissecting Insects," Mr. G. J. Spencer.

The records show that twenty-four new members have been added to the rolls of the Society during 1914-15. The reports of the branches of the Society for 1913-14 all showed a successful year. It is with much pleasure that the Council records the formation, due largely to the efforts of Prof. W. H. Brittain, of a large and flourishing branch of the Society in Nova Scotia.

REPORT OF THE CURATOR.

The collections of the Society have been examined from time to time during the past year and kept free from museum pests.

With a view to supplying in a small way the sad need of Diptera, Hemiptera and Hymenoptera, special collections were made this summer and, as soon as the material can be identified and labelled, it will be added to the collections.

Contributions of these orders to the Society collections from members will be greatly appreciated.

G. Spencer, *Curator.*

REPORT OF THE LIBRARIAN.

During the year ending October 31st, 1915, seventeen bound volumes have been added to the library, making the number on the register 2,220. A large number of unbound pamphlets, bulletins, reports and periodicals have been received from authors and publishers and in exchange for *The Canadian Entomologist.* No binding has been done during the past year.

Among recent additions to the library may be mentioned the following: Packard's "Monograph of the Bombycine Moths of North America, Part 3"; Sir G. Hampson's "Catalogue of the Lepidoptera Phalænæ in the British Museum," Vol. 13 and supplementary vol. 1; Fletcher's "Some Indian Insects"; Slingerland and Crosby's "Manual of Fruit Insects"; Pierce's "Genitalia of British Geometridæ."

Reference to the library is constantly being made by the staff and students of the Biological Departments of the Ontario Agricultural College, and books are from time to time taken out by members of the Society at a distance.

Respectfully submitted,

Charles J. S. Bethune, *Librarian.*

REPORTS ON INSECTS OF THE YEAR.

Division No 1, Ottawa District—Arthur Gibson, Entomological Branch, Ottawa.

Attacking Field Crops.

Locusts. These insects were again very abundant in eastern Ontario. The young locusts began to appear towards the end of May, but owing to dull, cool weather conditions did not become active until the first and second weeks of June. The Lesser Migratory Locust (*Melanoplus atlanis*) was the chief destructive species. It was accompanied in noticeable numbers by the Pellucid Locust (*Camnula pellucida*). These two species are frequently found working together. Near Bowesville, Ont., where we continued our work on control with poisoned baits, the insects were present in countless thousands. The crops attacked were chiefly oats, barley, timothy, buckwheat, clover, tobacco, potatoes, and corn. In one instance near Ottawa about 6,000 celery plants were destroyed. On page 156 will be found a brief account of our 1915 work with poisoned baits.

CUTWORMS. The two species which in 1915 effected most damage in the Ottawa district are the Common Striped Cutworm (*Euxoa tessellata*), and the Dark-sided Cutworm (*Euxoa messoria*), both of which were very abundant the previous season. Vegetable and flowering garden plants were freely attacked. The former was the chief culprit and destroyed first sowings of beets, carrots, onions, etc. To a lesser extent the Red-backed Cutworm (*Euxoa ochrogaster*) was also present, being reported specially by vegetable growers. The Kansas grasshopper formula (Bran 20 lbs., Paris green 1 lb., molasses 2 quarts, oranges or lemons 3, water 2½ gallons*) this year gave excellent results at Ottawa for the control of cutworms. In one large field of onions the outbreak was stopped immediately. When scattered thinly the 20 lbs. may be used to treat about 3 acres, the application to be made after sundown. In one field of corn cutworms were plentiful and an application of the above mixture was made. Further injury was thus prevented and an examination made around 40 hills by Mr. Bryce, of Macdonald College, resulting in the finding of from 1 to 6 dead cutworms near each hill.

ROOT MAGGOTS. The three species, viz., THE CABBAGE MAGGOT (*Phorbia brassicæ*), the IMPORTED ONION MAGGOT (*Hylemyia antiqua*), and the SEED-CORN MAGGOT (*Phorbia fusciceps*), were all present in the Ottawa district in 1915, the two former causing much loss. The latter was reported attacking beans in small gardens. The Cabbage Maggot was particularly destructive to cauliflowers, cabbages, turnips and radishes. One market gardener near Ottawa reported the loss of 3,500 early cauliflowers. In continuing our work on the control of this insect we again demonstrated the value of the one-ply tarred felt paper disc. In one experiment about 1,600 plants had the discs placed around their stems and practically the whole crop was protected from maggot attack. The control of these root maggots is discussed in full in a bulletin which we have just prepared and which we hope will be available for distribution in the spring of 1916.

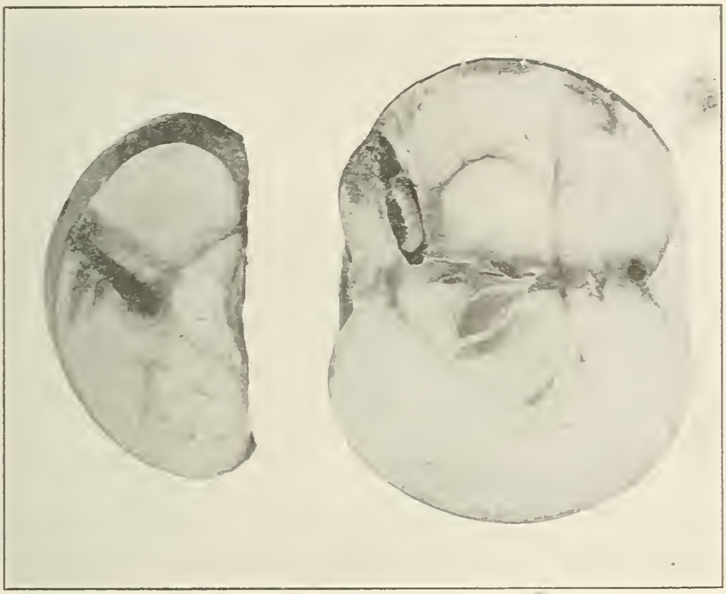
THE ASPARAGUS BEETLES. In September 1906, we found at Ottawa the larvæ of the COMMON ASPARAGUS BEETLE (*Crioceris asparagi* L.). Until 1915, this was the only record we had for the district. During the past season, however, the insect was abundant and destructive, and it was accompanied by the TWELVE-SPOTTED ASPARAGUS BEETLE (*Crioceris 12-punctata* L.). The year 1915 is the first in which we have found this latter species at Ottawa. The adult beetles were commonly found in the latter half of August. The larvæ of the latter species were collected from the seeds of asparagus on September 23rd. Growers of asparagus in the Ottawa district should watch for the appearance of these beetles in spring and apply the well known remedies.

THE ASH-GRAY BLISTER BEETLE (*Macrobasis unicolor* Kirby). Large numbers of this insect were observed in eastern Canada, near Ottawa, and also in parts of Quebec Province, where locusts had been destructive. In one field of potatoes which I examined in the latter half of June the beetle was present in thousands and the vines were conspicuously defoliated. At Bowesville, near Ottawa, Mr. T. Rankin found the insect abundant in early July. In addition to potatoes this blister beetle attacks beans, peas, beets, tomato, clover, etc.

*In preparing the bran mash the bran and Paris green are mixed thoroughly while dry. The juice of the oranges or lemons is squeezed into the water, and to this is also added the pulp and peel after cutting into fine bits. The molasses should then be added, and when dissolved the mixture should be poured on to the dry bran and poison, stirring the whole constantly so as to dampen the bran thoroughly.

THE RED-HEADED FLEA BEETLE (*Systena frontalis*). In the middle of August this common black flea-beetle was seen at Ottawa to be attacking potatoes, and in flower gardens asters and chrysanthemums were injured. It was also found on carrot. It may be easily recognized by the conspicuous red patch on the top of the head; in length it is about three-sixteenths of an inch. Potato vines which are properly sprayed to protect them from the Colorado Potato Beetle would, of course, also be protected from the ravages of the Red-headed Flea Beetle.

PEA APHIS (*Macrosiphum pisi*). In eastern Ontario a rather serious outbreak of the pea aphis occurred, and from a few places reports of injury by the CARROT RUST FLY (*Psila rosæ*) were received.



Illustrating larva of Dock Sawfly, *Ametastegia glabrata* (*Taxonus nigrisoma*) and its habit of boring into apples in autumn in which to hibernate. (Original.)

ATTACKING FRUIT TREES.

APHIDES. These insects were present in large numbers during the season, many enquiries being received particularly with regard to the species occurring on plum and apple.

THE OYSTER-SHELL SCALE (*Lepidosaphes ulmi* L.) was frequently reported, but few instances of noticeable damage by the Codling Moth (*Cydia pomonella*), came to my notice.

THE DOCK SAWFLY (*Ametastegia glabrata* Fallen). During 1915 this insect, which in Canadian literature was previously known as *Taxonus nigrisoma* Nort., was abundant throughout eastern Canada, and its well-known habit of boring into apples in autumn was complained of. The same injury was noticed at Ottawa. In 1902, Fletcher* first recorded such injury to apples in Ontario, which was also in that year observed at Ottawa. The larva, which is known as the Dock False-worm, usually feeds on plants of the Dock family. Its habit of boring

*33rd Annual Report of the Ent. Soc. of Ontario.

into the soft flesh of apples in autumn to hibernate is shown in figure 1. In one apple examined in September last two larvæ were found. The holes where the larvæ had entered were conspicuous. Several apples were examined and, in one, three holes occurred close together. An examination of these indicated that the larva evidently has the habit of boring several holes before finally closing one up in which to pass the winter. In one case the cavity in the apple was five-eighths of an inch long by one-eighth of an inch wide. The end was closed up with the "chewings" made by the larva, no frass being present. In another instance the larva had entered to a distance of nine-sixteenths of an inch and in still another eleven-sixteenths of an inch. In every case the head of the larva was towards the skin or outside of the apple. The larva was one-half inch in length, dark green in colour, the sides and centre whitish green; head pale brown, darker brown at vertex, on either side a conspicuous dark brown spot. In the December, 1915, number of the Proceedings of the Entomological Society of Washington, Rohwer places the name we knew the insect by, viz., *Taxonus nigrisoma* Nort., as a synonym of the European species, *Ametastegia glabrata* (Fallen).

Greenhouse and Garden Plants.

Garden plants of many kinds suffered seriously from the attacks of plant lice, and in early spring newly set out annuals were cut off by cutworms, the Striped Cutworm being the most destructive of the species which occurred in 1915.

The Four-lined Leaf Bug (*Pœcilocapsus lineatus* Fab.) was abundant in the district, attacking freely such garden plants as asters, dahlias, etc.

The Red-headed Flea Beetle (*Systena frontalis*). As already mentioned, this common flea-beetle was found this year in August attacking asters and chrysanthemums.

The most interesting greenhouse insect of the year at Ottawa was the occurrence of the Chrysanthemum Midge, (*Diarthronomyia hypogæa* H.Lw.) in one of the large houses. This insect had doubtless been recently introduced with the plants from the United States, where it has become recently established. The Ottawa occurrence is the only record we have of the midge in Canada. Dr. Felt,* the New York State Entomologist, in writing of the species in April, 1915, recommends the destruction of badly infested plants by burning. Where the leaves only show slight infestation many of these may be removed. Fumigation with hydrocyanic acid gas would, of course, destroy the midges but would have little or no effect on the larvæ, which work within the leaf tissues.

Division No. 3, Toronto District—A. Cosens.

So far as the writer is concerned, the Entomological season of 1915 opened April 7th with a trip to the Etobicoke, a small stream that enters Lake Ontario a few miles west of the city. The banks of this creek are still wooded in many places, and even yet the Indian significance of the name, "the place of the Alder," is peculiarly applicable. The locality was choice, but a delightfully warm sun and the lethargy incident to the first tramp of the year made energetic collecting almost an impossibility. This and the early date serve as an explanation of the confession that the only insects captured were specimens of *Aphodius femoralis* Say., many of which were on the wing.

The excessive rainfall and the low average temperature of the past summer do not appear to have reduced materially the production of the various forms

*Jour. Econ. Ent., Vol. 8, 267.

of insect life. Some orders were relatively poorly represented in the early part of the season, but later on became normally abundant. With the exception of the Cabbage-butterfly, other species were not so common as usual, until about the end of August, when several forms began to appear in larger numbers. At Mt. Dennis, Oct. 11th, many specimens of Milbert's Tortoise-shell, *Vanessa milberti* Godart, were flitting about or resting upon the heads of the large purple aster, the flower and insect combination adding a pleasing touch of color to the otherwise rather sombre tints of the frost-touched vegetation. After about the middle of July the Baltimore, *Melitaea phaeton* Drury, was fairly plentiful. As a general rule, both of these species are comparatively rare in this district.

The damage done this year by several injurious insects has been more pronounced than usual.

At the beginning of the season, the webs of the Tent caterpillars were frequently seen on the Choke Cherries and other native trees of the fence rows and thickets in the vicinity of the city. From complaints received from fruit growers, it would seem that this pest has lost none of its wonted energy, and is still an important issue from an economic standpoint.

The continuous wet weather is credited by many with the greatly increased activity of the Carrot Rust Fly, *Psila rosae*. A gardener of many years' experience, who had never noticed the pest before, had his crop completely ruined by its ravages. In some cases the larvae had so tunnelled the carrot that the entire cortex was destroyed; it was impossible to find a single plant that was not attacked. For the benefit of others who may have crops similarly affected, I take the liberty of quoting the directions, kindly sent by Mr. Gibson, for bringing the insect under control. "Protection against the attack of the insect may be obtained, early in the season, at the time the plants are thinned out, by spraying with the ordinary kerosene emulsion, diluted one part in nine of water. Where carrots are stored in sand for winter use, the larvae leave the roots and pupate in the soil. In spring, of course, such sand in which the puparia occur should be removed and buried in a deep hole or thrown into a pond. It is wise to use land next year in which the carrots were not grown during the present season."

Sawfly larvæ were received from Mr. Blakely, of the Parks Department, who reported that they were damaging the California poplars in the eastern part of the city. Several trees were attacked by them, and the leaves badly eaten. These larvæ have a ground colour of yellow, broken by two pairs of lateral rows of black spots. In the upper series, these are irregularly circular in outline; in the lower, while of nearly the same shape, they are much smaller. The vertex of the head is black, shading to a deep brown at the front and sides. All the mouth-parts are yellow, with the exception of the mandibles, which are black. A black spot covers the dorsal portion of the last segment. The whole body bears a covering of long light-yellow hairs. The larvæ are gregarious feeders. Mr. S. A. Rohwer, Washington, to whom specimens were sent, writing under date of Sept. 27th, replied as follows:

"Yours of the 25th instant reached me this morning. The sawfly larvæ that you sent cocooned en route, but I do not doubt in the least that it is *Trichiocampus viminalis* (Fallen), a species that is treated under the name of *Aulacomerus lutescens* by Lintner in the fourth report of the State Entomologist of New York, pages 44-46. As far as I am aware, this is the first report of this species being of economic importance. The larvæ cocoon in the leaves, or the cocoon is attached along the trunk of the tree. Lintner found two generations, and this is probably the last. The best control measures to be adopted would be the raking up and burning of the leaves."

The Lesser Bud-moth, *Recurvaria nanella*. Larvæ of this Europeon species were found in numbers at Toronto, on a pear tree; and an apple tree in an adjoining lot had all the leaves rolled up by the larvæ. The species was determined by Mr. August Busck. The insect is discussed at length in Bull. 113 of the United States Department of Agriculture.

A large percentage of the grasshoppers, examined during September, were found to be parasitized by "hair snakes" of either the genus *Gordius* or *Mermis*, the latter being more numerous. The Red-legged Grasshopper, *Melanoplus femur-rubrum* De G., was the favorite host in this district. It would seem a reasonable conjecture that the wet season has had, in this case, a deterring effect on the production of the grasshoppers by furnishing more suitable conditions for the development of this parasite, but the dexterity with which the infected specimens evaded a net has given me grave cause to doubt the efficiency of this check. At least it seemed impossible to distinguish parasitized from unparasitized forms by any lessened activity on the part of the former.

Throughout July, the unusually wet weather must have produced ideal conditions for the maturing of aphids, as these insects were forced upon the attention at all times. Many different species of plants were infested, the spiraeas and roses of the city gardens were often seriously injured by them, and even the burdocks and lamb's quarters, of the vacant lots, were not immume from their attacks. Masses of a small black species surrounded the stems and leaf petioles of the common nasturtium, in many cases killing the smaller plants. Another variety established colonies on the flower clusters of the honeysuckles, and destroyed the majority of the unopened buds. Especially in the case of infected roses, a number of different remedies were applied. Some growers apparently had implicit faith in the effectiveness of an "absent" treatment, and did nothing at all, to the detriment of their own and their neighbor's plants. Others were firmly convinced that spraying with cold water was all that was necessary, while a few substituted a solution of nicotine. This last method appeared to give universal satisfaction wherever it had been properly tried. One gardener did, however, assure me that his bushes had developed a particularly hardy variety of aphid that refused to succumb even to the nicotine application.

A very interesting root gall was collected early in the spring by Prof. J. H. Faull, University of Toronto. The galls, which are produced on the roots of the False Solomon's Seal, *Maianthemum canadense*, Desf., consist of elongated swellings, from 8-12 mm. in length, and 2-3 mm. in diameter. They are circular in cross-section, and fairly regular in shape, tapering gradually at each end to the size of the normal rootlet. As the specimens were immature when secured, it was necessary to keep them under moist conditions for several weeks. This may account for the fact that only four producers were secured from a dozen galls. The insects were sent to Dr. E. P. Felt, Albany, N. Y., who has pronounced them a new species, and is describing them under the name *Dasyneura torontoensis*. The only information that we possess, concerning the life histories of the adults, is that they emerge late in June. The light color of the insects would seem to indicate that the greater part of their existence is spent underground.

DIVISION NO. 5, PORT HOPE DISTRICT—FRANCIS J. A. MORRIS.

An active collector of Lepidoptera in Port Hope, Mr. H. L. Bowers, has now moved to Oshawa and reports an unprofitable season's work due to bad weather and unfamiliarity with his surroundings. He writes:

I collected pretty steadily until June 15th, but took few specimens, Oshawa being a poorer hunting ground than Port Hope. Extreme wet seemed to keep insect pests in the background. "*Pieris rapae,*" owing to spread of wild mustard, seems on the increase; in September the fields were white with them; milkweed butterflies were more numerous than last year; other butterflies were scarce; such scarcity has been remarkable the last two or three seasons. During 1912 I could have taken hundreds of *Vanessa J-album,* but have seen few since. Tent caterpillars, both American and forest, were more numerous this year than last. Many orchards around Oshawa were completely defoliated. I was interested to see how much these were parasitized, and out of 100 cocoons, I did not find one thus suffering. Pistol case-bearer of the apple was very plentiful. I noticed many apple trees badly infested with aphids. The tendency to allow wild apple, cherry and plum to grow unchecked has a great tendency to render means taken by progressive orchard-men to keep down insect pests, largely abortive. Practically all of the wild apple trees that I have seen around Oshawa have been heavily infested with the Oyster-shell scale. In September, I saw many cherry trees near Newtonville badly eaten by pear-tree slug (*Selandria cerasi*). The caterpillars of certain species of *Crambus* were very numerous in meadows. I noticed the maple trees in Oshawa badly infested with Pigeon Horn Tail, which oviposited continuously from August 3rd to September 15th; *Thalessa lunator* was also plentiful. Hemlocks on the main street were badly infested with *Tortrix funiferana.* Some horse-chestnuts were badly eaten by tussock caterpillars. The Promethea moth, found very scarce at Port Hope (one cocoon in six years), seems plentiful here. I took *Phigalia titea,* April 13th; *Orthofidonia vestaliata* were plentiful for several weeks; *Drepana arcuata,* May 30th; *Sphinx cerisyi,* June 13th; *Thecla liparops,* July 18th. I have identified some of the captures made last year, and the following is a list of those made at Port Hope, which have some interest. I believe they are all fairly scarce:—

Sphinx cerisyi.
Diphthera fallax.
Hyperaeschra georgica.
Fentonia marthesia.
Galgula hepara.
Catocala innubens.
Catocala vidua.
Raphia pater.
Semiophora opacifrons.
Semiophora tenebrifera.
Hydriomena ruberata (birivata?).
Thecla edwardsii.

Dr. Watson of Port Hope reports the cutworm locally troublesome on cabbage and cauliflower.

Mr. Duncan, of the Department of Agriculture in Port Hope, says the Potato Beetle was very prevalent and that he noticed in several places the Friendly Perillus at work destroying the larvæ. Aphids were not so abundant. He was called to look at an apple orchard near Orono that was overrun by Tent caterpillars. It was ten or twelve acres in extent, and most of the trees were denuded of foliage and bore no fruit, except in the one corner that he was able to save by spraying with arsenate of lead. Some idea of the numbers of these creatures could be gathered from a sack that he saw slung over a branch in the orchard: *ex pede Herculem*—in the folds of the sack he counted over fifty cocoons. His recollection is that both species of caterpillar were equally numerous. The orchard was a well-kept one and had not been attacked in 1914. This, again, points in the same direction as Mr. Bowers' note. There were doubtless rich breeding grounds along some nearby fences the year before, or even that same season, but the larvæ ran out of food and like many another young innocent crept into the apple orchard. The canker worm was also prevalent in the orchard.

The school collections of insects, Mr. Duncan says, were up to average and a few collections were extensive and well arranged. In the Peterborough Collegiate 30 or 40 of these come in annually and I often find specimens of great interest among them. This year the families of American Silk-worm moths and of Sphingidæ were remarkably well represented. Among the latter was a very beautiful specimen of the Nessus (*Amphion nessus*).

For the amateur collector the summer of 1915 was far from favourable. The bright days of May and June were nearly all marred by cold winds. This kept the sun-loving species inactive, and made your director's favourite field of collecting comparatively barren. This feature was specially noticeable in the second week of June and again after a spell of wet weather at the end of June. The early mornings were bright and promised well, but by noon quite a chill wind from the east had sprung up and the results of several all-day tramps were on the whole disappointing. In two years' residence in Peterborough it has been impossible for me to collect through the month of July, owing to work in Toronto. Next season this work will probably not be incumbent, and I have great hopes of watching more closely the insect visitors to blossoms during June and July in my new neighborhood. So far my observations have been chiefly confined to bark, sap, fungus and foliage.

Very early in May the tent caterpillars again made their appearance about Peterborough in large numbers. The city authorities set apart a small sum of money and had some men go round the residential streets within the limits, cutting off infected limbs and destroying some of the apple trees and wild plums on waste grounds and in hedges where the pest abounded. This work seemed fairly effective in saving shade trees about the city, but it did not strike at the root of the evil as Mr. Bowers points out. I had the curiosity one day to count the webs (very populous webs) beyond the limits on a stretch of lane about equal in length to two blocks of city street. They numbered over 100; choke-cherry, pin-cherry, wild plum, apple, and hawthorn, all affording food and shelter to myriads of both the forest and the apple tent caterpillar.

Early in May I paid a visit to the alder swamp between Peterborough and Best's where the varieties of Chrysomela reported last season had been found. These were all present once more, the differences from normal being apparently quite constant. In the middle of May where some cedar groves had been chopped down, I took several specimens of *Callidium aereum* on a cedar trunk. At the end of May I captured some interesting beetles in hawthorn blossom; these included *Cyrtophorus verrucosus, Molorchus bimaculatus, Callimoxys sanguinolentus, Acmæops proteus, Leptura capitata,* and *L. sex-maculata; Orsodachna atra;* and *Malachius æneus.* This last was new to me, though a single specimen was taken near Port Hope this year by Dr. Watson. It is very abundant in the neighborhood of Peterborough. The collection made by pupils at our collegiate, I notice, are rarely without it. Last season I saw fifteen or twenty at the end of June on the blossoming heads of meadow grass; and this season I captured over a hundred from a single hawthorn on Aylmer Street without apparently reducing the number of guests at the banquet. This beetle is interesting to the systematist. It is described by Le Conte and Horn as introduced from the West coast and is, moreover, *sui generis* in Eastern America. The family occupies a space between the Lampyridæ and the Cleridæ. I think the only other member of the family known to me is a *Collops,* a very pretty little beetle (also frequenting blossoms) that I have captured occasionally—once at Guelph, when I was out with Mr. Caesar.

In the first week of June at Jubilee Point on the north shore of Rice Lake I captured two specimens of an Agrilus, steel-blue, with white marginal marks on the metasternum and abdomen, feeding on hazel leaves; and on Spook Island where I paddled over in the hopes of locating a colony of *Chrysomela scalaris*, var. *pnirsa*, I discovered nearly all the foliage on the island fretted into holes by millions of *Brachys ovata* on oak, *ærosa* on basswood and grapevine. About the middle of the month I spent a day at Hastings, and saw for the first time immense numbers of the larvæ of the Jumping Sumach beetle (*Blepharida rhois*); they were feeding on the fragrant or Canada Sumach. This shrub I have seen in three places only, on the north shore of the upper Rideau, in August, where the imago of this beetle was abundant; on the cliffs below the Whirlpool Rapids, Niagara, where no trace of either larva or imago could be seen; and here at last, June, 1915, where hibernated imagoes were occasional and larvæ in great abundance. The larva is one of the most disgusting sights in the insect world. It is covered with what appears to be liquid excrementitious matter. This is smeared so thickly over its surface as to give it a deformed lumpy appearance. The insect glistens with this slime much as the larva of the saw-fly, known as the Pear-tree Slug. Though the sumach grows, a low and upright shrub, in open pastures, and the insect feeds in broad daylight, exposed on the upper surface of the leaves, yet the fiercest rays of noontide sun seem to have no effect on its slimy coat; it neither evaporates nor cakes. Without imputing a fairly high aesthetic sense to insectivorous birds, we must suppose this creature to be just about as savoury a morsel as it looks; the soft, helpless, sluggish infant of a larva is just as immune as the hard-shelled, leaping and flying beetle.

On June 13th I captured a newly emerged specimen of the Elder-borer, *Desmocerus palliatus*, south-east of Peterborough. This is the earliest record I have made for the insect in our latitude; they became abundant in the last week of June. About the 10th of July I captured six in Niagara Glen and as late as the first week of August one in the neighborhood of Owen Sound. About the middle of June in some felled and decayed elms lying on the edge of a poplar swamp I found breeding several specimens of *Physocnemum brevilineum*. These were settling in the sunshine on the prostrate trunks, or sheltering from the east wind in crevices and under loose flakes of bark. It was there and then that I found the first specimen of the Elm Saperda (*Saperda tridentata*) I have ever taken on its food tree. As the net result of two visits to this collecting ground I will list the more interesting captures made:

Physocnemum brevilineum (elm)	25
Saperda tridentata (elm)	14
***Tetropium cinnamopterum* (white pine)	1
***Hoplosia nubila* (basswood)	1
Callidium antennatum (cedar)	1
Pachyta monticola (thimble-berry blossom)	6
Leptura proxima (thimble-berry blossom)	2
***L. chrysocoma* (thimble-berry blossom)	1
L. 6-maculata (thimble-berry blossom)	1
Rhagium lineatum (hemlock trunk)	1
Clerus thoracicus var. *rufiventris*	19
(wood piles)	abundant
Melanophila fulvoguttata (newly felled hemlock)	abundant
Anthaxia æneogaster (fleabane blossoms in hemlock swamp)	abundant
Xenorhipis brendeli (basswood stumps)	abundant

Besides these, seven or eight other species of Leptura were noted and ten other genera of cerambycid. In the latter part of June, larvæ, pupæ, and imagines of the very handsome Ladybird (*Anatis 15-punctata*) were found in great numbers on leaves of elder, ash, butternut, basswood and maple. About one-fifth of these were of the normal form, the rest were of the variety *mali*, in which the elytral spots are "eyed" with a narrow halo paler than the ground color. This mention of varieties recalls a point of interest in connection with an insect taken in 1914, but not identified by me till after our last meeting. The insect is the Staphylinid *Oxyporus*, but as my report is a long one I will omit the note, as I have done with similar notes on *Hoplosia nubila* and *Pogonochœrus mixtus*. The note is mainly of systematic interest.

At the end of June I went down to Port Hope a few days before reporting for duty in Toronto. While there I visited a hardwood four miles north of the town, where axe and saw had been busy in the winter. Again I will save space by listing the more interesting captures made:

Neoclytus erythrocephalus (dead twigs of hawthorn and maple)	3
Arrhopalus fulminans (under bark, stump of butternut)	1
**Calloides nobilis* (under chip of oak)	1
**Centrodera decolorata* (maple stump)	1
Elaphidion villosum (oak stump)	1
**Pogonochœrus mixtus* (pine trunk)	1
**Goes oculatus* (willow foliage)	1

The last beetle in this list was captured on the old home farm of Mr. John Hume. There is a swamp here just below a high ridge of land to the north, and where the willows are thick two streams flow out from the swamp, one about the size of a field drain, the other rather larger; the smaller flows south-east, the larger south-west. In the willows here I noticed a number of wasps flying to the stems. The stems proved to be covered with recent bore-holes, from which was exuding dark pulp. It was evidently the pungent smell of fermenting sap that had brought the wasps, and while I was investigating, several butterflies hovered or settled about the bores and two beetles (*Gaurotes cyanipennis*) were taken feeding at them. Presently I discovered a pair of weevils, with a large white patch near the apex of the elytra, resting on a stem a foot or two above the bores. It was *Cryptorhyncus lapathi* (as I have since learned from Mr. Caesar). I was unable to see any insect emerge from the tunnels, nor did I notice any ovipositing. Soon after, Dr. Watson came out with me and we captured over 20 of these curculios. Next day I had to go to Toronto as an associate examiner. This was about the 3rd of July. Dr. Watson visited the place about four times in the next five weeks and never failed to find several of these creatures on the willow. At Thanksgiving I visited the same place and also followed the larger stream for half a mile south-west. No insects were to be found on the trees, and though I took some infested stems home with me, I could find no trace of eggs. There were several larvæ, but I could not identify them for certain. One looked like the larva of *Saperda concolor*. The willow worst-bored appeared to be *Salix discolor*. Trees of *Salix nigra* seemed immune and also those of a species I could not identify—the leaves broad and not very long, rugose with veins on the upper side and downy beneath. The foliage was partly shrivelled in October and there seems to be much intergrading among the willows, which makes identification unsatisfactory except in the blossoming season. The boring was worst at the base and seldom extended further up than eight or nine feet. Stems less than 2½ inches in diameter were seldom, if ever, touched. Those of 5 inches in diameter seemed the favorite resort, and occasionally stems eight and nine inches in diameter were badly bored, but not trees of greater thickness than this. The damage was observed over more than a mile of country between south and north, and half a mile between east and west. In the west area the willows were riddled with holes, and trees that had five or six stems growing out from the roots had (nearly all) lost some of these, either snapped off above by the wind or broken down by their own weight at the base. More than once in crossing the stream I broke off a thick stem by simply bearing on it with my hand. On returning to Peterborough after Thanksgiving I went through twenty or thirty collections of insects made by pupils of the school, and in one located a single specimen of the beetle. So far I have not found any damage to willows in our neighborhood.

While I was in Toronto (between July 3 and July 24) Dr. Watson captured a large number of *Urographis fasciata* on a felled oak as well as on a neighboring woodpile of the same material. On the log he saw also, but failed to capture, some specimens of *Neoclytus erythrocephalus*. They are extremely quick in their movements, especially during hot sunshine. Two days snatched from the holocaust of July, I managed to spend at Queenston and made a number of interesting captures between there and Niagara Glen, mostly about blossoms of New Jersey Tea. I have a list of these but will not trespass further on your time and patience.

**Toxotus cylindricollis* (foliage of hazel)	1
Plagionotus speciosus (foliage)	1
Oberea bimaculata (raspberry)	1
***Strangalia luteicornis* (New Jersey Tea)	3
**Leptura subhamata* (New Jersey Tea, all male)	4
***Leptura cordifera* (New Jersey Tea)	6
***Leptura* (sp. ? *dehiscens* New Jersey Tea)	2
Trichius, 2 species (flowers)	abundant
Macrobasis unicolor (vetch)	abundant
3 species of *Cryptocephalus* (foliage)	abundant
Eupogonius subarmatus (basswood)	abundant

Early in August I took another specimen of *Eup. subarmatus*, always on basswood; and throughout August in the Algonquin Park found *Leptura canadensis* common—none of them males.

On returning to Peterborough in September, I found the climbing nasturtium on our verandah-railing badly infested with *larvæ* of *Pieris rapæ*. In a few minutes I picked about 100 off the leaves over a space of about six feet. On each of the two following days I gathered almost as many. I suspect they came from a vacant field, nearly opposite, in which charlock has been allowed to grow. They were succeeded in October by black aphids from a neighbor's dahlias. These multiplied so on a thick stem that had twined about the verandah post that it resembled a ship's mast coiled round with a spiral of tarred rope.

Division No. 7, Niagara District—William A. Ross.

As Mr. Caesar in his report on "Insects of the Season in Ontario" will no doubt refer to most of the common pests found in the Niagara district, I shall confine my attention to a few insects which were of special interest to me.

Apple Aphids. The three species, *Aphis sorbi*, *Aphis pomi*, and *Aphis avenæ*, were again abundant. Some young apple orchards were very heavily infested with *A. pomi*, but in bearing orchards *A. sorbi* was, as usual, the chief depredator.

In connection with the summer hosts of *A. sorbi* it was found that the migrant forms readily colonized three species of Plantago—*P. lanceolata*, *P. major* and *P. rugelii*, and that as many as eleven generations of the aphid may develop on these weeds. Both in the insectary and in the fields *P. lanceolata*, common rib grass, appeared to be the favorite host.

The Pear Psylla (*Psylla pyricola*). At the Vineland Experimental Farm gratifying results in the control of this insect were obtained. In one experiment infested trees were sprayed, after the cluster buds had burst, with lime sulphur wash, testing 1,030 specific gravity. In a second experiment, of course with different trees, lime sulphur diluted to summer strength in tobacco water (1 lb. tobacco refuse in 2 gallons of water) was used and the application was made just after the blossoms had fallen. The results given by these two treatments can best be stated by quoting from notes made on May 22nd: "Exp. No. 1. Results good—very few nymphs are present on the trees. Exp. No. 2. Results practically 100 per cent. effective—only one living nymph found. Check. Psyllas are numerous on unsprayed trees."

Lesser Peach Tree Borer (*Aegeria pictipes*). Early in the season many complaints were received from fruit growers regarding a "worm" which bored into the trunk and large branches of peach trees and produced gumming. On looking into this matter it was found that in practically all cases the gumming was primarily caused not by the "worm" but by the peach tree canker fungus. The "worm," the lesser peach borer, was, however, very much in evidence in the cankered areas and by its work aggravated and greatly increased the wounds. I should mention here that I found the borer in all old cankers which I examined, and that I took as many as six larvæ from one injured area.

The adults of the lesser peach borer commenced to emerge towards the end of May and the maximum emergence appeared to take place during mid-July, judging by the large number of empty pupal skins found protruding from the trees at that time.

Cherry Aphis (*Myzus cerasi*). Last spring there was a serious outbreak of this plant louse on sweet cherries in different parts of the Niagara district. In a Vineland orchard, which I had under observation, the young shoots were injured so severely that by the latter part of July most of the tender foliage was dead. The fruit in this same orchard was small, ripened irregularly and much of it was covered with honey dew and honey dew fungus. In fact so much damage was done to the fruit that most of the crop was left on the trees.

Mr. Howard Curran, my assistant, sprayed two infested trees with whale oil soap, 1 lb. to 4 gallons of water, and destroyed in the neighborhood of 99 per cent. of the aphids.

The Raspberry Byturus (*Byturus unicolor*). This insect is rarely troublesome in Ontario. However, during May it was present in a large raspberry plantation near Jordan in sufficiently large numbers to give a great deal of anxiety to the grower. The beetle destroyed many of the flower buds by eating into them. It also fed on and skeletonized the tender foliage, especially the foliage near the flower buds.

The owner of the raspberry bushes sprayed them with arsenate of lead and apparently got good results, because when I visited his place later on I found comparatively few beetles on the bushes.

The Raspberry Sawfly (*Monophadnoides rubi*). This pest was very troublesome last year, but I regret to say it was much more destructive this season. Two large raspberry plantations near Vineland were very badly infested and on many of the bushes all that was left of the foliage was the petioles and leaf ribs.

The raspberry sawfly is readily controlled by spraying with arsenate of lead, but as the insect is not regularly injurious the fruit grower seldom thinks of applying the remedy until it is too late.

The Privet Plant Louse (*Rhopalosiphum ligustri*). This greenish-yellow aphid was again very abundant on privet and as a result of its depredations several beautiful hedges were partially defoliated.

Last year I referred to this insect with some doubt as the European species *Rhopalosiphum ligustri*. However, there is no longer any question in regard to its identity, as my determination was confirmed by Prof. Theobald, of London University, England, who kindly examined some specimens which were sent to him.

Before coming to this meeting I had occasion to examine an infested privet hedge, and I was greatly interested to find three kinds of males present, viz.: winged, wingless and forms intermediate between alate and apterous. This would seem to suggest that the male of *R. ligustri* is in an unstable condition and that it is gradually changing from the primitive to the specialized form, i.e., from alate to apterous.

The Asparagus Beetle Parasite (*Tetrastichus asparagi*). Early in June this interesting chalcid, heretofore unrecorded in Canada, was found destroying the eggs of the asparagus beetle (*Crioceris asparagi* L.) at Vineland Station.

Tetrastichus has a very curious life history. The female by means of a sharp ovipositor pierces the egg of the asparagus beetle and deposits within it her own eggs (from three to nine in number according to dissections which I made). In due course, the beetle egg, its viability unaffected, hatches, and the grub grows to maturity. The chalcid eggs in the meantime hatch and the parasites apparently nourish themselves on the body fluids of their host without appreciably interfering with its development. The full-grown asparagus grub enters the soil and forms the pupal cell, but proceeds no further because at this stage it is wholly consumed by the chalcid larvæ. The parasites then pupate within their host's cell and later emerge as adults.

The adult *Tetrastichus* is a voracious feeder on the eggs of the asparagus beetle and in this capacity the insect is really of greater economic importance than in the role of a parasite. In support of this statement I may mention that early in June asparagus beetles and their eggs were exceedingly abundant on the asparagus plants at the Vineland Experimental Farm, but the hungry chalcids destroyed so many eggs that very few grubs hatched out—less than one per cent., I should say. Later on when the parasites were not so plentiful a larger percentage of the beetle eggs hatched.

In feeding the chalcid stands on the egg, plunges her ovipositor into it, and energetically works the ovipositor up and down usually for three or four minutes. She then steps back, applies her mouth parts to the puncture and feeds on the egg contents. If the first prodding does not render sufficient food available the operation may be repeated. In fact I noticed one chalcid attack an egg no less than four times.

There are apparently two broods of this insect in the Niagara district. Adults of what I took to be the first generation were very abundant during early June, but by June 28th they had all disappeared. Second brood "flies" emerged late in July and were found on the asparagus plants until the latter part of August. This generation was much smaller in number than the first.

REPORT OF THE BRITISH COLUMBIA ENTOMOLOGICAL SOCIETY.

Mr. Treherne: As Secretary of the British Columbia Entomological Society, a branch of this Society, I may say that our membership stands at about seventy at the present time. About thirty of these can be considered active members, those that are engaged in recording insects from different parts of the province, and who are anxious to receive information of a more technical character, such as is recorded in *The Canadian Entomologist.* The remainder are mostly farmers and fruitgrowers of a better type who are interested in the control of insect pests. We have an interesting development that occurred during the past year in the formation of sub-branches, Victoria and Vancouver. The Vancouver sub-branch are holding monthly meetings during the winter, turning in their reports to what they call the parent Society, that is to say, the Entomological Society of British Columbia. The membership has been affected on account of the war, several of our men having gone overseas, and our Society has decided to continue their payments out of their own funds. We have published up to date seven bulletins during the past three and one-half years. At the present time many recent members, members that are not particularly interested in the Society, are dropping out, and the result is that with those that are members we are getting on a more level basis in that we have men that are more keenly interested in the Society, and I think that in a year or two the Entomological Society of Ontario will find a very active, strong Society in the West.

Dr. Hewitt: The Society has listened with much interest to Mr. Treherne. We all know that the formation of the Branch out there is entirely due to Mr. Treherne's personal efforts and the support he has received from men like Mr. Wilson, who is with us to-day, Mr. Day, and others, and it is very satisfactory to think of the strong branch the Society has out there. We will now have the report of the Montreal Branch.

REPORT OF THE MONTREAL BRANCH.

The 42nd annual meeting of the Montreal Branch was held at 32 Springfield Ave., Westmount, on Saturday evening, May 15th, 1915.

The Secretary read the report of the Council as follows:

The Branch has held, during the season of 1914-15, nine monthly meetings, the average attendance being over six.

We record, with deep regret, the death of our late member Mr. Henry H. Lyman, who had been an active member since 1875, and had occupied all the executive offices of our Society at one time or another. By his will, his large and valuable collection of Lepidoptera and other insects, and his fine entomological library, are now housed in the Redpath Museum of McGill University. This is now being carefully put into order and when funds become available it should rapidly become one of the most important insect collections in Canada, and of great assistance to students of insect life. By the terms of Mr. Lyman's will the President and Secretary of this Branch are desired to be associated with the Professor of Zoology of McGill University, as members of a committee to manage the bequest.

The papers read at the meetings during the year were as follows:

1. Annual Address of the President .... A. F. Winn.
2. Electrical Fuses Attacked by Larvæ of *Dermestes lardarius* Geo. A. Moore.
3. The American Tortoise Shell Butterfly, *Vanessa milberti* Godard .... A. F. Winn.
4. *Saldidae*, or Shore Bugs .... Geo. A. Moore.
5. Studies in the Genus *Phaeocyma* .... G. Chagnon.
6. The Geometrid Genus *Nyctobia* Hulst .... A. F. Winn.
7. The Coloration of Insects .... A. F. Winn.
8. The Coloration of Exotic Butterflies .... G. C. Clayson.
9. The Colors Seen in Hemiptera .... Geo. A. Moore.
10. Address on Annual Meeting .... Prof. Lochhead.
11. Illustrated Talk on "Work of Entomological Division .... A. Gibson.
12. Notes on the Cause of the Blue Coloration of the Blue Lycænids .... H. M. Simms.
13. Report of the Annual Meeting of the Quebec Society for the Protection of Plants .... Geo. A. Moore.

Besides the regular papers read Mr. Winn exhibited the list of Quebec Diptera which had been compiled with the assistance of Mr. Beaulieu, and had been edited by Mr. Johnson of Boston.

Our January meeting was honored by a visit from Prof. Lochhead, of Macdonald College, with three students.

We also had a visit from Mr. Arthur Gibson. Assistant Dominion Entomologist, at our February meeting. He gave a lantern-illustrated talk upon the work being done at the different entomological laboratories in Canada.

At this latter meeting Mr. Simms illustrated the blue coloration of the Lycænids, by means of a spectroscope.

Our March meeting was made more interesting by a series of microscope slides being shown.

The report of the Treasurer showed a balance of $82.34 on hand.

Mr. H. M. Simms, one of our members, has enlisted for Overseas service in the great European war.

The following officers were elected for the ensuing year:

President .... A. F. Winn.
Vice-President .... G. Chagnon.
Secretary-Treasurer .... Geo. A. Moore.
Librarian .... G. Chagnon.
Council .... Messrs. G. A. Southee, G. H. Clayson, E. C. Barwick, H. M. Simms.

Geo. A. Moore,

Sec.-Treas.

REPORT OF THE TORONTO BRANCH.

The nineteenth annual meeting of the Toronto Branch was held in the Biological Building on Thursday, October 14th. 1915, the chair being occupied by the President, Dr. Cosens.

The minutes of the previous meeting having been read and approved, the report of the Council and financial report were presented and adopted.

Eight regular meetings, not including the annual meeting, were held during the season 1914-15, at which the average attendance remained about the same as in past years.

The following list comprises the papers read during the season:

Oct. 9. "Insect Aliens, Desirable and Otherwise," illustrated with specimens. Dr. A. Cosens.
Nov. 19. "A Trip to Point Pelee." Mr. C. W. Nash, Provincial Biologist.
Dec. 10. "Crickets," illustrated by specimens. Dr. E. M. Walker.
Jan. 14. "Some Entomological Notes in North Dakota," illustrated by specimens. Mr. F. J. Prewett.
Feb. 10. "Two Months in New Brunswick," with lantern illustrations. Mr. E. Horne Craigie.
Mar. 25. "Types of Neuroptera," illustrated by specimens. Dr. A. Cosens.
April 29. "Blood-sucking Flies," with lantern illustrations. Dr. E. M. Walker.

At the meeting held May 20th, Dr. Walker exhibited a collection of beetles intended for the Royal Ontario Museum; Mr. Hanniball, a living horned toad from Texas, and Dr. Cosens, galls and producers of the genus Rhodites.

A successful field meeting was held at Mount Dennis on May 29th.

During the season four new members had been elected, two had gone to the front, and one had resigned.

The financial report showed a balance on hand of $13.90.

A paper was read by Dr. Cosens upon "The Founding of the Science of Cecidology," after which the election of officers for the coming season took place.

The election resulted as follows:

President .... Dr. E. M. Walker.
Vice-President .... E. Horne Craigie.
Secretary-Treasurer .... S. Logier, 1244 St. Clair Ave., Toronto.
Librarian .... H. E. Bicknell.
Council .... Dr. A. Cosens, C. A. Snazelle, C. W. Nash, J. Hanniball.

Respectfully submitted,

E. Horne Craigie,

Secretary.

THE NOVA SCOTIA BRANCH.

The President: We are very pleased to learn, as announced in the report of the Council, of the formation in Nova Scotia of an Entomological Society, which has become affiliated as a branch of the Ontario Entomological Society, and I should like to take this opportunity of congratulating Prof. Brittain and his associates in the energetic way in which he has collected together the scattered units who have entomological leanings in that Province. We shall be glad to hear from Prof. Brittain, if he has not a formal report, a few words in regard to the Society.

Prof. Brittain: Though I did not prepare any formal report, I am pleased to be able to say that in July last we held an organization meeting and succeeded in forming a very flourishing branch of the Ontario Entomological Society.

We were fortunate enough to have the support of Dr. A. H. MacKay, Superintendent of Education; Mr. L. A. DeWolfe, Director of Rural Education; several of the provincial school inspectors and others. All of these men have shown the deepest interest in the work of the Society, and with their help we have been able to enlist the support of a large number of teachers throughout the Province, many of whom have already done some collecting and otherwise shown an interest in entomological work.

I have also had the heartiest assistance and encouragement from Mr. George E. Sanders, Field Officer of the Dominion Entomological Branch. In all these, together with the inspectors and ex-inspectors of the Dominion and Provincial Entomological Branches, we have a very good nucleus for the establishment of a strong and vigorous society.

At the present time we have a paid-up membership of forty-one members, and I confidently hope and expect that before the winter has passed, we will have doubled that number.

The President: I am sure the members have listened to this extempore report with very great pleasure. It is a matter of regret that while there used to be a branch in the City of Quebec, we have not had a branch there for many years, at least as long as I have been in this country, although we now have in the Province of Quebec the Society for the Protection of Plants from Insect Pests and Plant Diseases, which, in a way, takes the place of a Provincial Entomological Society. At the same time, I think there is room for greater activity in the Province of Quebec in the matter of entomology. We have a faithful friend in Mr. Chapais, who, I think, should try and work up the interest of the Entomological Society in the Province of Quebec. Before proceeding further I should mention that letters of regret have been received from the following people on account of their inability to attend the meeting: Mr. Grodge Davidson, Provincial Botanist of British Columbia; The Rev. Abbé Huard, Provincial Entomologist of Quebec; Prof. J. M. Aldrich; Prof. G. A. Dean; Dr. W. E. Britton, State Entomologist of Connecticut; and then, in addition, we had promises to be present from the following members of the Society and gentlemen who intended to be present: Dr. Felt, but he has had an urgent call to Long Island; Dr. Walker, who has been unable to come on account of his academic duties, and Dr. Bethune, who was not able to make the trip and who had lectures to attend to. Dr. Howard was to give our public address, but he is unable to come owing to the fact that he met with an accident. We also should have had with us Prof. Willing, Assistant Professor of Natural History at the University of Saskatchewan, but illness has prevented him from coming.

REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

I have the honor of presenting the following report of the work of the Ontario Entomological Society for the year 1914-15.

The past year was a very successful one. The active membership continues to increase, and the Society has now a relatively large number of trained workers engaged in the investigation of the many insect problems that arise yearly in every province. The presence of these new members has a stimulating influence on the general work of the Society. They are young men, mostly graduates of the agricultural colleges, and filled with the enthusiasm of youth and eager to advance the interests of their profession. As a matter of fact the entomological interests of the Dominion are now, to a large extent, in their keeping.

Another feature of recent entomological work is the appearance of an increasing amount of investigation that might fairly be classed as high grade. This result may be attributed to the fact that our younger entomologists have the advantages of a scientific training and are thus able to undertake problems beyond the power of their predecessors.

Much of the credit for the vigorous condition of the Society must be assigned to its active President, Dr. C. G. Hewitt, Dominion Entomologist, who presided most worthily at the fifty-first annual meeting held in Toronto on the 5th and 6th of November last. This meeting was well attended, and many valuable papers were presented. Considerable discussion took place on various subjects of importance, particularly on the outbreak of the Army-worm in Canada in 1914.

Following is a list of the chief papers and addresses:

"Applied Entomology in Canada: Its Rise and Progress," the address of the President, Dr. C. G. Hewitt.
"The Habits of Spiders" (illustrated), by Prof. J. H. Comstock, Cornell University.
"Jean Henri Fabre, the French Entomologist," by Prof. W. Lochhead, Macdonald College, P.Q.
"Insects of the Season," by Prof. L. Cæsar, A. Gibson, W. Lochhead, A. Cosens, J. A. Morris, W. A. Ross, C. E. Grant, and C. E. Petch.
"The 1914 Outbreak of the Army Worm in Canada," by A. Gibson.
"The Army Worm in Ontario in 1914," by A. W. Baker, O.A.C.
"Mountains and Hills," by Dr. T. W. Fyles, Ottawa.
"Experiments with Poisoned Bran Baits for Locust Control," by A. Gibson, Ottawa.
"An Imported Red Spider Attacking Fruit Trees," by Prof. L. Caesar.
"Cherry Fruit Flies," by Prof. L. Caesar.
"Control of Forest and Shade Tree Insects of the Farm," by J. M. Swaine, Ottawa.
"Variation in the Hedgehog Caterpillar," by A. Gibson.

The Canadian Entomologist, the monthly journal of the Society, continues to maintain its high reputation and its wide circulation in spite of the increased subscription price. The 46th volume, completed in December last, is the largest and most fully illustrated that has yet been published.

During the year 1914 and since the last meeting of the Royal Society, the Ontario Entomological Society lost two of its best known members. Mr. H. H. Lyman perished in the disaster to the "Empress of Ireland" on the 29th of May—a few days after he had presented his report as delegate of this Society. Dr. William Saunders, ex-Director of the Dominion Experimental Farms and one of the charter members of this Society, died at his home in London on Sept. 13th. In his Presidential Address at the Annual Meeting in Toronto, Dr. Hewitt spoke very feelingly of the loss of these two highly esteemed members and ex-presidents of our Society, and paid a high tribute to their memories. Besides, our worthy and revered member, Rev. Dr. Bethune, who knew both very intimately for many years, has written notes of high appreciation in the 45th Annual Report.

W. Lochhead, *Delegate.*

INSECTS OF THE SEASON IN ONTARIO.

L. CAESAR, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The past season with its abnormal amount of rainfall has been much more favorable for the development of plant diseases, both fungous and bacterial, than of insect pests.

CODLING MOTH (*Carpocapsa pomonella*). The most interesting thing about the Codling Moth was that in the Niagara district, where the amount of injury done by the second brood is usually very much greater than by the first, this year for the first time in my experience things were just reversed, the second brood being remarkably small, though the first brood was about as abundant as usual. Probably the excessive moisture was the chief reason for this, though other factors may also have been at work.

PLUM CURCULIO (*Conotrachelus nenuphar*). This insect also was apparently less abundant than usual, although the fruit in neglected apple orchards suffered a great deal of injury both from spring and fall attacks. On some trees nearly every apple was deformed.

SAN JOSÉ SCALE (*Aspidiotus perniciosus*). The season of 1914 with its dry summer and long open fall was remarkably favorable for the increase of San José Scale. This was not true in 1915, for this year, so far as my observation enables me to judge, the increase has been less rapid than usual. This spring was also favorable for good results from careful spraying. With a single application we were able to destroy almost every scale in an old orchard that would otherwise have been nearly all dead by now. Lime-sulphur, strength 1.035, was used on one part of the orchard; Soluble sulphur, strength 12½ lbs. to 40 imperial gallons, on another part, and Scalecide 1 to 15 on a third. All were about equally satisfactory this year.

BLISTER MITE (*Eriophyes pyri*). For some unexplained reason the increase of Blister Mite, even in unsprayed orchards, the last two or three years has been very slight: in fact some trees seem to have fewer leaves infested than three years ago.

LEAF-ROLLERS [*Tortrix* (*Cacœcia*) *rosaceana*, *T. argyrospila* and *T. semiferana*]. (See p. 163.)

CAPSIDS ATTACKING APPLES (*Neurocolpus nubilus, Paracalocoris colon, Lygidea mendax and Heterocordylus malinus*). All four of these Capsids were found on apple trees but not all in any one orchard. *Lygidea mendax* was found in the greatest number of orchards, but *Neurocolpus nubilus* has apparently been the most destructive. It was sometimes found with *Lygidea mendax,* but in other orchards was the only species present. *Heterocordylus malinus* apparently did almost no harm and was much more common on hawthorns than on apples. *Paracalocoris colon* was also scarce. *Lygus invitus* is abundant in the Province but has not yet been found attacking apples or pears. Mr. Crawford's paper gives an account of our work on *Neurocolpus nubilus.*

TENT-CATERPILLARS (*Malacosoma americana* and *M. disstria*). These caterpillars still destructive in the eastern half of the Province, though Mr. E. P. Bradt, the district representative at Morrisburg, informs me that a large percentage, apparently 50 per cent., of the eggs failed to hatch and fully 50 per cent. of the caterpillars died before reaching maturity. There has been a gradual decrease the last two years in the numbers of both species down east, but this is not true of the western part of the Province, into which they are gradually spreading.

M. americana is now very abundant, at least as far west as St. Thomas. It has not yet, however, so far as I could see, become numerous in the extreme western counties. Around Guelph there are many egg masses this year, and, therefore, prospects for a severe infestation next year. *M. disstria* west of Toronto does not seem to be nearly so abundant as *M. americana*.

Fall Canker-worm (*Alsophila pometaria*). Throughout a considerable stretch of territory from Grimsby west, including Hamilton and Dundas, the Fall Canker-worm is very numerous and destructive. It is also very abundant in some forests in Norfolk County where the American elms, basswood, wild cherry, blue beech, birch and oaks were either partly or entirely defoliated. Elms suffered most. Maples were not so severely attacked as the other trees mentioned. Several other kinds of loopers were also prevalent on these trees, but not in nearly so large numbers as the Fall Canker-worm.

Pear Psylla (*Psylla pyricola*). Early in the season it looked as if pears were going to be much infested by this insect, as adults and eggs were abundant. However, the cold weather of May destroyed all but a very few. By autumn a few orchards were again badly infested.

Aphids. On apple trees there were many aphids this spring up to a few days before the blossoms were ready to burst. They then almost completely disappeared in all the orchards that I had an opportunity to examine, so that apple trees suffered very little from any of the leaf and fruit infesting aphids.

The Woolly Aphis (*Schizoneura lanigera*) in some districts was abundant, especially on young shoots in late summer and autumn. On cherry trees at Guelph the Black Aphis (*Myzus cerasi*) was very conspicuous and much more numerous than for many years past. It was also very troublesome in the Niagara district.

When moderately early peas were just beginning to bloom in Norfolk County hundreds of acres of them grown for the canning factories were threatened with destruction through the abundance of the Pea Aphis (*Macrosiphum pisi*) on the blossoms and new growth. Fortunately there came several days of very hot weather with occasional heavy downpours of rain and almost all the aphids disappeared. Sufficient damage, however, had been done to lessen the yield considerably and in some fields almost to destroy the crop. The Pea Aphis has done more damage the last few years in Ontario than it formerly did.

Peach Borer (*Sanninoidea exitiosa*). Many complaints have been coming in of injuries from this borer, particularly from those districts where peaches have only recently been grown to any appreciable extent. I suspected at first that the gum oozing out of the trunks of the trees as the result of winter injury was being mistaken for the work of the borer, but my observations this year in Norfolk County showed that such was not necessarily the case, as nearly every tree in some orchards was attacked by from 1 to 20 or more borers. We have done some preliminary work on the control of this pest, and in this connection have also worked out fairly well its life history for this Province. It will be interesting to some to learn that adults appeared in Norfolk County as early as July 15th and continued up into September. One female in Niagara was seen on September 11th.

Lesser Peach Borer (*Aegeria pictipes*). The numerous cankers on peach trees in many orchards in the Niagara district have given ideal conditions for the increase of this insect, so that it is to-day very prevalent in that district. Control measures under the circumstances are not easy.

Rose Chafer (*Macrodactylus subspinosus*). Near Fonthill several vineyards had almost every grape cluster destroyed by this pest. I visited the district as soon as informed of the trouble, but it was then too late to do anything as the beetles had already begun to disappear. Several acres of waste sandy land lying alongside the infested vineyards showed ideal conditions for bringing about just such an outbreak.

IMPORTED RED SPIDER (*Tetranychus pilosus*). This spider was found as far east this year as Trenton. It continues to do considerable injury, especially to European plums. Some trees, however, that were badly infested last year were only lightly attacked this year. Moreover, in some apple orchards trees heavily infested just before bloom were comparatively lightly infested a couple of weeks later. It is very probable that weather conditions have a very important part in the control of this pest as of so many others.

GRAPE-VINE FLEA-BEETLE (*Haltica chalybea*). There were again many complaints of injury from this beetle, especially in the Niagara district.

GRAPE LEAF-HOPPER (*Typhlocyba comes*). This insect was very abundant in the Niagara district. Red grapes were, so far as I observed, much worse attacked than blue. The foliage on many of the former in September was so brown from injuries that one would expect the fruit at picking time to be inferior in quality. I have had no opportunity to test whether this was so.

RASPBERRY SAW-FLY (*Monophadnus rubi*). This raspberry pest is very widespread in the Province and has the last few years been doing more damage than usual. One large raspberry plantation near Vineland was almost completely defoliated by it this year.

IMPORTED CURRANT-BORER (*Aegeria tipuliformis*). Almost every currant plantation is infested by this borer. In some cases a very large number of the canes are found to be attacked.

GLASSY CUTWORM (*Hadena devastatrix*). Last autumn at our annual meeting I reported that some fields of wheat had been badly injured by this cutworm. The caterpillars in November last varied in length from about ½ to 1 inch; hence we expected these over-wintering caterpillars, where numerous, to do much damage. As soon as growth began in spring reports started to come in of fields of wheat and barley being attacked. Several fields of wheat were almost ruined by the severity of the attacks. A few Army-worms, but only a very few, were found among the cutworms. As the Glassy Cutworm works under the surface of the soil farmers were advised to use the poisoned bran, harrowing it into the soil in the evening. I did not receive any reliable accounts of the degree of success obtained. About the usual number of reports of damage by other kinds of cutworms here and there throughout the Province were received.

STRAWBERRY WEEVIL (*Anthonomus signatus*). A few more complaints than usual were sent in of injuries from these insects.

IMPORTED ONION MAGGOT (*Pegomyia ceparum*). It is worth recording that in the great onion marshes of Kent County I could scarcely find a root maggot when visiting the district this summer. Growers tell me they are never troubled by it. This is strange, because onions have been grown on these marshes for at least fifteen years, and, as the Onion Maggot is a very troublesome pest in many parts of the Province, one would expect it to do even more damage in the marshes where onions are grown on a larger scale than anywhere else in Ontario.

SLUGS. In Oxford County the district representative stated that Slugs were so abundant this spring that some farmers claimed they were destroying the corn just as it was coming or had come through the ground.

MILLIPEDES. Last year, but more especially this year, Millipedes were very abundant and several correspondents asked for methods of destroying them. Some work was done in testing different substances. Of these tobacco seemed the most satisfactory, although it was not a complete success. The Millipedes are repelled by it and, where they come into close contact with a moderately strong solution, are slowly killed. Dusting tobacco refuse thickly over the garden where they are troublesome and then watering it well with the hose once or twice a day for a few days seems about the best method, and the least dangerous to the plants. It is probable that placing decaying fruits or other decaying vegetable matter here and there in little heaps among infested plants and then pouring scalding water over such traps daily would gradually do a great deal to free the garden of the Millipedes. They are very fond of collecting under such decaying refuse and roam around in the dark so freely that they would be very likely to find the baits.

SPITTLE BUGS (*Cercopidæ*). This seems to have been a remarkably favorable year for the multiplication of Spittle Bugs. Complaints of the great numbers of froth masses on the grass came in from Clarksburg, Mount Forest, Ridgeway, Thornton, Oakville and several other districts. A few pasture fields near Oakville were so badly infested that the farmers, fearing injury to stock if they fed on the infested grass, mowed the pastures and destroyed the cut grass.

A SARCOPHAGID ATTACKING THE FOREST TENT-CATERPILLAR (*Sarcophaga aldrichia* Parker). In 1914, while engaged in some investigation work in the County of Dundas, I observed that many of the pupæ of the Forest Tent Caterpillar were parasitized by what I considered to be the larvæ of a Tachinid Fly. On further examination at Mountain, Kempton and Morrisburg I estimated that close to 90 per cent. of all the pupæ contained what seemed to be this same larva. About 30 of the cocoons were gathered and brought to Guelph, though it was nearly two weeks before I reached there. On my arrival the cocoons were all transferred to a pint jar, in the bottom of which an inch or so of sand was first placed. The jar then was covered with cheesecloth. In May, 1915, I happened to glance at the jar and to my surprise found seven dead and one living Sarcophagid. These Dr. J. M. Aldrich kindly identified for me. He states "The species is one which Mr. R. R. Parker now has in manuscript as *Sarcophaga aldrichia*, n.sp. His article is completed and, I think, is deposited with the Boston Society of Natural History for publication, but I am not quite sure on that point. I will send him a quotation from your letter if you do not mind, as it indicates a considerable economic importance for the species which is widespread, occurring in the Puget Sound region."

If I am correct in my opinion that the death of the pupæ was due to the larva of this insect and not to disease, we have here a very good example of what seems to have been only comparatively recently fully admitted, namely, the true parasitic habits of some Sarcophagids.

PHOROCERA DORYPHORÆ. In June Prof. T. D. Jarvis called the attention of my assistant, Mr. A. H. Cowan, to the white eggs on the back of Colorado potato beetles at Grimsby. Mr. Cowan reported to me and on my suggestion reared a few adults and captured a few more that were attempting to lay eggs. Dr. Aldrich identified all these as *Phorocera doryphoræ*, a parasite that, as he says, has been bred repeatedly from this host.

Mr. Cowan made the following observations: "Eggs begin to be laid in June. At first they seem to be laid only on adult beetles, but later to some extent on the slugs. From June 18th to July 13th eggs were found mostly on the beetles, 1/3 to 1/2 of the beetles being affected. Early in July some were found on larvæ also, but always on nearly full-grown larvæ. The total time from egg to adult fly would appear to be about one month. On September 15th the eggs and adult flies were again found at Vineland."

At Simcoe I observed on several occasions what was probably this same Tachinid attempting to lay eggs on full-grown larvæ of Colorado potato beetle.

Poplar Sawfly (*Trichiocampus viminalis*, Fallen (?)). On September 28th the Parks Commissioner of Toronto sent me a few Sawfly larvæ that were attacking the foliage of Carolina poplar in the City and asked for the name of the insect and the method of control. On looking over the list of insects given by Dr. Felt in the New York Museum Memoir 8 as attacking poplars I found that the description given there of the larvæ of *Trichiocampus viminalis*, Fallen, agreed very closely with the larvæ I had received. The latter were, when full grown, nearly one inch in length, orange-yellow in color, though some had a decided greenish tint. The head and caudal plates were black, and on each side of the body were two rows of distinct black spots, the spots in the upper or subdorsal row being three or four times as large as those in the lower or stigmatal row. On the back and sides were numerous white hairs arising in thin tufts from numerous tubercular-like areas on each segment. These hairs were not more than 1/4 as long as the width of the body.

I wrote to the owner of the infested trees for further information on the habits of the insect. The following extract is taken from his reply:

"The caterpillars were green at first, changing to yellow as they grew larger, apparently being full grown by the time they had eaten a full sized leaf. They were all side by side on the under side of the leaf tight together, eating from the edge away from the stalk towards it. That is to say, their heads were away from the stalk and they kept getting towards the stalk as the leaf was eaten away. Some of them grew faster than others, or seemed to, and as the leaf narrowed down they dropped off, thus leaving the smaller ones to finish the leaf. When I first noticed them they were small and green, and I should say there were about twenty on a leaf. It was full on the outside edge with all lying the same way, heads from the stalk of the leaf, the middle ones parallel with the thick membrane of the leaf, that is the continuation of the stalk. After dropping off the leaf they crawled all over the board fence and up the side of the house everywhere off the ground looking for holes in the fence. They went into every hole or crack they could find. The fence was covered with them. Into some overalls that were hanging on the line they got and when found were in a cocoon. Every leaf that they were on was completely eaten except the stalk, and the continuation of it right to the point. I notice that it is not a leaf here and there, as all the leaves on some branches are eaten and others not touched. I should say they have been on about 1-20th of the branches of the trees and eaten them. As there are six trees about 35 feet high, you may guess the number of them. I can only say there were thousands. I killed thousands myself with a broom on the fence."

THE IMPORTED WILLOW AND POPLAR BORER OR CURCULIO.

(*Cryptorhynchus lapathi* L.).

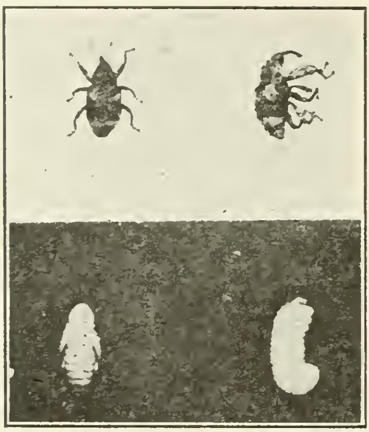
L. Caesar, Ontario Agricultural College, Guelph.

About the middle of August I was requested to investigate the injury done by a borer to willows and poplars in the eastern part of Toronto Island. I visited the district on August 21st and again September 8th. On the latter occasion

J. E. Howitt, Professor of Botany, kindly accompanied me to assist in the identification of the species of willows and poplars that were attacked and also of those that were immune.

The insect in question was, as suspected, the Imported Willow and Poplar Borer or Curculio. The total damage done on the island was not large but was sufficient to convince the Superintendent of Parks that if the insect were to spread throughout the island and attack all kinds of willows and poplars, it would destroy the beauty and attractiveness of Toronto's favorite summer resort. One can easily understand why he should feel alarmed when we consider that about 90 per cent. of the trees on this island consist of willows and poplars, because these are the chief kinds that will thrive in its light, sandy, moist soil.

My observations showed me that before I could suggest the right means of control it would be necessary to know two things: first, at what time infested trees should be cut down and burned to destroy the maximum number of the



Willow Curculio: two adults, a pupa and full-grown larva.
(All about natural size.)

insects; second, what species or varieties of willow and poplar, if any, were exempt from attack. If the latter species were known they could henceforth be substituted for the kinds subject to attack.

On looking over the literature on this insect I found that to satisfy myself on these points I should have to devote whatever time could be spared this autumn to finding out whether the borer differed in Ontario in any important respects from the accounts given by Kirkland, Jack, Webster, Chittenden, Felt and others. The following are the results of my investigations:

Length of Time the Beetle has been in the Province and Present Distribution.

This beetle, which is known to be a native of Europe and of parts of Asia, and which is supposed to have been imported into the United States about the year 1880, was not, so far as I have been able to discover, found in Ontario until the year 1906. That year Mr. Cosens took it at High Park, Toronto, and Prof. E. J. Zavitz at Ridgeway and Beamsville. These discoveries in three widely separated localities lead me to believe that it must have been in the Province several years earlier. Up to the present time I have records of its presence at the following additional places: St. Catharines, Grimsby Beach, Grimsby, Winona, Fruitland, Guelph, Elmira, Willow Grove near London, Toronto Island, Port Hope, Trenton, Hillier (Prince Edward County) and Montreal (Quebec).

There has been very little opportunity to examine other parts of the Province, but the above localities show a very wide distribution throughout the Province, especially along the great waterway on the south. It is apparently, however, not yet all over the Province, because I have been in several localities where there seemed to be no evidence of its work, and Dr. E. M. Walker tells me that he has not seen any evidence of injury from it at Lake Simcoe. Montreal, near which Mr. Swaine reports its presence, seems to be the only place it has been seen in Canada east of the Province of Ontario, though very likely it is present in several localities but has not been noticed.

Host Plants.

In Europe this insect attacks several species of willows and poplars and also a few species of birches and alders, including our common alder (*Alnus incana*).

In the United States a perusal of the writings of Jack, Kirkland, Webster, Chittenden, and Felt, show that scarcely any species or variety of poplar or willow, whether native or imported, is entirely exempt and that the birches (*Betula pumila* and *B. nigra*) are also occasionally attacked. I do not remember seeing any definite record of its having been found in alders.

In Ontario I have devoted every opportunity I could get to discovering the host plants and the degree of infestation of each. Prof. Howitt has assisted me greatly in determining the species whenever I was in doubt. I find that the insect prefers Balm of Gilead (*Populus candicans*) and Balsam Poplar (*Populus balsamifera*) to any other variety of poplar, but that it is sometimes quite abundant in Carolina Poplars, especially where the above species are not present. At Guelph the Balm of Gilead is severely infested in a small clump of poplars on the College grounds, but the other poplars in this clump, consisting of the Carolina, White, Large-toothed and Lombardy species, are untouched. By the edges of a woods not far away from the College the Balsam Poplars are much injured by the pest, but the American Aspens alongside them are uninjured. The same was true of the aspens near infested Scrub Willows in the swamps.

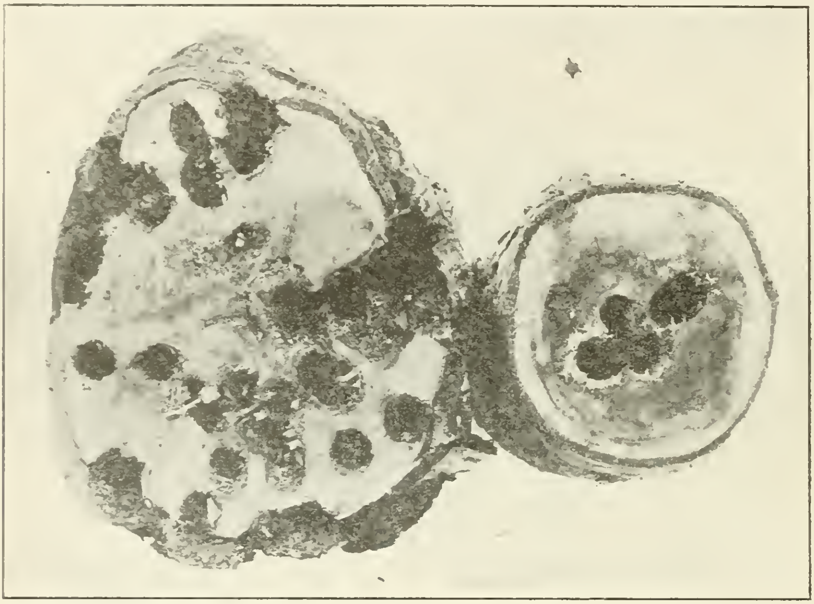
Of the willows the worst infested are our native Scrub Willows found so abundantly along streams. A tree willow, whose species could not be determined at this season of the year, was also severely attacked. This willow grows 25 feet or more in height, has not so large spreading branches as the Golden or White Willow (*Salix alba*) or the Crack Willow (*Salix fragilis*) but has much more slender and drooping branchlets and smaller, more delicate leaves. It is evidently a native species. One ornamental Weeping Willow in a lawn at Winona was killed by this borer last year. It was the dark-bark type of Weeping Willow, apparently an imported tree. Of the other willows we have not seen more than a very light infestation on the Crack Willow, and the White Willow has been entirely uninjured, as also the Glossy Willow (*Salix lucida*). There are not many Babylonian Willows to be found, but so far they too have been uninjured wherever examined.

Comparing what we have observed in Ontario with what has been written of the host plants in the United States, it seems quite clear that Balm of Gilead, Balsam Poplar, and our native Scrub Willows, along with one or two native tree willows, are the favorite food plants. Next to these would appear to be the Carolina Poplar (*Populus deltoides*).

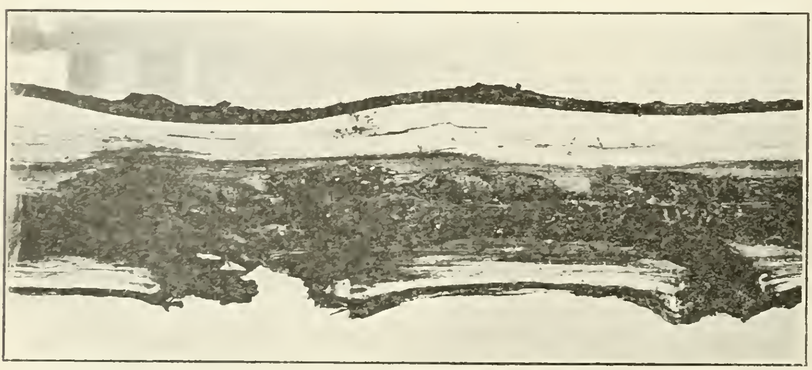
No alders were found infested even when in the midst of infested scrub willows. Birches have also appeared to be exempt in Ontario.

Nature of the Injury.

The photographs show sufficiently well the sort of injury done. It is all caused by the larvæ. These work both in the sapwood and heartwood in older trees and in the heartwood of very small trees. The borers seem to prefer the base of the smaller trees, but they are found on larger trees as high as 15 feet or



Cross section of a young poplar and of a larger willow tree, near the base, showing the work of the borers. (About natural size.)



Longitudinal section of a poplar tree, showing tunnels made by the larvae. (Slightly reduced.)

more. In old trees with rough bark they usually work in the lower branches instead of in the base of the trunk. Often there are so many tunnels, especially towards the base of the tree, that it is weakened and easily broken down by a strong wind. It is quite common to see Scrub Willows killed and also small poplars. The swellings on the bark of poplars where the larvæ have entered, and also the exit holes, cause the trees to look unsightly, and these, along with the castings around them composed of small tissues of wood from the tunnels, dust and fæces, easily reveal the presence of the insects. The total number of trees destroyed in the Province must be large, but the Scrub Willows are of very little value and, though the Balm of Gilead and Balsam Poplars are of much more importance, they can scarcely rank among our valuable trees. Fortunately not many Carolina Poplars seem to have been killed yet. These are good shade and landscape trees and their loss would be deplorable.

Life History.

Adults.—The adult is a snout beetle, stout, about one-quarter inch long, black, with the body and legs mottled with light pinkish or grayish white scales. These scales are so abundant on the sides of the prothorax and also on the anal third of the wings as to cause these parts to be pale pink or white. The upper surface of the body is rough, being coarsely and deeply punctured, and having longitudinal furrows on the elytra. The rough appearance is increased by the presence of a few tufts of black scales scattered here and there over the thorax and elytra.

I do not know how early the adults begin to appear. In willows at St. Catharines examined about June 20th, 1914, the larvæ seemed full grown but no pupæ were seen. As Kirkland estimates the pupal stage at about 18 days, it is probable that adults would have been found last year on these trees early in July. Mr. F. Morris found many adults on willows near Port Hope the first week in July, 1915. I have captured a few in August in previous years. By September 8th, 1915, by far the majority seemed to have emerged at Toronto Island but they still continued to appear this year all the first half of October, the weather being warm. An examination on October 23rd showed a few live adults still in their burrows in poplars, also some pupæ that looked healthy and four larvæ, but three of the latter were dead. The fourth looked healthy but, when handled, did not move, so may also have been dead. In all the accounts I have read it seems to be assumed that very few adults are to be seen in the spring. Kirkland found one which he remarked was "probably an overwintered specimen." But the adults in May are not nearly so few in number in Ontario as one would expect from the different accounts of the insect given. Three of my nursery inspectors each captured several specimens and saw others this last May on poplars and willows in the nursery rows. There were a few also on apple trees in adjoining rows. It is not known whether these passed the winter in the trees as adults, pupæ or larvæ, or whether they emerged in autumn and wintered over under shelter. The important point is that there was a considerable number of adults found at that time of the year, indicating that many others also were probably present. The adults in autumn hide on cold days but appear on the trees when the weather is warm. They feed on the juices exuding from injuries at the points of exit, also upon the young twigs, where they seem to prefer the neighborhood of leaf scars, in which the small feeding punctures are often seen. These punctures, however, may also be found in various other parts of the tree and sometimes even on the bark of dead fallen branches. In breeding cages I fed them on pieces of ripe apples and peaches, both of which they relished greatly. I do not know the length of life of these autumn adults, but five specimens caught in September were still alive almost a month later when I removed them from the cages. The last adults were seen in the open on October 11th. One found then was ovipositing.

Eggs.—Oviposition probably begins early in August, but with the very limited time at my disposal the first adult I could find doing this was on September 29th. After that date I saw several both in the cages and outside. It is very probable the beetles found in May oviposit in spring, as in Europe, eggs are laid both in autumn and in spring. The eggs are laid, as one would expect, at such places on the tree as we find the injuries later. Sometimes this may be at the base of a bud or small branch, but on the Balm of Gilead trees under observation and also in the cages it was just as commonly on the internodes, sometimes where there was a small rupture in the bark, sometimes where there was no rupture. About one hundred egg punctures in all were observed and several ovipositions. Before laying the egg the female eats a small hole, usually easily visible to the eye, through the bark to the full depth of her proboscis; at the bottom of this she makes one, two or three cavities. Where there are more than one they are a little distance apart from each other. Then she turns around, inserts her protruded ovipositor into the hole and lays an egg in each cavity. The making of the hole and laying of the egg is a slow process. I observed one which had already been at work some time when noticed and from the time she was first seen until the eggs were laid was a little over thirty minutes. One female was observed after laying the egg to turn around and insert her beak into the hole many times as if putting in small particles of bark. The eggs are pale translucent whitish, oval, about 1.5 mm. long and a little more than half as wide as long. Each female probably lays many eggs. One about to oviposit was dissected and only three mature eggs were found in the ovaries, all the others being much smaller.

It is hard to say how long it takes the eggs to hatch. As stated the first oviposition was observed on September 29th, but an examination from time to time of egg punctures at Guelph revealed no larva until October 7th. On October 25th, fourteen egg punctures on a Balm of Gilead were examined and in five of these sound unhatched eggs were seen, in five others tiny living larvæ, and in the remaining four hatched eggs but no larvæ. All previous examinations showed more unhatched eggs than larvæ on all trees.

Larvæ.—The freshly hatched larva is white, curved, and has a brown head. Full-grown larvæ are, as shown in the photograph, stout, about half an inch long, white, curved and have a brown head and no legs.

The young larvæ found were in every case very near where the eggs had been deposited, and had not eaten their way through the bark. They appeared to be settled down comfortably for the winter. Only in one case was there any evidence of a larva having reached the cambium, and that one was doubtful.

The discovery of so large a percentage of healthy eggs along with these tiny larvæ would suggest that the winter is probably passed in the egg stage as well as the larval. We saw above that it is apparently passed also either in the adult or pupal stage or both, with a slight possibility of there being some full-grown larvæ too remaining over in the burrows.

A study of the burrows shows that in spring the larvæ work obliquely into the sapwood, throwing out many castings at first as they do so. When they have gone in some depth the entrance appears to become closed, at least in poplars, by a callous growth, referred to above. Once in the wood the burrows run nearly straight. The total length of a burrow is from 2½ to 4 inches. In spring the larvæ clearly grow very rapidly, as by the end of June they are about full grown in many cases. When this stage is reached they evidently turn back in their tunnels and enlarge them either to the place of entrance or else to some more convenient exit. They then return to the far end of the burrow, make a little chamber for pupating, then with head toward the exit change into a white pupa. The adult works its way out through the tunnel enlarged by the larva.

Means of Distribution.

The insects have been widely distributed by shipping out poplars and willows from infested nurseries. The tiny larvæ or eggs in these in the spring would easily escape notice. In addition to this means there seems no doubt that the adults fly about from place to place. They have large under wings well adapted for this purpose. Flight is probably late in the evening or at night, as I have never seen an adult fly when observing them during the day.

Methods of Control.

In most cases no effort will be made to control or prevent injury from the pest, but in parks like Toronto Island, control measures are very necessary. It was my intention to suggest that all infested trees be cut down in the winter and burned early in spring, but since learning from my inspectors of the discovery of a considerable number of adults in May which very probably lays eggs, I have thought it wise to suggest that the cutting down and burning should not be done until the first or second week in June, so that all the insects might then be caught in the larval stage. This should lessen the numbers of the insect greatly. Then to avoid future loss in these places I think that the willows most exempt from attack, viz.: the White Willow (*Salix alba*), one of our largest and best willows, and possibly the Glossy Willow (*Salix lucida*) should be planted instead of those removed. Also White Poplar and Aspen Poplar might be substituted for the Balm of Gilead, Balsam Poplar, and even for Carolina Poplar. Of course if Soft Maples, Dogwoods or other suitable trees or shrubs will thrive in these places, they would be preferable to any of the above. I should be very pleased to have further suggestions from anyone present.

The President: I am sure we have all listened with much pleasure to Mr. Caesar's two excellent papers. They are now open for discussion. We are pleased to see with us to-day Professor Zavitz, the Provincial Forester of Ontario, and he has no doubt something interesting to say regarding the papers just read.

Prof. E. J. Zavitz: Mr. Chairman, I came here to obtain information, and this beetle to which Professor Caesar has been referring is naturally of interest to foresters. I first saw it in the Niagara District near Ridgeway, working in the scrub willows. This season, in visiting that district early in the summer (it is a favorite collecting ground) I found that these willows had been entirely killed.

I think the chief danger from this insect is to our Carolina Poplar (*Populus deltoides* Marsh) which, to my mind, is the most important poplar from the foresters' standpoint. We were beginning to think that the Carolina poplar would be a very important tree in sand planting and in fact we are using considerable numbers in Norfolk County. I regret to find that this insect is working in that tree. Apart from the willow holts or basket willows, the damage to willows will be small. We use the other willows to a very small extent in forest planting.

The chief injury from the standpoint of the forester will likely be to the poplars and especially the Carolina Poplar.

The President: Perhaps Mr. Swaine would like to make a few remarks in this connection.

Mr. Swaine: Mr. Chairman, I have had very little opportunity to study this beetle in Canada. Some years ago in Ithaca it was very common in the basket willow in the plantations there and did considerable damage. In Canada I have found it only near Ste. Anne's and it was there in the common scrub willows and not very abundant. I have not had it sent in in the last three or four years in any numbers from any part of Canada except Ontario and southern Quebec, and very few reports have been received. Mr. Caesar's account was very interesting, indeed; the life-history is just as I remember it on the different occasions I have studied it, and the control measures usually given are not very effective; it is a very difficult matter to control this beetle. On the smaller willows no special effort to save any particular tree is worth while and the destruction of the infested trees is perhaps the only effective method. Only a few of the willows that are affected are worth saving.

Mr. Winn: Professor Caesar mentions the keeping of the beetle alive on apple or peach. I may say he very kindly sent me ten specimens of the beetle to show what it looked like in order that I might recognize it if I ever found it alive. After a couple of days I turned the specimens out on a blotting pad and pinned two or three, then noticed that instead of there being ten there were only nine. The tenth was still alive and had crawled away. This I secured and placed in a tin box and after again taking it out three weeks later, apparently dead, it recovered. This shows how long the insect can live without food being given it, and how dangerous the insect might be when capable of living through a like shortage under natural conditions.

Prof. Caesar: One of the points that I would like very much to get information on is whether any person has found the adults of this beetle in the spring. It seems to be taken for granted in the U. S. literature on this pest that it does not pass the winter as an adult, and that there are no eggs laid in the spring, but the fact that we could find a considerable number of them in nurseries suggests that egg-laying in the spring is very probable.

Mr. Swaine: The specimens that I took at Ste. Anne's were, I think, all taken in the fall. This is some years ago, so I am not quite certain on this point, but believe that they were taken in the fall.

The President: I have no doubt that if any of the members get further information in regard to this beetle hibernating in the adult form they will advise Professor Caesar of the fact, and we will now proceed to the next paper.

Dr. Felt's paper was read by Mr. Gibson.

SIDE INJURY AND CODLING MOTH.

E. P. Felt, Albany, N.Y.

This type of injury has been unusually abundant in the western part of New York State for the past four years. It appears to have been figured and described first by John W. Lloyd in 1907 (Bul. 114, Ill. Agr. Exp't Sta.). He, however, attributed the damage to the work of the second brood.

Investigations the past season established the connection between late-hatching first brood larvæ and this type of injury. Many codling moth eggs are laid in the lake region the latter part of June and early in July on the fruit. The young larvæ hatching from these eggs enter the exposed, smooth surface of the developing apple and excavate a shallow gallery having a radius of approximately 1/16 of an inch. This is probably a manifestation of the leaf-mining habit of the young larvæ, recorded by a number of observers, in relation to those hatching from eggs deposited upon the foliage. A few days after entering the fruit many of the larvæ desert the initial point of injury and make their way to the blossom end. The impulse to desert a perfectly satisfactory shelter and brave the dangers of migration to the blossom end can hardly be explained as other than inherited and an outcome of the same unrest which, under other conditions, leads the larva to forsake the leaf mines and search for fruit. The attempt to enter the apple once more is frequently a failure on sprayed trees, owing to the poison deposited in the calyx cup in the after blossoming treatment. Unfortunately, so far as the apple grower is concerned, the young codling moth larva does not perish until the characteristic mark has been made on what should be an unblemished surface.

Records made during the past four years by Mr. L. F. Strickland, Horticultural Inspector of the New York State Department of Agriculture, show that as much as 20 per cent. of the fruit may be affected in this manner. Investigations by the speaker last summer indicate a somewhat general prevalence of such conditions along the south shore of Lake Ontario. In one orchard at Newfane, 9 to 12 per cent. of the total crop on three sprayed plots bore this side blemish, while in an Orleans county orchard similar plots showed from 25 to 35 per cent. side injury. The unsprayed or check plots in these two orchards had from 30 to 37 per cent. respectively, of the apples thus affected. It should be stated in this connection that very little "side injury" is to be found in Hudson Valley orchards.

The somewhat general limitation of this type of work to the vicinity of a large body of water leads us to believe that this variation in habit may be caused by local climatic modifications. There is on record a statement by Cordley to the effect that eggs are not deposited when the evening temperature falls much below 60° F. In this connection some interesting data has been published by Sanderson (N. H. Agr. Exp't. Sta., 19th-20th Rep'ts., 1908, p. 406). He finds that if evenings be cool, egg laying will sometimes be deferred for several days, and states that from June 9th to 15th, 1906, he was able to secure eggs but after that the evenings were cool until the latter part of the month and no eggs were obtained until June 28th. Again, in 1907, "no eggs were found until June 22nd * * * * though moths had been emerging since the 10th." An examination of records made the past four years by Mr. Strickland shows a fairly close connection between this type of injury and the rise of daily minimum temperatures above 60° F. The damage referred to above occurs mostly the last of June and the first half of July, and so far as records go, is preceded by a period of low temperatures which probably inhibit the crepuscular or nocturnal activities of the moth, and then with the rise of minimum temperatures above 60° F. we have the deposition of eggs and the development of side injury.

The low minimum temperatures from about the time the moths begin to emerge till the latter part of June, do not materially hinder the development of the apple and, as a consequence, when oviposition is possible the fruit is some size, smooth, and from observations in the orchard, appears to be more attractive to the moths as a place of oviposition than the foliage. Two, three and even four eggs were to be found upon apples here and there, though this would hardly be an average, and more than three-fourths of the eggs found were upon the fruit. This is the reverse of conditions recorded earlier by Messrs. Ball, Card, Pettit and Sanderson.

It will perhaps suffice to state in this connection that in the Hudson Valley, where "side injury" is comparatively rare, temperature records show no such prolonged periods after emergence of the moths begins where daily minimum temperatures fall below 60° F.

The "side injury" phase of the codling moth problem has a very practical bearing, since experiments conducted the past season show it to be extremely difficult, if not impracticable, to reduce damage of this character to a negligible quantity by one season's work. It happened that two of the experimental orchards mentioned above were very badly infested and in one, although the spraying was distinctly above the average, 25 to 33 per cent. of the fruit in certain plots showed the familiar side blemish. This was due largely to the fact that the injury was caused by newly hatched larvæ attacking the poorly, necessarily so, protected surface of the rapidly growing apple. These eggs, it is evident, were deposited by moths developing from hibernating larvæ, consequently this serious "side injury" was the logical development in a badly infested orchard when climatic conditions compel a late deposition of eggs, many of which may be placed on the fruit. This danger, in our estimation, is ample justification for urging thorough and annual sprayings of bearing orchards whether the trees happen to be fruiting or not. There are in most orchards, even if there is no crop, enough scattering apples to carry to maturity a number of codling moths, ignoring, if you please, the fact that Headlee and Jackson observed larvæ which developed to full size in water sprouts.

It is noteworthy in this connection that the experimental orchard of last season, not badly affected by "side injury," was sprayed annually and presumably thoroughly, even when not in fruit. The same was true of some other orchards where there was very little codling moth injury. That this comparative immunity could not be attributed entirely to accident was evidenced by the fact that just across a roadway from the orchard showing almost no injury, trees were found with 75 per cent. of the apples on the ground wormy.

The President: This paper of Dr. Felt's is of great interest to those who are engaged in fruit insect investigations, particularly insects affecting the apple. The Codling Moth damage, of course, is usually internal and quite serious, but on the other hand it is a kind of damage which, even if slight, may produce a blemish on the outside of the apple, which is very serious from the fruit grower's point of view, in view of the fact that it degrades his fruit. You may have a very fine apple, which ordinarily would rank as No. 1, but through some blemish produced in this way by the Codling Moth it is degraded to No. 3. This proves to be very serious in the case of the large fruit grower. In Nova Scotia, Mr. Sanders is making a study of a somewhat similar injury caused by the Budmoth, which also reduces the quality of the apple by a blemish of much the same nature as the one caused by the Codling Moth. I think it might be well to mention here that in his investigations Mr. Sanders found that there was injury being caused by another insect imported from Europe, and he sent me the other day a photograph of the injury caused by this insect, the Lesser Budmoth, *Recurvaria nanella*. As a number of men here have been working on insects affecting apples and fruit generally I have no doubt that they will have something to say in regard to Dr. Felt's paper.

Prof. Caesar: In regard to the matter of side-worms, I may say that every persons who endeavors to spray thoroughly for Codling Moth finds that far the greatest trouble is to prevent the worms from entering the side of the apple, especially if there are two broods and if it is the first season the orchard has been sprayed. I do not know anything about the influence of temperature on this questions of side-worms, but I do know that in Ontario side-worm injury is abundant both on high land and on low land.

Mr. Gibson: Mr. Chairman, I should like to remark that in Dr. Cosens' report which he sent as Director, he makes a brief mention of the occurrence of the Lesser Budmoth on pear trees in Toronto, and he also mentions that it was quite abundant on an apple tree. This insect is treated of in a bulletin published by the U. S. Bureau of Entomology.

The President: If there is no further discussion on this paper we will proceed to the next by Mr. Winn.

THE HOME OF GORTYNA STRAMENTOSA

Albert F. Winn, Westmount, Que.

This moth is one to which but little space has been devoted in our literature, but being a typically Canadian insect, perhaps you will pardon a longer and more rambling paper than intended for the meeting.

In Vol. XXXII, pp. 61-63 of the Canadian Entomologist, Mr. J. A. Moffat, late curator of our Society, published a copy of Guenée's description of the moth, an enlarged half-tone cut of it and some remarks on its occurrence. This was followed in the same volume by a note on p. 119 by Mr. Grote, and a reply on p. 133 by Mr. Moffat. The species has again been figured by Sir George Hampson in Vol. IX of the Phalænidæ of the British Museum, plate 138, to which we will refer elsewhere. From Mr. Moffat's article we quote the following: "*Stramentosa* has been taken regularly at Montreal for years past by collectors connected with the Branch of the Entomological Society of Ontario there, apparently none knowing of its existence there except themselves. Mr. Brainerd intends to make a vigorous effort to discover its foodplant next season."

Although over fifteen years have elapsed since this was written and we had already been hunting over ten years, the search for its foodplant and consequent laying bare of the life history has been carried on faithfully and well by various members of our Branch, and at last it has fallen to my lot to have the pleasure of entirely solving the mystery of its hiding-place. It is not necessary to particularize the members who have tried to locate it and failed; practically all of us interested in Lepidoptera have searched our Mountain for infested plants possibly tenanted by *stramentosa*, and we had a few years ago the aid of Mr. Henry Bird for a couple of days; but although we were actually within a few feet of scores of larvæ, they were not detected. It is doubtful if any other Canadian insect has had so much time and thought expended on its habits and life history, and as successive seasons closed with the flight of the moths around our street lamps in the fall, and occasional captives on flower heads, we began to feel certain that no visible clue could be hoped for in the plant and that nothing but sheer luck would ever disclose the secret, but we kept on pulling up and splitting down all sorts of possible and some impossible plants.

On the afternoon of September 13th, 1914, while walking along a path on our Western Mountain, near the ski-grounds, looking for edible fungi rather than for insects, I found a *stramentosa,* resting on a leaf of the rattle-snake root (*Nabalus racemosus*) and a minute later disturbed another on a plant of the same species. This plant was given a tug and it broke off short, but the root was easily dug up and was evidently bored. On going back to the first plant, it was also found to have been attacked. Things began to look interesting and mushrooms were put aside for another day. By tramping among the plants and beating them with a stick, a number of the moths were disturbed, either dropping to the ground or flying a short distance and hiding. Among the hundreds of plants in the neighborhood a plant here and there was pulled up and most of them showed they had been bored, and we felt so sure that the long-sought for plant had been stumbled across that a supply of seeds was sent to Mr. Bird so that he might have a supply of plants in his "garden of borers" at Rye, N.Y., ready for the larvæ that would follow another season.

Early this June, when the larvæ of the borers were beginning their work in burdock, thistle, cicuta, iris, etc., the same locality was visited, but the Nabalus plants were hardly visible above ground and those dug up showed no sign of attack. We concluded that we were too early, for the moth being later in appearing than most of the borers, it seemed possible that the egg was also later in hatching. The next visit was three weeks later and the plants were about two feet high, but the most careful search failed to find any trouble. Something had evidently gone wrong with our discovery of the previous fall and *stramentosa* was still surrounded by a mystery. One thing was very certain, however, namely, that if I had disturbed a dozen or so of the moths there must have been in the neighborhood scores or hundreds that were not seen, and as the number of examples seen about the lights each year was about uniform, there *must* be a lot of larvæ close at hand. If they were not in Nabalus, they must be in something else growing commonly there. Fortunately I was in a clear patch on a hillside and could get a sort of bird's-eye view of the tangle of weeds and undergrowth. A plant was noticed that we had seen in many places on Mount Royal Park and an isolated clump was selected. There was no wilted top nor brown leaf to indicate attack, but on splitting the longest stem down from the top, a boring was struck about a foot from the ground and a section containing the little larva was quickly boxed. Other plants were similarly treated but nothing was found, and it looked as if our day's take was going to be only one larva. Something suggested that we were again off the track, so we opened our box, removed the larva from its boring and had a good look at it. It was seen to belong to a different genus—*Papaipema,* probably *P. cataphracta,* and such it proved to be. This in itself was rather a discovery, as the insect, though common enough in Ottawa and elsewhere, is seldom found with us, and it seemed remarkable that the very first stem selected to be split open should have contained a larva, which prevented my continuing the process down to the ground, which is the simplest way of locating boring larvæ in their earlier stages. We could not recollect ever having pulled up a clump of this plant on any previous occasion and as we looked at the erect stems with their perfect foliage surmounted by the forming seed pods, which later on rattle merrily when touched, it seemed incredible that they should be bored; and yet, that little cataphracta had been in one stem, equally perfect externally. A cluster of stems coming from one root was grasped and given a tug. Up it came, and after giving it a shake, a fine fat larva about $1\frac{1}{4}$ inches long was seen shuffling back into its burrow. As we were extricating him, another dropped to the ground and was secured. This surely was our quarry at last. Another clump was pulled up, two more larvæ and so on, as many as eight being taken in one clump and no blanks, every clump seemed to be attacked. Other plants noticed here and there on the way home were examined and proved to harbour larvæ in their roots. There was, henceforth, no shadow of doubt as to the home of the *stramentosa.* But what was the plant's name? I tried to determine it by Gray's Manual of Botany, but was misled by the square stem in trying to locate it among the members of the Mint family. A specimen was sent to the Dominion Botanist and Mr. Adams kindly determined it as belonging to the genus *Scrophularia,* but did not like to state the species owing to the absence of flowers. On referring to Britton and Brown's Botany, our plant was easily recognized by the cut and description as being *S. leporella*—the hare figwort—but to make doubly sure, the original description was turned up in Vol. 33, p. 317, Bulletin of Torrey Botanical Club (1896)—so *stramentosa* may be given the common name of the "Fig-wort borer."

As I was leaving town for my holidays within a few days, the bulk of the larvæ and roots were packed up and sent to Mr. Bird, only a few being kept as I felt sure that on my return any desired quantity of full-grown larvæ could be secured and that the pupæ would be likewise found in due season. Mr. Bird was away on a *Papaipema* hunt in Illinois when the package arrived, but his son looked after it and was successful in obtaining the imagos and so quickly that we might almost suspect that he used an incubator in his anxiety to get the first bred *stramentosa.* On my return I found several larvæ had pupated, while the rest died of starvation owing to the drying up of the roots. A series of wet days and other contingencies prevented my getting any time to visit my hunting-ground till Saturday, August 20th, by which time it was supposed all would be in pupa. In the first clump selected a larva was found and evidence that there had been another, so I proceeded to get out my entrenching tool and began scraping away the earth carefully. At a depth of about two inches a fine yellowish-brown pupa lay exposed, wriggling about in a very lively fashion as if not at all appreciating being disturbed. Proceeding to a nearby clump resulted in two more—then six, which is the most found under one plant, and in the course of three-quarters of an hour, thirty had been boxed. Reluctantly we were compelled to stop, as the drizzling rain which had been falling was becoming heavier and the vegetation was decidedly moist to work among. The pupæ were all found in the same situation as the first, namely not over two inches below the surface, invariably on their sides, without any cocoon or cell and wriggling much when disturbed. All were within a foot's radius from middle of root. The question occurred: how would the moths emerge from those earthy homes? Would they force their way through the soil or would instinct tell the pupæ to come to the surface? Having brought home a supply of soil from the woods a layer was put in two breeding cages, 18 pupæ were placed in one cage and 12 in the other, all in a horizontal position, and were covered with about two inches of soil and on top was an inch or more of the *prepared fibre,* sold by the florist for growing bulbs. This I find an excellent material for keeping burying pupæ moist enough without inducing mold. Two days later the question was answered. Seventeen of the pupæ were visible, some were on their sides, but most of them were nearly vertical, tail up. To what extent the cremaster aids the tunneling process was not ascertained, but its structure is suggestive that it might be useful.

On August 30th my first moth appeared. The following evening I went straight from the office to the woods but it was nearly 6.30 when the ground was reached and four pupæ were all that were secured in what remained of the daylight. The next Saturday afternoon, September 4th, was warm and bright, rather too warm in fact for digging operations. Pupæ were found nearer the surface and two sticking up on end, cremaster up, as in the cages. Collecting at this date, though successful, is difficult, for the digging implement is almost sure to injure about as many pupæ as it unearths sound ones, so after cutting in two or dinting over twenty a piece of wood was substituted. It was not much improvement as the extra force required to use it bruised the pupæ instead of cutting them in two. On returning home it was found that twenty-six sound pupæ was the result of the outing. But this was not all, for two larvæ were found, one evidently sickly, the other full-grown and well below the ground ready to pupate. One empty pupa shell was also picked up and the plant above searched for the moth. Whether it was this one or another I disturbed during my search cannot be said, but happening to look down a moth was seen running along among the leaves on the ground and took refuge under one of them. When disturbed, she ran off and finally hid under another leaf—the performance exactly resembling that of *Amphipyra tragopogonis* which in England has earned for itself the common name of *The Mouse*. Several other moths had by now emerged in the cages and many pupæ were darkening up in color, betokening early emergence. In doing this one escaped and fell to the floor, without attempting to use its wings, and immediately scurried about on the floor in search of a hiding place. It was noticed that the moths in the cages all appeared to try to squeeze themselves as close into the dark corners as possible, often remaining two or three days without altering their relative positions. It is, of course, possible that during the night they may have flown or moved about and returned to their post before morning, but the habit of secreting themselves by day is evident.

Having a supply of living moths the next point was to secure eggs, and not having any experience in getting bred specimens of Noctuids to mate in captivity, I tried every plan I have ever used in the case of moths belonging to other families, but was unable to get a pairing among themselves, and freshly emerged females placed on the inside of screen doors and taken into the woods failed to "assemble" any flown males. Finally a large skeleton box, about thirty inches each way, covered with netting, was put in the garden, with stems of several figwort plants stuck vertically in the ground, as well as the cuttings of such perennials as were in flowers and some twigs and leaves smeared with sugaring mixture. After feeding all the moths forcibly, they were turned into the moth paradise. Two days later, success was attained, one moth having selected a blue-bell, and in the axil of the leaf deposited a cluster of eight eggs, irregularly placed, while lower down on the same stem were about ten eggs in a crooked line, the lowest barely an inch from the ground, and the moth was hiding under the lowest leaf which was drooping and provided a suitable shelter. The moth was brought indoors and placed in a breeding cage with cuttings of figwort and blue-bell stems, but evidently they were not attractive-looking, for the moth would not use them, but placed eggs in all sorts of places in corners, on the glass door, loose on the bottom and most curiously on and in the empty pupa cases of its own kind. It was hoped, by observing where eggs were laid in confinement, that the habits in nature would be indicated, but the results were unsatisfactory. In no case did it seem as if the eggs were placed otherwise than as a sort of makeshift, although the use of the axil of leaf and inside of pupa cases hinted that they would probably be concealed, that is thrust in somewhere; which might have been presupposed. However, knowing what the eggs looked like, and armed with a reading glass, we proceeded to the hillside the next Saturday afternoon and looked over the plants from the ground to the top seed-vessels. The inside of the latter were very carefully examined, as well as the little cluster of leaves closely pressed together at the foot of the plants ready for next year's growth. Nothing was found, and it looked as if the old saying about looking for a needle in a hay-stack might be revised to cover looking for a moth's egg on a mountain. Next day I was in a different place, but seeing some of the figwort, pulled up a clump just to see whether it had been attacked. It had—very much so. All of a sudden it occured to me that the natural place for eggs to be deposited to secure a ready access to food supply in spring had been overlooked, and that the habit of the female running on the ground should have been a sufficient clue. As is the case with many tall perennials that are bored, there remains of the previous year's stem a little tube extending a few inches above ground and forming a natural tunnel straight to the roots. Hastily, but carefully, with a penknife this was split open and four eggs were revealed. Others were found, as many as twelve in one case, and some of them were so slightly attached that many others may have dropped down the hole. This, of course, may not be the only place the female selects, but it satisfied me that in 1915 a good deal had been found out about the home of *stramentosa*. There is one brood per annum, the egg hibernates, the larva feeds wholly in the roots of the figwort, matures about the middle of July to August 10th, the pupa lies beneath the plant about two inches below the surface, bores its way to the surface tail first, the moth, emerging, tumbles the pupa over, and climbs very rapidly up the plant's stem, stops, holds its soft wings by its sides for eight to ten minutes, then when about half expanded, suddenly flaps them together over the back like a butterfly at rest, and remains in that position till the wings are fully developed, or about half an hour. The wings are then lowered, and the moth crawls into a corner and stays there. How long it takes for the wings to become dry enough for flight was not ascertained. Most of the moths emerged between five p.m. and eight p.m. No parasites were observed, but indoors the wriggling pupæ proved enticing to a pair of mice, and one of my small cages having a cotton netting in front was entered, with the result that there was a round hole in the net and the chrysalids went away inside the mice. They were evidently relished, for next night a trap caught one mouse and the following night the other. This suggests that field mice may greatly reduce the number of pupæ after they come up and wriggle about on the surface of the ground. The moth most closely allied to the figwort borer—*G. immanis,* the hop-vine borer—is said to be considered as a particularly choice delicacy by skunks (Can. Ent., XIV, 93-95), one hop-grower stating that he had seen ten acres where not a dozen hills had escaped their little noses. It may be that the absence of this odoriferous mammal from the neighborhood of Montreal has given *stramentosa* a chance to increase in the land.

Detailed descriptions of the various stages will be published shortly by my good friend, Mr. Bird, as in view of his wonderful knowledge of the life histories of the boring Noctuids, it seemed more in the interests of science that the making of descriptions and comparisons should come from his pen than from mine.

The President: We are very pleased to have Mr. Winn's paper, and I should like to thank him for the specimens of this interesting moth which he has placed in our National Collection here. It has been said to me by a keen external observer of the activities of this Society for many years that there is a preponderance of economic papers in our programme, and that this is not as it used to be, that in the old days there were more papers of a purely scientific character by such men as Mr. Winn, who are not professional entomologists but who follow entomology as their chief hobby. For that reason we are especially pleased to have Mr. Winn's paper. It would be a very bad day for the Society when papers of such a nature cease to appear in our proceedings, and for that reason also we shall look forward to hearing a number of other papers by our old friends who are not professional entomologists, such as Dr. Fyles' paper this afternoon and Mr. Morris' paper to-morrow. The paper is now open for discussion.

Mr. Gibson: The study of these Lepidopterous boring larvæ such as Mr. Winn has told us about is one which has always given great pleasure to those who are interested in rearing the larvæ of our moths. We have not, as yet, found this insect at Ottawa, but now that we know more about the larvæ and what they feed upon we hope that we may be able to find the species. The chief boring larva of this family which occurs in the Ottawa district is called the Burdock Borer, *Papaipema cataphracta*. This is quite a pest, some years attacking soft-stemmed flowering plants, such as dahlia, lily, etc., and in addition, of course, it occurs in burdock and thistle. I am very glad to know that Mr. Winn has donated specimens for the collections here.

Sir James Grant: Mr. President, I should like to make a few observations. I am happy to inform you that after a very careful survey of the Dominion of Canada, from Victoria on the Pacific to Halifax on the Atlantic, through the whole of Central Canada and New Ontario, that the work of this Entomological Society has proved of great practical value to Canada in the Department of Public Health. The information that you have given to our people on the part played by the house-fly as carriers of disease has conserved very materially the life of the people of Canada. Those house-flies play, as you know, a very important part in the dissemination of tuberculosis from sputum. There is now, I am happy to inform you, as you will find in my report recently presented to the Canadian Public Health Association at Toronto, a reduction in the past fifteen years of fully twenty-five per cent. in the number of cases of tuberculosis. I have lately gone through whole sections of Central Canada where fifteen years ago the disease was very common, indeed, hundreds of cases in nearly every direction. To-day, with difficulty, in those sections can you discover a solitary case of tuberculosis, and I am happy to inform this Association that if they continue the good work they have done in the past in the preservation of health by similar measures, and by the destruction of the house-fly, I am confident that the next ten or fifteen years will bring about a reduction of this disease of fully fifty per cent. The head of the Pasteur Institute, Paris, France, has recently announced that throughout the whole of Europe there is now a reduction of fully twenty-five per cent., and I am very glad, indeed, to have accepted your kind invitation to attend this meeting to thank you and the members of this Association, for the active part taken in instructing our people, as to the vast importance of the destruction of this house-fly, which is undoubtedly very instrumental in the production of the death rate from tuberculosis.

Dr. Hewitt: We are very pleased to have Sir James Grant with us and I hope that he will attend as many sessions as he can and hear other papers of interest.

INSECTS OF STE. ANNE'S, QUE., SEASON OF 1915.

E. Melville DuPorte, Macdonald College, Que.

During the past season there were outbreaks of several injurious insects at Ste. Anne's and the surrounding country, the most important of which are discussed below.

Grains and Clovers.

The Frit Fly (*Oscinis carbonaria*) along with the Wheat Stem Maggot (*Meromyza americana*) caused appreciable injury to small grains. These insects which have not, at least within recent years, been destructive in this region were more plentiful than usual.

Hessian Fly injury was observed by Mr. P. I. Bryce in the experimental plots at Macdonald College. Hitherto these plots have been free from this pest. As the plots worst affected were in the neighborhood of a manure pile it is practically certain that the insects were brought in with the manure.

The more important insects of the clover during the season were the Clover Seed Chalcid (*Bruchophagus funebris*), The Lesser Leaf Weevil (*Phytonomus nigirostris*), The Clover Mite (*Bryobia pratensis*), The Pea Aphis (*Macrosiphum pisi*), and *Tychius picirostris*. The Seed Chalcid was quite destructive during the seasons of 1913 and 1914. The injury due to it was not so marked during the season under discussion, but its work was supplemented by that of the Lesser Clover-leaf Weevil, the larvæ of which destroyed a fair proportion of the red clover seed. The Clover Mite was quite abundant in the latter part of the season.

Locusts. The locust outbreak was very severe in the Province of Quebec during the past season. Not only forage and field crops, but some garden crops were severely injured. The species most numerous and causing most injury at Ste. Anne's was the red-legged locust (*Melanoplus femur-rubrum*). *M. bivittatus* was also quite numerous. At Macdonald College the poisoned bran mash, Kansas formula, was used to protect the experimental plots. For some reason the mortality among the locusts was not as high as expected. The incursion of locusts from neighboring untreated fields increased the difficulty of controlling the pest and for this reason strong emphasis should be laid on co-operation among farmers in combatting these insects.

Field and Garden Crops.

Cutworms. Another very serious outbreak of cutworms occurred in parts of the Province, causing considerable injury to garden and field crops. At Ste. Anne's the species responsible for most of the injury was the striped cutworm (*Euxoa tessellata*), but a few white cutworms and red-backed cutworms were also found. Several parasites of these insects were actively at work, and the relatively small number of moths observed holds out some hope that the cutworms will be less destructive next year.

Root Maggots. Both the cabbage root maggot (*Chortophila brassicæ*) and the seed corn maggot (*Chortophila fusciceps*) were the cause of much injury to cruciferous crops. In some turnip fields a large proportion of the plants was destroyed by the seed corn maggot even after the tops were practically full grown and the roots had attained a fair size. The carrot rust fly (*Psila rosæ*) was more injurious than usual this year, causing considerable loss in small kitchen gardens.

The Beet-Leaf Miner (*Chortophila vicina*) was injurious at Ste. Annes to mangels, beets and spinach. Complaints were received also from other parts of the Province.

The Hop Flea-Beetle (*Psylliodes punctulata*). Beets and mangels were badly attacked by this insect in the early part of the season. It was the only flea-beetle which occurred in very large numbers at Ste. Anne's.

The growing of parsnip seed for the first time at Macdonald College introduced there a new pest, the Parsnip Web-Worm (*Depressaria heracliana*), which greatly reduced the yield of seed. This insect is always present in the wild carrot at Ste. Anne's but has not before given us any trouble.

Orchard and Small Fruits.

The Plum Slug (*Eriocampoides limacina*) was very destructive during 1913 and 1914, and judging by the number of adults which emerged last spring and the number of eggs laid, I expected a severe outbreak this season. The eggs, however, were so effectively parasitized by the chalcid *Pentarthron minutum* that it was not even necessary to spray for the slug.

The Budmoth (*Tmetocera ocellana*) continues to be injurious in various parts of the Province, especially in poorly kept orchards. Its parasites were at work, *Pentarthron minutum* being most active. Experiments on the control of the budmoth larvæ indicated that they could be kept in check by the application of two sprays, one three days before the blossoms open, the other shortly after the petals fall. It was also found that lead arsenate at the rate of $2\frac{1}{2}$ lbs. per 100 gallons of spray, applied at the end of June while the eggs are on the leaf, will destroy a very large proportion of the newly hatched larvæ.

The Cigar Case Bearer (*Coleophora fletcherella*) was present on unsprayed trees but gave no trouble in well kept orchards.

The work of the Buffalo Tree-Hopper was very evident in some orchards. In a young orchard of about 4,000 trees, not far from Ste. Anne's, this insect has dwarfed and deformed several of the trees to such an extent that they are practically valueless.

Among the insects injurious to small fruits the more important were the Currant Saw Fly, the Raspberry Saw Fly, and the imported Currant Borer.

THE OCCURRENCE OF TYCHIUS PICIROSTRIS ON CLOVER AT STE. ANNE'S, QUE.

E. Melville DuPorte, Macdonald College, Que.

Last May I noticed that the leaves of red clover which forms a cover crop in an orchard at Ste. Anne's were being destroyed by a small snout beetle. This insect was present in large numbers feeding gregariously on the leaves, in many cases upwards of twenty being found on a single leaf. On being disturbed the weevils readily "feigned death" and fell to the ground. Specimens sent to the United States Bureau of Entomology were identified as *Tychius picirostris* by Mr. E. A. Schwarz.

Later in the season, as soon as the clover came into bloom, the insects deserted the leaves and attacked the flower heads in which they remained throughout the season. My latest record is dated September 28th.

The weevil was found in practically all fields of common red and mammoth red clover in the neighborhood of Ste. Anne's, but did not seem to attack other varieties.

The adult beetle is a small curculio about 2.25 mm. long and 1 mm. broad. The interspaces of the elytra are thickly clothed with narrow, hair-like, procumbent scales, the elytral striæ are naked. The ventral side of the body bears somewhat broader scales. Pronotum punctate; not much narrower than the elytra; its length about equal to its greatest breadth; narrowed in front; the scales on the pronotum and also on the legs are similar to those on the elytra. The head is sparsely clothed with fine hairs; the beak is about as long again as the head and clothed at its basal end with scales like those of the elytra.

The scales of the elytra and prothorax give the weevil a pale olive green colour, but they are rubbed off as the insect gets older, leaving the elytra and pronotum bare so that the insect gradually assumes a dark brown colour.

Tychius picirostris is not an indigenous form, but has been introduced from Europe where it attacks the flower heads of red clover, plantain and *Genista*. It has not before been recorded as injurious in North America though I learn from

Tychius picirostris on clover leaf. (Original.)

Professor F. M. Webster that it has been collected at Ithaca and Oswego, N. Y., and at Framingham, Mass. I have observed it at Ste. Anne's for several years, but not before in sufficiently large numbers to be regarded as injurious.

The President: Mr. DuPorte is to be congratulated on his account of his season's work, which indicates how very active he has been and to what good purpose he has directed his attention. We here have been particularly interested in his observations on *Tychius picirostris*, this new pest of clover, and probably Mr. Gibson has some remarks to make about this.

Mr. Gibson: We have a specimen in the collection which may possibly be this species and which is from Brockville. We have not, however, examined it carefully enough to be certain. I was glad to hear of the eastern occurrence of the Hop Flea-beetle, which Mr. DuPorte referred to.

Prof. Lochhead: I would like to remark in regard to Mr. DuPorte's papers that I had not much time to give to the work done by Mr. DuPorte, who is a member of the Biology staff of Macdonald College as investigator under the Dominion Federal Agricultural Institution Act. He has done a great deal of work of which this is a small fraction, and he has other more elaborate work at hand. It is especially in the line of anatomical work that his investigations are valuable. I know of no person in Canada who is more adept or more patient in the unravelling of minute anatomy than Mr. DuPorte, and we may expect to hear of some of his investigations a little later. He had the honour of presenting a paper to the Royal Society last year, and I feel sure that Mr. DuPorte will favor us year after year with his attendance and give an account of his work.

The President: If there is no further discussion I think we will conclude this morning's session.

THURSDAY, NOVEMBER 4th—AFTERNOON SESSION.

The President: We are to begin the afternoon session with a paper by Dr. Fyles. Dr. Fyles needs no introduction to the Entomological Society. He is the oldest member among us, and when he said last year that the paper he presented would be probably the last I well remember disputing the fact with him, and apparently my own prophecy has proved correct in that we are to enjoy another paper by Dr. Fyles entitled "Observations Upon Some of the Predaceous and Parasitic Hymenoptera."

OBSERVATIONS UPON SOME OF THE PREDACEOUS AND PARASITIC HYMENOPTERA.

Rev. Dr. Fyles, Ottawa.

One day in summer, I was sitting under the verandah of a friend's house, at Hull, when I noticed a specimen of *Pelopœus cementarius* Drury, exploring some webs that had escaped the notice of the mistress of the dwelling. The creature was in search of spiders, wherewith to provision the mud castles that it was building for its young. This incident suggested the subject of my paper.

The question entered my mind, How can I obtain a supply of the mud structures for use in the preparation of the article? I bethought me that boys are privileged, and can go where older persons cannot, without being regarded as intruders, so I asked the aid of one of Baden Powell's boy scouts, and not in vain; for next day he obtained for me an ample supply of the castles, from an unused attic of a neighboring house.

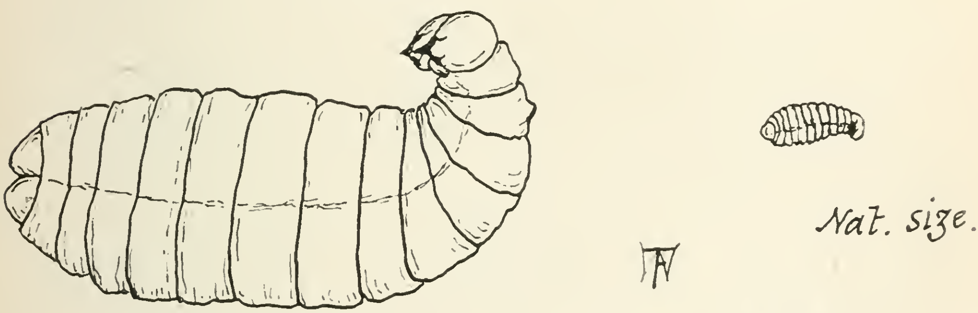
Pelopœus cementarius has practised the business of pottery from the creation of the world that now is. Its instinct impels and guides it, and its work is accurately done, according to its need.

I have watched the insect preparing material for its building.

In the grounds of the late Mr. Quartus Bliss, at Compton, in the eastern townships, there was a horse-trough hewn out of a huge basswood log. The water was supplied by a spring, and its overflow escaped at one end of the trough, through a circular cut, and formed a puddle in the clay ground. One day, when on a visit to Mr. Bliss, I saw a number of mud-wasps at this puddle gathering soil, tempering it with their mandibles, and then flying away with pellets of the cement.

The cells brought to me were in masses, and probably numbered two hundred. They reminded me of dirty peanuts jammed together. Within each was a long oval chamber, at one end of which were the remains of the spiders on which the inmate had fed. Next to these was a hard cap, rough and rounded on the outside, and concave and polished on the inside. Attached to this was a case, yielding to the touch, and somewhat brittle, but strengthened by a fine silken covering, which I found could be peeled off.

The case was semi-transparent. The form of the waxen larva, free and unattached, could be seen through it. Examined through a glass it appeared to be formed of a like silken texture as its covering, but smoothed and compacted by a vehicle that resembled glue or varnish.



Grub of *Pelopœus cementarius* (Drury) in the month of November.

As the case was complete, and the remains of the spiders on the outside of it, its occupant must have ceased to feed.

The perfect Pelopæus is a grim object, very active, very forbidding. Its "frightfulness" is its protection. It seems to say, "You let me alone, and I'll let you alone." In reality it is one of our insect friends.

I think three spiders for each would be a low estimate for the provision made in the cells brought to me. That would give 600 spiders collected in the immediate vicinity of the house in which the cells were found. Now, when you call to mind how prolific the female spider is, you will be able to form a faint idea of the terrible and disgusting plague from which the mud-wasps preserve us.

But the spiders have their use in the economy of nature. Are there no counter checks against the undue increase of the mud-wasps? Yes, several ichneumon-flies have been recorded as preying upon them: for instance, *Cryptus junceus* Cresson (Am. Ent., Vol. I, p. 137).

Some years ago, I had a batch of Pelopæus cells in my study window. One day, when the wasps were breaking from their domiciles, I found a specimen of *Sarcophaga prœdator* Zabriski in the window. I can only account for its presence by supposing that it came from one of the mud cells. If my surmise is right, how can we account for the presence of intruders such as this in the mud castles of the wasp? I think that Prof. W. S. Blatchley, in "Woodland Idyls," pages 206-9, has supplied an answer. He tells that he saw an ichneumon light upon a spider, *that a wasp was carrying off,* and deposit an egg in it.

Zabriski found *S. prædator* in the nests of *Vespa maculata* Linn., and *Vespa germanica* Fabr., insects of widely different nesting habits. Has it a wider choice of domiciles? It may have.

The Digger Wasps should be numbered among our insect friends.

One summer day, a few years ago, I was walking in the beautiful cemetery at St. Joseph de Levis when I came to a bare and unused portion of ground. The soil was light yet not friable. It seemed to be just suitable for the operations of *Bembex fasciatus* Fab. About a score of these insects were in sight, some of them sinking shafts in the ground; others storing their shafts already completed with Blue-bottle flies.

It must be told here that a considerable tract of Government land lies near the burial ground which I have spoken of; and that some of the dwellers in the vicinity were guilty of the reprehensible practice of carting their garbage out to this waste land, and leaving it there uncovered. It was not surprising that Blow-flies were plentiful in the neighborhood, and that Digger Wasps and Carrion Bettles were plentiful there, too.

I once saw *Ammophila communis* Cresson, staggering along with a caterpillar larger than itself, and then burying it in a hole previously prepared.

The monarch of our Canadian ichneumons is undoubtedly *Thalessa atrata* Fab.

On the 17th of June, 1899, the Quebec Branch of the Entomological Society, which was then in a flourishing condition, held a field day in the grounds of Mr. Harper Wade, of New Liverpool, Quebec. Mr. Wade's house is on a bluff overlooking the St. Lawrence. Behind it is an extensive lawn bordered by ornamental trees and shrubs. At the time of our visit a huge maple log had been sawn into blocks of stove length, ready for the splitting; but the owner had placed them here and there, under the trees, for rustic seats. On approaching one of these I found several female specimens of *atrata* in the act of depositing their eggs, while others of the species were darting about in the vicinity. Each block had its visitors of the kind attracted by the larvæ of *Tremex columba* Linn., which were tunneling in the wood. But how were the ichneumons attracted? Was it by some subtile emanation from their victims? Who can say?

There are trees on each side of the street on which I live. A Red Maple (*Acer rubrum*) is growing a few yards from my door. On the 16th of June, 1912, looking from the portico over this door, I saw an assembly of ten or a dozen males of *Thalessa lunator* Fabr. The insects were clustered on a spot where a limb of the tree had been lopt some years before.

There was apparently much agitation amongst them. Before night two females made their appearance from the wood; and then the males dwindled in number. Only the two females remained next day.

What attracted the male insects to the spot where the females were about to show themselves? Was it scent, or sound, or some influence we know not of?

While speaking of the Longtails let me say that some years ago, I took on the Heights of Levis a Thalessa of great rarity. It is about the size, and of the same rich sienna-colour as *Thalessa lunator* Fabr., but very different in its markings. Instead of the lunettes which are seen on the abdomen of *lunator*, there are, on each side of the 3rd, 4th and 5th abdominal segments of the insect I am speaking of, a bright crome-yellow circle upon a black fascia which passes round the segment. I presume that this insect is *Thalessa nortoni* Cresson.

Epialthes gigas Walsh, which closely follows the above in our lists, has a forbidding appearance. Epialthes (Gr.) means a *nightmare, one that leaps upon you.* Not a bad name! Decidedly it is better to have the insect preserved in the cabinet than alive in the bed-chamber.

I have in my collection, amongst many other useful insects, representatives of twenty-two species of the genus *Ichneumon.* They attack the Noctuids. I have seen *Ichneumon lætus* Brullé break from the emptied skin of a cut-worm.

The micro-hymenoptera are valuable friends to man. I have here a family of 103 specimens of *Apanteles longicornis* Provancher, which fed in one Tussock caterpillar, and then spun their cocoons around the remainder of their victim.

To show how thoroughly the work of the micro-hymenopterous parasites is done, and how important it is, in sometimes un-noted directions:

Those who have stood on a Quebec wharf in the blueberry season, and seen the Saguenay steamboats discharging their freight, will have noticed the stacks of rude boxes, made of slabs from the sawmills, and filled with blueberries, landed there; and they will have witnessed the eagerness with which dealers have made bids for them. The reflection will have come into their minds, what an important source of revenue—what a provision of food—the blueberry crop must prove, to the poor inhabitants of the Chicoutimi and Saguenay wilds, and how serious a loss to them its failure would be.

In May, 1895, I sent to Mr. Wm. H. Ashmead, a number of galls that I had found on the blueberry bushes at Levis, and specimens of the flies that I had raised from them. Mr. Ashmead replied:

"The gall on Vaccinium is my *Solenozopheria vaccinii* described in 1887 (Trans. Am. Ent. Soc. XIV, p. 149).

"The parasite reared from it is my *Megorismus nubilipennis.* The gall occurs abundantly on various species of Vaccinium, in all parts of the country, but the maker is extremely rare; and the only one known, so far as I know, is my single type specimen. I took the gall by the hundreds, and have never reared but one specimen of the gall-maker; all other things reared from it being parasites. I have reared several distinct species of micro-hymenoptera from it, although of these the *M. nubilipennis* was the most common."

One of the most brilliant little micro-hymenoptera came under my notice in peculiar circumstances, and has remained a memory and a mystery to me to this day. The late Mr. Joshua Thompson, of D'Aubigny Villa, Levis, sent to me one day in July, begging me to come and see his plum trees. The trees were loaded with half-grown fruit; and a most remarkable invasion of the trees had occurred. I never witnessed anything like it. There were myriads of tiny hymenopterons upon them. I counted as many as thirty on one plum. The females of the species had their ovipositors thrust deep into the fruit.

I submitted specimens of the insects to Mr. Ashmead and he declared them to belong to a new species. I named them *Torymus thompsoni,* and I published a full description of them in the Thirty-fourth Ann. Rep. of the Ent. Soc. of Ont., page 10. The type of the species is in my collection in Ottawa.

I had previously raised specimens of *Torymus sackenii* Ashmead, from blisters on the leaves of Golden Rod.

In the valuable series of Farmers' Bulletins issued by the Bureau of Entomology, at Washington, there appeared lately an article by Mr. F. M. Webster, which reminded us of a time when the hearts of men began to fail them for fear because of the devastations wrought in their grain fields by the Hessian Fly. Where this insect comes in its strength—to use the words of Mr. Webster—

"hundreds of thousands of acres of wheat may be either totally, or so badly injured as to reduce the yield 50 to 75 per cent., and the monetary losses expressed in dollars would run far up into the millions."

Agriculturists, at the time I have alluded to, were at their wits' end to discover checks upon the destroyers. The checks came, but they were not of man's devising. Doubtless, in the beginning of the world that now is, such interruptions and disturbances in the order of nature, as the Hessian Fly plague—

"Deep in God's foreknowledge lay."

And it was He who brought to bear the minute antagonists of the fly, that are so well figured in the bulletin I have mentioned, viz.: *Polignotus hiemalis, Merisus destructor, Platygaster herrickii, Bæotomus subapterus.*

A bulletin on the Hessian Fly has also been written by Mr. Norman Criddle, and published by direction of the Minister of Agriculture, Ottawa. In it a full description of the pest, its life-history, and its operations are given. A reference to its hymenopterous parasites is also made.

Such investigations as Mr. Webster and Mr. Criddle, and others of our practical Entomologists, are carrying on, dignify our favorite study, and raise it far above trivialities and hobbies. In following out the life-histories of our insect friends and insect foes, and showing how wonderfully they work for the general good, they—

"Justify the ways of God to man."

In pointing out the best methods of operating under the vicissitudes of nature, of remedying evils, and advancing benefits, their work is ennobled, for the are "workers together with God."

HYMENOPTERA PARASITICA—ICHNEUMONIDÆ TAKEN IN THE PROVINCE OF QUEBEC BY THE REV. DR. FYLES.

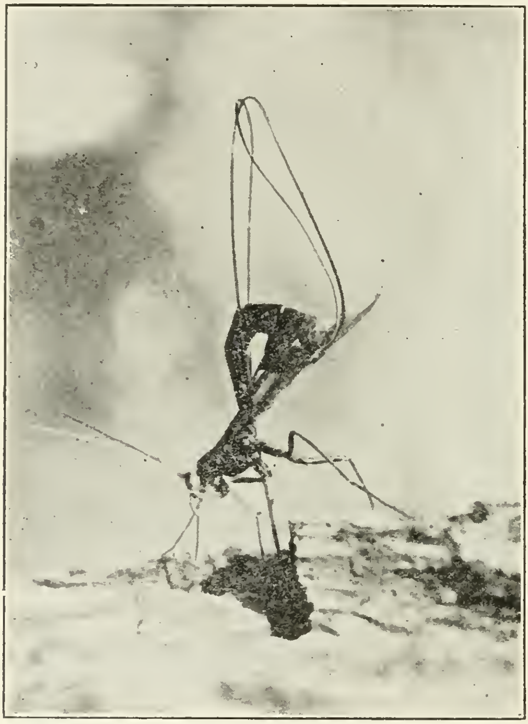
ICHNEUMONIDÆ.

Ichneumon annulipes Cresson. Levis, rare.
Ichneumon canadensis Cresson. Levis, common.
Ichneumon cincticornis Cresson. Levis, common.
Ichneumon comes Cresson. Levis, common.
Ichneumon creperus Cresson. Levis, common.
Ichneumon extrematus Cresson. Levis, rare.
Ichneumon flavicornis Cresson. Levis, common.
Ichneumon flavizonatus Cresson. Levis, common.
Ichneumon grandis Brullé. Levis.
Ichneumon insolens Cresson. Levis.
Ichneumon jucundus Brullé. Levis, rare.
Ichneumon lætus Brullé. Levis, common.
Ichneumon malacus Say. Levis, rare.
Ichneumon paratus Say. Levis, rare.
Ichneumon pictifrons Cresson. Levis.
Ichneumon promptus Cresson. Levis, rare.
Ichneumon rufiventris Brullé. Levis, rare.
Ichneumon sublatus Cresson. Levis, common.
Ichneumon unifasciatorius Say. Levis, common.
Ichneumon versabilis Cresson. Levis, common.
Ichneumon wilsoni Cresson. Levis, rare.
Ichneumon xanthropus Ashmead. Levis, rare.
Amblyteles indistinctus Provancher. Levis, rare.
Amblyteles quebecensis Provancher. Levis, rare.
Amblyteles rufizonatus Cresson. Levis, rare.
Amblyteles subrufus Cresson. Levis, common.
Amblyteles saturalis Say. Levis, rare.
Trogus brullei Cresson. Levis, common.

Trogus copei Cresson. Levis, common.
Trogus exesorius Brullé. Levis, common.
Trogus fulvipes Cresson. Levis.
Herpestomus hebrus Cresson. Levis, rare.
Trychosis tunicula-rubra Fyles. Levis.
Cryptus americanus Cresson. Levis, rare.
Cryptus extrematis Cresson. Levis, parasitic in *Samia cecropia.*
Cryptus robustus Cresson. Levis, rare.
Hemiteles mucronatus Provancher. Levis, parasite of *Tricotaphe levisella* Fyles.
Hemiteles utilis Norton. Levis, secondary parasite in Acronycta larvæ.
Ophion macrurum Linneus. Levis, parasitic in the Saturnians.
Ophion purgatum Say. Levis, common.
Exochilum fuscipenne Norton. Levis, common.
Exochilum mundum Say. Levis, common.
Heteropelma flavicornis Brullé. Levis, common.
Opheltes glaucopterus Linneus. Levis, parasitic in *Cimbex americana.*
Paniscus geminatus Say. Levis, common.
Campoplex glaucus Norton. Levis, rare.
Campoplex laticinctus Cresson. Levis, rare.
Exetastes rufofemoratus Provancher. Levis, common.
Exetastes suaveolens Walsh. Levis, rare.
Sphecophorus prædator Zabriskie. Hull parasitic in nests of Vespa.
Polyblastus quebecensis Provancher. Levis.
Exyston humeralis Davis. Levis, rare.
Bassus tripicticrus Walsh. Levis, rare.
Arotes amœnus Cresson. Levis.
Arotes vicinus Cresson. Iron Hill.
Thalessa atrata Fabricius. New Liverpool.
Thalessa lunator Fabricius. Sherbrooke, common.
Thalessa nortoni Cresson. Levis, very rare.
Ephialtes gigas Walsh. Levis.
Pimpla annulicornis Cresson. Levis, rare.
Pimpla conquisitor Say. Levis, common.
Pimpla inquisitor Say. Levis, parasitic on *Hylotoma pectoralis.*
Pimpla pedalis Cresson. Levis, common.
Pimpla pterelas Say. Levis.
Pimpla tenuicornis Cresson. Levis, rare.
Lampronota americana Cresson. Levis, common.
Lampronota punctulata Cresson. Levis, rare.
Lampronota varia Cresson. Levis, rare.
Xytonomus stigmapterus Say. Levis.
Echthrus abdominalis Cresson. Levis.

THE PRESIDENT: Dr. Fyles, I should like to express on my own behalf and on behalf of the members here our great appreciation of your address, especially your peroration and your tribute to those practical entomologists who, in their work, are rather apt to forget that aesthetic and beautiful side of entomology which you so well express, not only in this but in your previous papers. Your reference from time to time of discoveries you made fifty years ago make so many of us here feel how really very young we are, and how much we have to learn from our predecessors in entomological investigation and study. I have always felt, sir, that the papers and addresses which you have given from time to time are most valuable to us particularly as exponents of good English. I feel that in the hurried life we lead and the desire that some workers have to get their information quickly into print, there is a tendency to neglect the form and style of our English, which, of course, as English-speaking people, we should do everything we can to prevent, and, therefore, for an additional reason your addresses are more valuable and of practical use to us as examples of the use to which English can be put. I will not detain the meeting any longer, because there may be other members who would like to say a few words of appreciation.

PROF. LOCHHEAD: Mr. President, may I say a few words in addition to what our Chairman has said regarding the long services of Dr. Fyles in connection with work in entomology? I have known Dr. Fyles for over twenty years; I am sorry I have not known him longer, for I might have been a better man. About twenty years ago I came into contact with a small number of men older than myself, I might say a generation older—Dr. Fyles, Dr. Bethune and Dr. Fletcher, a little younger than these two. I met them all at the Annual Meeting in London, in 1895 or 1896. These men, I think you will all have observed, have given great attention to the literary form in which they express themselves. I have said very frequently in reading over their papers (take the old Entomological Society Reports of Dr. Bethune or Dr. Fletcher, for example) that they were masters



Megarhyssa atrata ovipositing on maple, approximately natural size. Photograph by Charles Macnamara, Arnprior, Ont.

of English, and we are not keeping up to the standard they set in this respect. I agree with our Chairman that more attention should be given to the form in which our reports and papers are prepared. This is not the first paper I have heard from Dr. Fyles during all that time, for he has seldom been absent from the meetings. Then in addition, we have had him several times in attendance at our meetings of the Quebec Society for the Protection of Plants at Macdonald College. While Dr. Fyles is a strong member of the Ontario Entomolgical Society, yet I think his heart is in Quebec, where he has laboured so long. While he cannot come down to our meetings as he used to, yet we always feel that his heart is with us, and his mind and thoughts are with us at our Annual Meetings. I hope he will be able to come down for the next meeting. I rise simply to show my appreciation of the valuable work that Dr. Fyles has done in connection with the Society.

THE PRESIDENT: I wish to make a slight alteration in the programme because of the circumstances. We have with us a gentleman from Arnprior, Mr. Macnamara, who is rapidly becoming an entomologist—in fact I think he is already an entomologist. He has been making some very interesting observations on certain insects to which Dr. Fyles referred, namely, those extraordinary hymenopterous parasites of the genus *Thalessa.* Mr. Macnamara, in addition to being an entomologist, is also a photographer of considerable skill, and has been able to apply his photographic knowledge to the recording of the oviposition of those extraordinary parasites, some of the most extraordinary parasites we have, and, therefore, I think it is rather fitting that, although I took upon myself to ask Mr. Macnamara to read this paper and it is, therefore, not in the programme as the latter had already been prepared, Mr. Macnamara should give us a brief discussion on his observations of which he has some photographs.

MR. MACNAMARA: You have taken me entirely by surprise, Dr. Hewitt, and I do not think I have much of interest to say, but I have a few photographs of one of the ichneumons that the members may care to see. The prints show the male and female *Thalessa,* or as the genus is now called, *"Megarhyssa" atrata;* and the female alone with her extraordinary ovipositor separated to show the two sheathes and the drill. Other prints show the tree infested with Tremex which the *M. atrata* frequented, and magnified views of the ovipositor, foot and other parts are given. Perhaps the most interesting views are those of the insect in the act of ovipositing, with the flexible sheathes curved over her back.

I first observed these insects ovipositing on a maple tree in a small hardwood grove about the middle of June. They were in considerable numbers, some days twenty to twenty-five, and continued egg-laying until the middle of September when they disappeared. As their victim, the Tremex never seems to attack perfectly sound wood, *Megarhyssa* generally bores into somewhat decayed material, but it is wonderful that she should be able to drive her ovipositor as she does, to a depth of five or six inches into wood that we find hard enough to cut with a chisel or a knife.

Dr. Fyles spoke of the instinct which enables them to discover the tree tunnelled by the Tremex. Their instinct in this respect is remarkable. but by no means infallible. The *Megarhyssa* I observed frequently only on one tree in a grove of five or six acres, and frequent and careful search failed to discover them on any other tree in the wood. But in October a large maple nearby, broken off by a gale, was found to be riddled by Tremex and no *Megarhyssa* had ever discovered them.

As Dr. Hewitt has taken me entirely by surprise I hope you will excuse the crudeness of my remarks, as I have not had time to prepare anything, but probably the photographs will prove interesting to some of you.

THE PRESIDENT: I think the photographs which are going around will prove my statement that we have with us a photographer-turned entomologist, and those of you who remember Mr. Macnamara's previous contributions to entomology in the shape of his account of the habits and some notes on the biology of those very small, little-studied creatures, *Achorutes,* will agree with me that we have a very ardent entomologist in Mr. Macnamara, and I do not think that he will need any further introduction or words to back up his election for membership when his name comes forward, as it will to-morrow.

PROF. CAESAR: This photograph of Mr. Macnamara's, showing ovipositing is extremely good. It is a most wonderful thing to look at this insect ovipositing.

Time after time I have watched it and tried to get a photograph, but failed at the last moment. Might I ask that this photograph be published?

THE PRESIDENT: I agree with Professor Caesar that the publication of that photograph would be most useful.

We will now proceed to the programme. The next paper is that by Mr. Parrott and Dr. Glasgow on "The Leaf Weevil (*Polydrosus impressifrons* Gyll.) in New York."

THE LEAF-WEEVIL (*Polydrusus** *impressifrons* Gyll.) IN NEW YORK.

P. J. PARROTT AND HUGH GLASGOW.

The leaf-weevil which is discussed in this paper is a new and, until the inception of this study, an unrecorded enemy of shade and fruit trees in the United States. In view of the losses sustained by farming interests in America by introduced insects a newly-discovered species of foreign origin, however unimportant it is in its original home, is the subject of considerable speculation as well as of some apprehension until its status as a pest is definitely determined. The following notes represent a preliminary account of our studies upon the weevil, which are perhaps not without interest to those who are especially concerned in matters dealing with the introduction and spread of noxious insects.

DISCOVERY AND IDENTIFICATION OF SPECIES.

Our attention was first attracted to this species during the summer of 1906 when large numbers of the beetles were observed in young plantings of willows and poplars in the vicinity of Geneva. They were present on nearly every tree and were feeding on the margins of the more succulent leaves. Some days later specimens of the insect were sent to us by the foreman of a nursery in another part of Ontario County, N.Y., who reported that the beetles were injuring roses and apples. As the species was apparently not represented in entomological collections in this country and it was difficult to secure positive identification, specimens of the insects were forwarded to Professor Alfred Giard, The Sorbonne, Paris, and to Doctor G. Horvath, The Hungarian National Museum, Budapest, both of whom independently classified the beetle as *Polydrusus impressifrons* Gyll.

STATUS OF THE SPECIES IN EUROPE.

In view of the great numbers of the beetle in certain sections of New York, a perusal of European literature impresses strongly two points on the mind of the reader: (1) The weevil belongs to a group of insects which contain some species that are destructive, and (2) the species *impressifrons* is of little significance; and there apparently very little knowledge, if any, as regards its life history and habits—deficiencies which hold equally for some associated species that are of considerable importance, and therefore better known, at least by name. Notwithstanding the seeming lack of detailed data on life histories and habits, the weevils attacking buds and tender foliage of fruit and shade trees appear to be more injurious and varied as regards number of species in Europe than is

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*This genus is also designated *Polydrosus*, but W. D. Pierce of the U. S. Bureau of Entomology has kindly informed us that the foregoing designation is, according to the rules of nomenclature, to be preferred.

the case in this country. From the standpoint of economic status, two Otiorhynchid genera are at this time of special interest—*Phyllobius* and *Polydrusus*, which comprise a number of species of weevils that range from various shades of brown to bluish-green or golden yellow in colour. Several of these are listed as noxious insects because of their habit of nibbling young opening buds and then later attacking the foliage. With plants of horticultural importance as hosts some species also do considerable harm by gnawing the parts of the blossoms and thus preventing fructification. According to Zimmerman[1] the species of these genera are very similar in appearance and the two groups are distinguished by the character of the antennal groove. In his discussion he, however, treats the different species as a whole, considering in the following order *Phyllobius argentatus* L., *Phyl. maculicornis*, *Polydrusus sericeus* Schall, *Phyl. pyri*, L., *Poly. mollis* Stroem., *Phyl. oblongus* L., and *Phyl. viridicollis* Fabr. Aside from merely mentioning the names of the foregoing species and calling attention to errors in the writings of other authors, very little information is given as to the life histories and bionomics of the insects. It is to be noted also that *impressifrons* is not listed, an omission which would indicate that it was not of sufficient importance to be considered in an economic treatise. Judeich[2] and Nitsche mention nine species of the genus *Phyllobius* and two species of the genus *Polydrusus*, and make no reference to *impressifrons*. The also call attention to the lack of knowledge upon the different insects of the two groups. Die[3] Tierischen Feinde by Reh, which is one of the latest economic works on European insects, contains a brief account of a number of species in the genus *Phyllobius*, and states that of the numerous species in the genus *Polydrusus* only a few are so abundant as to be destructive. Four species are mentioned, but there is no reference to *impressifrons*. While Nördlinger,[4] Kaltenbach[5] and Hess[6] discuss other species in either of the two genera, none of these authors refer to the insect under discussion. In Fauna Austrica, Redtenbacher[7] gives a brief description of *impressifrons*, and states its habitat is North Germany. Jäger[8] gives its distribution as Germany and France. In 1888[9] Schilsky listed the species and states that it is plentiful throughout Germany. Turning now to England, Rye[10] in his work on Brtish Beetles lists a good number of species of the genera *Phyllobius* and *Polydrusus*, in which *impressifrons* is not definitely included. Theobald[11] in his Insect Pests of Fruit makes no reference to any species of *Polydrusus*, but discusses with some detail several Phyllobius species as *Phyl. calcaratus*, *maculicornis*, *oblongus* and *uniformis*. He states that various leaf weevils are found on all kinds of vegetation and that several species are common to not only many kinds of fruit but also to various forest trees and shrubs. Two species more prominent than others on fruit trees and bushes are the Green Leaf Weevil (*Phyl. maculicornis*) and the Oblong Leaf Weevil (*Phyl. oblongus*). The Glaucous Leaf Weevil (*Phyl. calcaratus*) is also mentioned as doing serious damage to black currant bushes. It usually occurs on alders and various low bushes and hedges. With respect to *impressifrons* Professor Theobald

[1] Zimmerman, Hugo, Die Obstbauschädlinge aus der Familie der Rüsselkäfer.
[2] Judeich, J. F., and Nitsche, H., Forstinsektenkunde, Bd. I, pp. 407-411.
[3] Reh, L., Handbuch der Pflanzenkrankheiten, Bd. 3, p. 539, 1913.
[4] Nördlinger, H., Die kleinen Feinde der Landwirthschaft, 1855.
[5] Kaltenbach, J. H., Die Pflanzenfeinde, 1874.
[6] Hess, W., Die Feinde des Obstbaues, 1892.
[7] Redtenbacher, Ludwig, Fauna Austrica, Die Käfer, Wien, 1858.
[8] Jäger, G., Käferbuch (C. G. Calwer), p. 420.
[9] Schilsky, J., Systematisches Verzeichnis der Käfer Deutschlands, 1888.
[10] Rye, Edward C., British Beetles, 1886.
[11] Theobald, F. V., Insect Pests of Fruit, 1909.

informed the senior author in 1914 that he was not familiar with it and no specimens were contained in his museum collections. As the species seemed to be more numerous in France, Austria and Germany, and desiring to know more of its present status as an injurious insect, a circular letter soliciting information on the creature was sent to a goodly number of European entomologists. The importance of the species can be judged from excerpts from two letters, one from France and one from Austria. A. Giard[12] writes that while *impressifrons* is by no means rare in the spring upon willow and alder, it is not an important species, and little is known regarding its ethology. Zimmerman[13] states that the insect is not very common in Austria or Germany and occurs on willow and alder. Injuries to the foliage of fruit trees have not so far been recorded. Little knowledge exists as to its life history and habits.

Distribution in New York.

The actual range of distribution of the beetle in the State of New York has not been determined. The insect has become established in Ontario, Monroe and Wayne counties, and scattering numbers of the species have been captured as far west as Albion, in Orleans county. It is not improbable that the species occurs over a larger territory than has been indicated.

Food Plants.

The beetle is apparently an omnivorous feeder, subsisting on the foliage of a large number of plants, among which there may be listed birch, willow, poplar, apple and pear as its favorite plants. Scattering individuals have been collected at various times on elm, rose, linden and black locust, which seemingly were feeding on these plants, although their presence on them may have been accidental and due to the close proximity of more attractive plants. While specimens of the beetles, either actively engaged in feeding or in copulation have been observed on all of the above plants, it should be noted that none or very few of the insects have been seen on maple, box elder, horse chestnut, lilac, syringa or elderberry, although these were growing in considerable numbers near the preferred hosts.

To determine more closely the preferences of *impressifrons,* beatings were made of different plants, and from the collections obtained it appears that the insects seek birches, willows and poplars in the greatest numbers, and, if the beetle manifests any choice among these, preference is given to birches. In feeding tests in breeding cages the creatures subsisted on the foliage of these plants as well as of pear with no apparent choice, and selected the foliage of the foregoing trees in preference to that of the apple.

Siftings of earth showed that the insect breeds in large numbers on such varieties as the Pussy Willow (*Salix discolor*), the Kilmarnock Willow (*Salix pendula*), the Laurel-Leaf Willow (*Salix petandra*), the Weeping Willow (*Salix babylonica*). the Wisconsin Willow (*Salix dolorosa*), and the White Willow (*Salix alba*). Larvæ in great abundance were similarly obtained in soil about two species of birch (*Betula populifolia* and *alba*) and the Carolina and Lombardy poplars (*Populus deltoides,* var. *carolinensis* and *P. nigra,* var. *italica*).

[12] Giard, A., Letter of July 7, 1906.
[13] Zimmerman, W., Letter of Aug. 7, 1910.

Character of Injury.

As is the case with many associated species in Europe, the damage that *impressifrons* causes is two-fold: First, it nibbles the unfolding buds and then it attacks the foliage, preferring the margins of the leaves. The beetles, while small in size, are voracious eaters, and the extent of their injury is, broadly speaking, in proportion to their abundance. Many of them confined to a relatively small feeding area may cause much harm. The numbers of the insect that one may sometimes observe would suggest at once that they must be doing appreciable damage. However, it should be recorded that generally the extent of injury seems to be greatly disproportionate to the numbers of the creatures. The most conspicuous example of their destructive capacity was observed in 1912 in a large block of willows in a nursery plantation. This was largely composed of the goat willow (*Salix caprea*) grafted to such sorts as New American, Rosemary and Kilmarnock. The latter variety particularly suffered severely as a great many of the insects attacked the opening buds, so that a goodly percentage of them were killed while those partially injured produced imperfect clusters of leaves. The initial injuries were later aggravated by the feeding of the beetles on the margins of the leaves. The effect of this latter attack is to cause the leaves to have an uneven outline, and in instances of extreme injury to present a ragged appearance. So abundant has the insect become in the certain nurseries that the owners have found it necessary to resort to spraying in order to protect their willow plantings. So far we have observed no injuries by the beetle to buds of poplar. birch, apple or pear, and while feeding to an important extent has not been detected on these trees, an examination of them during June will seldom fail to find the work of the insect on the margins of the leaves. At present *impressifrons* derives it importance as a pest from its destructive work in nurseries. In some plantings where it has become established it is very numerous and will hardly fail to attract the attention of an ordinary observer. There is no other species of snout-beetle that, during its active period, so frequently brings itself to your notice. It is not an uncommon experience to carry the beetles on one's clothes into the home or to observe them on the window screens of buildings. The foreman of one well-known nursery has informed us that aside from the damage sustained the beetles have become so abundant in plantings of poplar, birch and willow that they are a source of great annoyance to laborers by flying in their faces. The abundance of the insect is indicated by the following counts: From a sample of earth about osier willow two feet square and to the depth of the spade. ninety-two larvæ were collected. From three spadefuls of earth taken near the base of different kinds of nursery trees the following numbers of larvæ respectively were found: Carolina poplar, 27 specimens; Lombardy poplar. 12 specimens; silver-leaf poplar, 12 specimens; birch, 25 specimens; willow, 19 specimens; American mountain-ash, 17 specimens; European mountain-ash, 1 specimen; apple, old tree in sod, 1 specimen. A similar quantity of earth, three spadefuls, taken about five-year-old fruit trees in a mixed planting yielded the following numbers of insects respectively: apple, 65 specimens; pear, 51 specimens; peach, 35 specimens, and plum 62 specimens. One corner of this orchard was only a little removed from a row of osier willow. The fact that *impressifrons* is apparently of little significance abroad certainly does not warrant the conclusion that it will prove of no importance in this country. The conditions described justify the inference that the species is already more abundant and injurious here than in Europe or more attention would surely have been devoted to it there.

Life History and Habits.

The beetles emerge from the ground during the latter part of May and early June. In 1914, they were first detected on May 26, and during the next few days they were mating freely on the foliage. By May 30, eggs were being deposited. For the reception of the eggs the insect seeks cracks or crevices in the bark, such as spaces that occur when the bark is loose at stubbed ends of twigs or branches. Loosened bud scales on twigs or wood, which have been removed by pruning and allowed to remain on the ground, are also sought by the creatures for the deposition of eggs. They appear to select any dry cavity in which the eggs may be inserted, and which occupy positions that are exposed to the sunlight. Eggs have been observed in situations on trees that were ten feet from the ground, and doubtless they will be found in higher positions. The egg measures about .2 mm. in width and .5 mm. in length. It is white, cylindrical and gently rounded at the ends. Its shape seems to be influenced by the accommodation of the egg to surrounding surfaces. Eggs occur singly or in masses, but usually in groups containing from twenty to eighty-five of them. Oviposition is most active during early June. The period of incubation averaged between twelve and thirteen days with little variation under ordinary conditions. Upon hatching the young larva wriggles out of its position of concealment in the bark and falls to the ground. It then seeks a crack in the earth, when it quickly disappears. The larvæ apparently feed on tender roots, and our observations indicate that they can live exclusively on the roots of willow, poplar and birch. Doubtless they find subsistence on the root systems of other trees. It has not been determined that they can live on the subterranean parts of grasses or weeds which may be growing about the foregoing plants. The larvæ transform to pupæ during the latter part of April and early May. The pupal cells are considerably larger than the larvæ and are at an average depth of about two inches, although some of them may be three inches in the soil.

Methods of Control.

The beetles are quite susceptible to arsenical poisons, and should it become necessary to combat them little or no modification will probably be required in existing spraying practices. Cultivation, if done with care and at the proper time, would doubtless prove very destructive to both larvæ and pupæ in the soil.

The President: The State of New York certainly is a general stamping ground for new pests. We have the *Hyponomeuta,* and now we have this other *Polydrusus* which evidently by its abundance seems to be firmly established in that State. I do not remember whether you mentioned in the paper any suggestion as to how it came in.

Dr. Glasgow: We cannot say with certainty, but probably in earth about the roots of nursery stock. This is the only way apparently that it could get in.

Mr. Burgess: I would like to ask Dr. Glasgow what success he has had in its control.

Dr. Glasgow: It is very readily controlled by arsenical poisons.

Mr. Burgess: Do you use arsenate of lead?

Dr. Glasgow: Yes.

Mr. Burgess: At what strength do you use it?

Dr. Glasgow: Commonly at the rate of three or four pounds of the poison to fifty gallons of water.

Father Leopold: At what time of the year do you use arsenate of lead?

Dr. Glasgow: About the last of May or early in June, or whenever the beetle becomes abundant to warrant treatment.

The President: If there is no further discussion we will proceed to the next paper, which is of great interest, by Professor Brittain, on "*Lygus invitus* and its control in 1915."

THE GREEN APPLE BUG (*Lygus invitus* Say.) IN NOVA SCOTIA.

W. H. Brittain, Provincial Entomologist for Nova Scotia.

History.

For a number of years past certain fruit-growers in the Annapolis Valley have complained of the non-bearing of their Nonpareil trees. These trees would bloom heavily each year, but would never bear anything like a full crop, yielding only a few gnarled apples; or, in many cases, none at all. This trouble was not entirely confined to Nonpareils, but was more pronounced and by far the most common in this variety. Others complained that their pears "grew woody" and were covered with corky, disfiguring scars. This latter trouble was commonly ascribed to lack of iron in the soil, and liberal applications of iron filings were frequently applied to correct this condition. Driving nails or spikes into trees was also practised.

No one appears to have suspected that there was any connection between the apple and pear trouble, or that either was caused by an insect. In June, 1914, the writer visited an orchard consisting of mature Nonpareils, Ribstons, Gravensteins, Golden Russets and several varieties of pears. The owner stated that the Nonpareils had not had a crop for at least six years, and that the trouble was gradually spreading to the other varieties. Furthermore, the pears were so badly affected that a number of them had been cut down. The affected trees were swarming with the green nymphs of *Lygus invitus,* and it took very little observation to show that they were the culprits. Following this, many reports of similar damage to apples and pears were followed up with a like result, and further investigations have only tended to confirm our early observations.

Distribution and Spread.

The pest seems to be well distributed throughout the fruit-growing centres of Nova Scotia, including the counties of Hants, Kings, Annapolis and Digby. It seems to be more widely distributed on the pears than on the apples, the phrase "injury to pears only" occurring with considerable frequency in the reports of the entomological inspectors.

Though experiment has shown that the adults are capable of flying considerable distances, as a matter of fact, the pest spreads only slowly from orchard to orchard. One orchard immediately across the road from a very heavily infested one, showed few signs of injury. The amount of damage to pears does not seem to vary much from year to year, but the injury to apples appears to be on the increase in many localities and spreading from the more susceptible to the less susceptible varieties.

Seriousness of the Pest.

Sufficient has already been written to indicate that this insect is a very serious pest of both the apple and pear, but any estimate of the actual damage done would, of course, be out of the question. However, it is safe to say that it is one of the most serious insect pests of our orchards. In fact, there can be no doubt that in orchards where it has become established, we have no pest to compare with it, either in amount of damage done or in the difficulty of eradication. The pears in certain orchards have for years been so scarred as to be scarcely merchantable, and, in not a few apple orchards, the crop of fruit from susceptible varieties has been greatly reduced or even destroyed. In one orchard visited, only one apple could be found among ten large Nonpareil trees, due entirely to the work of the Green Apple Bug.

Host Plants.

As far as we have determined, the insect only breeds in the apple and pear. It has been found feeding in the adult stage on plums, but has not been known to oviposit in that plant. When shaken from the trees the nymphs have been observed to feed upon couch grass, timothy, red clover, dandelions and other plants growing beneath the tree, but on reaching the adult stage they again seek the apple and pear trees for the purpose of feeding and depositing their eggs.

The Insects.

When the insect first appears it is light yellow in color, but as it develops it becomes green. It somewhat resembles an aphis in appearance and was once described by a farmer as a "new kind of long-legged aphis." Others speak of it as the "horned aphis" on account of its long antennæ. The adult is a small, delicate insect, one quarter of an inch long. It is very pale on first emerging, but later becomes a combination of light and dark brown. In appearance it resembles quite closely the Tarnished Plant Bug (*Lygus pratensis*).

Life History.

The maximum emergence of the nymphs from the egg state coincides with the opening of the blossoms of the Gravenstein apple, but the beginning of the emergence is about five or six days earlier. They continue to hatch until the time the blossom petals fall, when emergence is practically finished. In the season of 1915 the first nymph to emerge was taken on May 24th and the last on June 10, the period of maximum emergence being from June 1st to June 5th. The duration of the first nymphal instar is 5.22 days (average of 52 individuals); of second, 5.43 days (average of 34 individuals); of the third, 6.66 days (average of 34 individuals); of the fourth, 6.77 days (average of 24 individuals); and of the fifth, 6.83 days (average of 12 individuals).

No nymphs were observed during the past summer after July 7th, all having completed their transformations by that date. The length of the adult stage varies greatly, single individuals having been taken in the orchard as late as the first week in October.

The following table gives the details of the life history of twelve individuals, which were reared from the egg to the adult stage:—

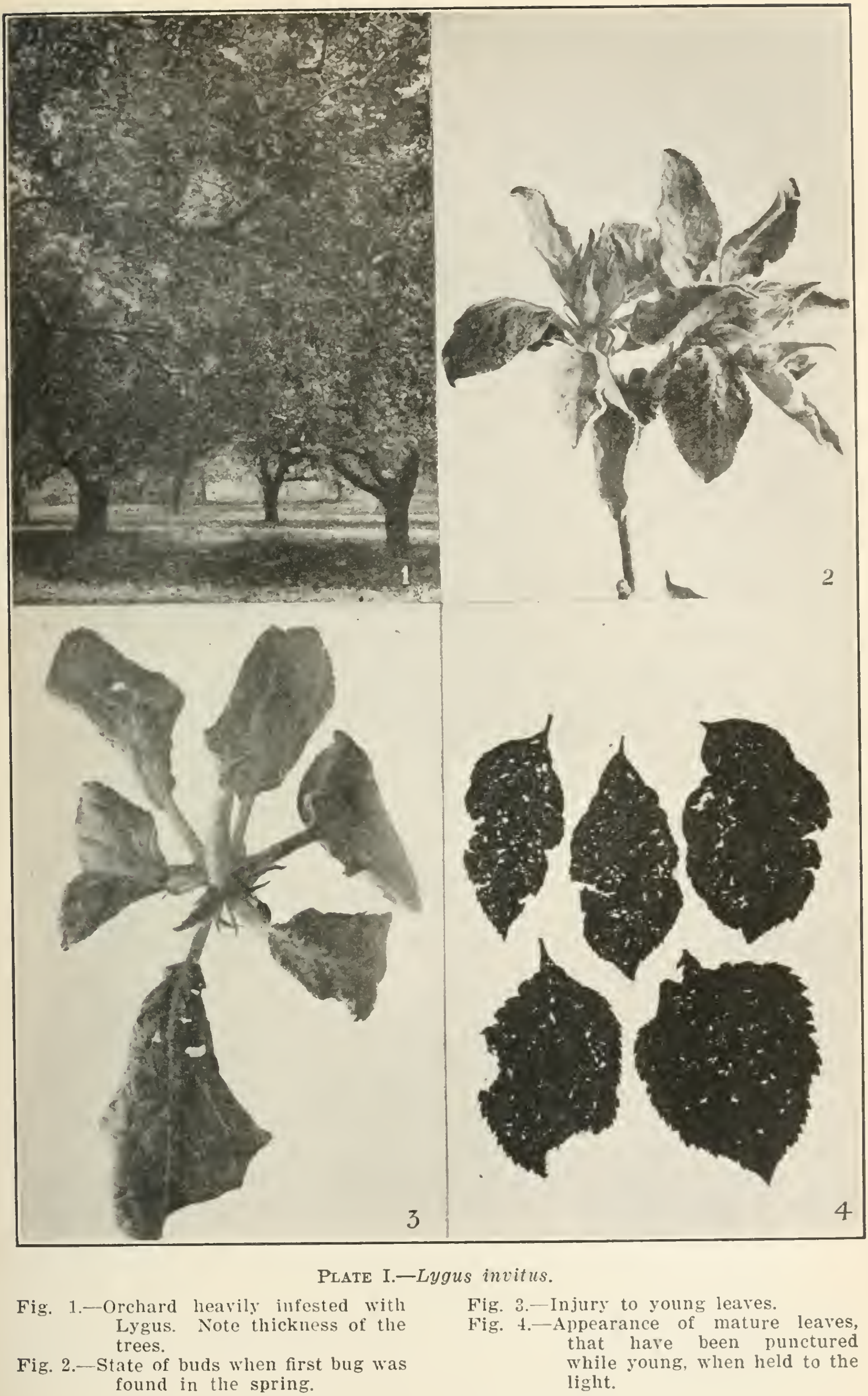


PLATE I.—*Lygus invitus.*

Fig. 1.—Orchard heavily infested with Lygus. Note thickness of the trees.

Fig. 2.—State of buds when first bug was found in the spring.

Fig. 3.—Injury to young leaves.

Fig. 4.—Appearance of mature leaves, that have been punctured while young, when held to the light.

LIFE HISTORY OF LYGUS INVITUS IN 1915.

No. of insect.	Date of hatching.	Date of 1st moult.	Date of 2nd moult.	Date of 3rd moult.	Date of 4th moult.	Date of 5th moult.	Date of death.	Number of days spent in each Nymphal instar.						Duration of adult stage.	Total length of life.
								1st instar.	2nd instar.	3rd instar.	4th instar.	5th instar.	Duration of nymphal stage.		
													Days.	Days.	Days.
1......	June 1	June 6	June 13	June 20	June 27	July 4	July 8	5	7	7	7	7	33	4	38
2......	" 2	" 7	" 11	" 18	" 26	" 3	" 4	5	4	7	8	7	31	1	33
5......	" 4	" 8	" 15	" 22	" 29	" 6	" 10	4	7	7	7	7	32	4	36
11......	" 4	" 10	" 16	" 22	" 29	" 6	" 13	6	6	6	7	7	32	7	39
17......	" 2	" 6	" 13	" 20	" 28	" 5	" 10	4	7	7	8	7	31	5	38
19......	" 3	" 8	" 15	" 23	" 30	" 7	" 11	5	7	8	7	7	34	4	38
22......	May 31	" 4	" 10	" 17	" 25	" 2	" 9	4	6	7	8	7	32	7	39
23......	June 2	" 7	" 13	" 20	" 26	" 2	" 8	5	6	7	6	6	30	6	36
27......	" 2	" 7	" 12	" 19	" 26	" 4	" 9	5	5	7	7	8	32	5	37
31......	" 3	" 9	" 16	" 22	" 28	" 5	" 14	6	7	6	6	7	32	9	41
33......	" 1	" 7	" 15	" 21	" 29	" 4	" 12	6	8	6	8	5	33	8	41
34......	" 3	" 9	" 16	" 21	" 28	" 5	" 10	6	7	5	7	7	32	5	37
						Averages		5.08	6.41	6.66	7.16	6.83	32	5.41	37.75

The duration of the nymphal stage in our open air insectary corresponds closely with that in the orchard, as proved by extensive observations, but the life of the adult insect under natural conditions is much longer than the insectary records would seem to indicate. Repeated experiments show that the adults will not thrive in confinement, but keep flying restlessly about, until they die of exhaustion. For the first week or ten days after emerging the adults were abundant in the orchard, but after that they began to die off quite rapidly. It was an easy matter during this time to find a number of dead bugs fastened along the midrib of a single apple leaf. The bugs have a habit, when about to die, of extruding the caudal extremity of the alimentary canal, which is covered by a viscid secretion, by means of which they attach themselves to the leaf.

Though large numbers of bugs died during the latter part of July, there was no difficulty in finding specimens through the month of August and early September. After that individual specimens could only be located with difficulty. On August 27th 50 adults were collected, 46 being females and four males; on August 30th, 50 more were collected, 45 females and five males; on September 3rd, collected 31 specimens, 27 females and four males; September 9th, 10 insects collected, all females, September 13th, 10 more specimens, all females, and on September 17th only two adult females could be found. From that date until October 7th scattering female specimens have been taken.

Oviposition.

The eggs are laid beneath the tender bark of pears and apples, principally the latter. All attempts to catch the female in the act of oviposition were fruitless, though many hundreds of females were brought into the laboratory and placed on apple and pear limbs, or upon apple seedlings beneath jars or wire frames. In no case was the female observed to oviposit, but after flying around for a few days dropped to the ground and died. Neither were we able to make any observations on this point in the orchard, owing to the extreme shyness of the adult insect. and to the almost continuous wet weather that prevailed at that time. Eggs were found beneath the bark on July 20th and several times subsequent to that date, which agreed in every respect with those dissected from the female insect.

H. H. Knight,* who observed one female of *Lygus invitus* in the act of oviposition, writes of it in these words:—

> The female observed to oviposit was first discovered when the ovipositor was inserted nearly to its base in a fresh pear shoot of the present year's growth. After two minutes the ovipositor was withdrawn. The female turned, inspected the hole, then moved along the branch about two inches. After five minutes she became very active and proceeded along the branch feeling with antennae and beak. She soon returned to the spot where eggs had been placed before, and, with proboscis to mark the opening, she raised up, unsheathed the ovipositor, and made the insertion much in the same manner as observed in the case of apple red bugs. A period of two minutes elapsed before the ovipositor was withdrawn. Upon examining the branch, it was found that six eggs had been laid in a space 1 mm. long. The eggs were closely packed in a double row lying flat just within the cambium layer. Of two eggs measured, the length is 1.05 mm. by 26 mm. wide.

Habits of Nymphs.

The nymphs of this insect are extremely elusive in their habits, which probably explains the fact that, though their injury has been known for many years, they themselves have never been connected with it until the present time. When

*Jour. of Economic Entomology, Vol. 8, No. 2, pp. 296-297.

disturbed they run rapidly, hiding in the axils of the leaves or any place that affords concealment. When disturbed suddenly, they often drop, but usually alight on another branch before reaching the ground. In cases where nymphs fallen to the ground have been prevented from reascending the tree, by means of tanglefoot bands, beneath which they cluster, it has been observed that when a person suddenly approaches the tree, a number of them will drop to the ground. Others have been observed to drop in this way when approached by an enemy or harvestman.

The young nymphs seem to prefer the young foliage of apple and pear, but will also puncture the tender shoots. Later they freely attack the blossoms, but they forsake all other food for the fruit once it has set. Though we have reared through these insects exclusively on leaves, there is no doubt that the later nymphal stages prefer fruit, and they can only with difficulty be induced to feed on mature leaves. A favorite place to feed is a cluster of fruit growing closely together and not having reached the size when their own weight pulls the separate fruits apart. In feeding, the nymphs range quite widely over the tree, especially when not numerous. Every fruit on a very lightly infested pear tree was pierced several times, showing that several must have been punctured by one insect. This observation was further confirmed by liberating a number of nymphs beneath a non-infested tree. The next day the typical injury was present all over the tree. The nymphs were observed to exhibit predaceous habits on several occasions. At one time a number of bugs were observed repeatedly thrusting their beaks into three larvæ of the green fruit worm (*Xylina* sp.) that had become caught in a tanglefoot band, and continued to do so until the caterpillars had been sucked completely dry. They will also on occasions attack man. The writer has been stung in the neck and hand more than once. If left alone the insect will pierce the skin of the hand as many as three times and remain feeding until gorged with blood.

Habits of Adults.

The adults, like the nymphs, are very active. On bright, sunny days they usually take to flight very readily when disturbed. On dull, cold days they are more sluggish and sometimes drop to the ground, though often they take to flight after having dropped a short distance. On really hot days the adults fly about considerably, and, standing in a heavily infested orchard, they can be readily observed flying about in the sunlight.

Since the prevailing opinion is that the pest spreads but slowly in an orchard, experiments were tried to determine the length of flight of the adults. When liberated the insects fly straight up in the air for a considerable distance, after which they can be followed by the eye for several yards, as they fly straight off in one direction. Just how far they fly at any one time it would be difficult to determine, but individuals have been taken one quarter of a mile from the point of liberation, a few days later.

Like the nymph, the adult may also become predaceous in habit. The writer observed one with beak inserted full length in a tussock moth larva, and it relinquished its hold very reluctantly. It will also pierce the skin of man quite as readily as the nymph.

The adult Lygus will not feed upon foliage at all readily, preferring a diet of fruit, and, unlike the nymph, which seems to prefer the apple, the adult seems to have a preference for the fruit of pears. One case was observed in which a row of pear trees had been freed of nymphs by spraying. Adjoining this row was a number of infested apple trees, and as soon as the bugs developed wings, they flew over

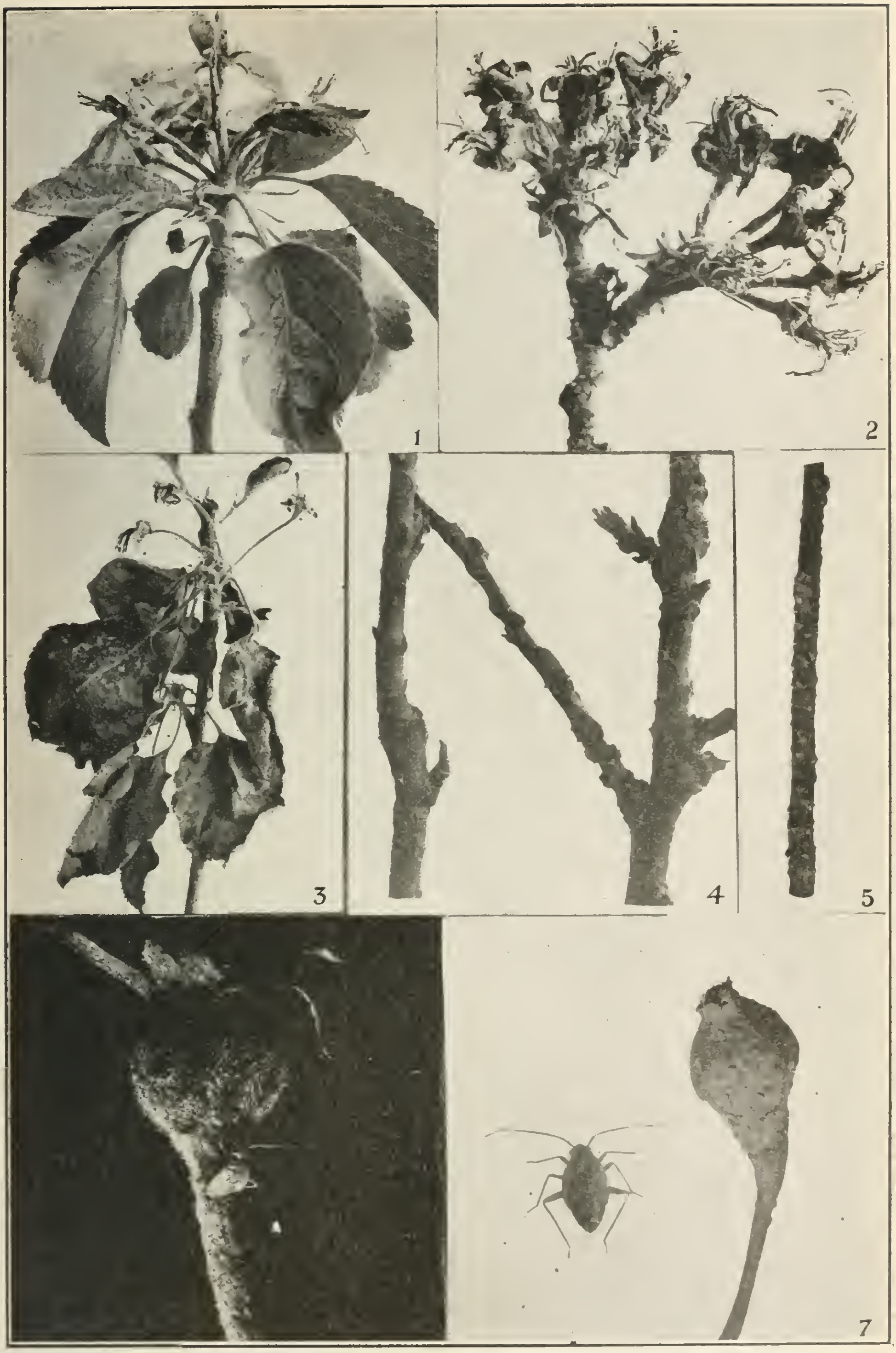


Plate II.—*Lygus invitus.*

Fig. 1.—Injury to blossoms.

Fig. 2.—Final condition of injured blossoms.

Fig. 3.—Blossoms and twigs killed by repeated punctures.

Figs. 4 and 5.—Twig punctures.

Fig. 6.—Nymph at work on a young apple.

Fig. 7.—Fifth stage nymph and young pear, showing effect of punctures.

and pierced the pears till they were bathed in the sap that oozed from the punctures. In the laboratory, adults have left a fairly ripe, soft apple to feed upon a hard green pear. All through the season a favorite place for the bugs to feed is about clusters of apples that have been dwarfed by the Rosy Aphis, and here the adults can be found, when nowhere else, late in the season. These belated individuals also show a preference for over-ripe or even decaying fruit.

Character and Extent of Injury.

1. Injury to the Apple.—The first evidence of injury is to the tender foliage in the form of purplish spots upon the surface of the leaf, accompanied, in severe cases, by a slight tendency to curl. To one who is familiar with the work of this insect, this symptom is most characteristic and makes it possible to detect the presence of the nymphs at a very early stage, and even when they are present in small numbers. Six newly hatched nymphs were placed on an apple seedling in the laboratory, and twenty-four hours later every leaf was spotted with the typical purplish markings. As the leaves unfold and later reach full size, the discoloration disappears, but if affected leaves are held up to the light they will appear to be pierced through and through with tiny holes. Very severe attacks result in a ragged, frayed appearance of the leaf. By these symptoms, the former presence of the bugs on any tree can be detected long after they have completed their transformation and disappeared.

The tender, succulent twigs are also subject to attack, and as the insect withdraws its beak a drop of clear or amber sap oozes through the bark, marking the puncture. Later, as the twig increases in size, quite a decided lump may develop at the point of puncture, accompanied in severe cases by a longitudinal crack.

In heavily infested orchards, where the insect may be present in tens of thousands, the repeated puncturing and withdrawing of the sap goes so far that affected twigs wilt, the leaves become brown and dry, and finally the whole shoot dies. Cases where many of the twigs were literally stung to death in this way were quite common early in the summer. Later the dead twigs dropped off and were replaced by a strong new growth, which covered up the injury done by the bugs.

As the blossom petals appear and begin to unfold they are quickly attacked by the young nymphs, which have been frequently observed right inside a blossom with beak inserted in the pistil. In fact, so numerous were the insects and so persistent their attacks that the blossoms and the blossom pedicels wither and die, having been sucked quite dry by the nymphs. These dead and dry blossoms remain on the tree for some time, but break off and fall to the ground before the end of the season. These facts explain why susceptible varieties may come into bloom year after year but never set a crop of fruit.

As soon as the young fruit is formed, drops of gum oozing through the skin show that it also has been punctured by the insect. Later, slightly raised, discolored spots mark the injury, and a large proportion of fruit so injured drops to the ground in the course of a few days. Apples that are able to cling to the tree or that remain uninjured until later on in their life, are badly gnarled and misshapen as a result of the insect's attack. The tissue above the puncture fails to develop and, as a result of the uneven growth, the apple will be one-sided with a pronounced depression about the point of puncture, which itself is marked by a brown, corky scar with ruptured epidermis.

2. Injury to Pears.—Injury to the leaves, stems and blossoms of the pear resembles that of apple, except that in this case the tissue about the puncture

turns black. Stinging of the young pears does not often result in dropping, as in the case of apples. The effect of the punctures on the fruit is, however, very conspicuous, it being covered with hard, granular, corky scars, which are often split open as in the case of those on the apple. Hard, flinty areas extend into the pulp, making the fruit useless for any purpose whatever.

3. Injury to Plum.—Injury to the fruit of plums is not uncommon, where these trees border on affected apples or pears. Plums injured by the bugs do not usually become scarred and twisted, as in the case of apples and pears, though they may sometimes grow somewhat one-sided. The seat of the injury is usually at the extremity of the fruit furthest from the stem. As usual in the case of stone fruits this injury is marked by the exudation of colorless gum which flows through the small puncture, sometimes forming a globule and sometimes a coil of gum which finally hardens in the air.

Feeding Experiments.

In affected orchards large numbers of nymphs are frequently shaken to the ground by sprays, heavy rains, winds, etc., and in numerous instances these were observed feeding upon dandelions, couch grass, red clover, and other plants at the base of the tree. Even when forced to feed on these plants early in the nymphal life the insects seemed to be able to complete their transformations, but once they had obtained their wings, they invariably sought the fruit of the apple or pear.

A number of nymphs in their second or third instars were divided into lots of ten and confined upon a number of plants under cheesecloth bags. The following observations were made:—

Grape (*Vitis* sp.).—The nymphs feed readily upon grape, puncturing leaves and blossom clusters. The tissue surrounding the punctures turns black.

Elm (*Ulmus americana*).—The injury to the foliage of the elm was quite noticeable in dark colored spots, but there was no apparent puncturing of the twigs.

Maple (*Acer saccharum*).—The injury to maple leaves was slight. The injury was characterized by small translucent spots.

Sweet Cherry (*Prunus avium*).—Slight puncturing of leaves and blossoms, but little apparent injury.

Peach (*Prunus persica*).—The leaves showed visible punctures and were slightly curled. Small globules of transparent gum showed where the fruit had been punctured.

Red Clover (*Trifolium repens*).—Transparent areas on the leaf accompanied by a gradual fading and wilting of the plant, characterized the injury to red clover.

Strawberry (*Fragaria chiloensis*).—Strawberries showed evidence of more serious injury than any of the plants experimented with. Blossoms and leaves were so badly punctured that they finally withered and died.

Couch Grass (*Agropyron repens*).—The blades of couch grass were punctured quite severely, fading in color and showing other evidence of wilting.

Susceptibility of Varieties.

Extensive observations regarding the susceptibility of varieties reveals the fact that of all varieties of apples the Nonpareil is by far the most liable to attack. In many orchards it is only the trees of this variety that appear to suffer at all. Cases have been observed in which badly attacked Nonpareil trees were surrounded by trees of other varieties apparently untouched. Nevertheless, it seems to be true that in most cases the bug will gradually enlarge its field of operation from the more to the less susceptible sorts. Fruit-growers tell of numberless instances where the trouble began in their Nonpareil and gradually spread to their other trees. The following varieties show susceptibility in the order named:—Ribston, Gravenstein, Golden Russet, Blenheim, Baldwin and Greening.

Among the varieties of pears attacked the Bartlett shows the highest degree of susceptibility. So much is this the case, that some have regarded the trouble as a disease of this variety. Other susceptible varieties are Clapps' Favorite, Burbridge, Maria and Flemish Beauty. Varieties not so susceptible are Louis Bonne, Bosc, Lawrence, Duchess and D'Anjou.

Conditions Favoring Increase.

It is difficult to state definitely under what condition this insect flourishes best, since it is found in orchards treated in every conceivable way. Sprayed and unsprayed, clean cultivated and sod, well cared for and neglected orchards are all attacked. It is a notable fact that some of the very worst infestations are in orchards that have received the best of treatment in the way of spraying, fertilization and tilth. In most cases, however, such orchards were unduly shaded, insufficiently pruned, or too thickly planted. In two very bad cases the orchard was cultivated on the strip system, i.e., a strip of clover sod alternated with a clean cultivated strip. In another case the orchard was part cultivated, part in sod. Here the trees in sod seemed to show the greatest evidence of injury, but the difference was not readily detected. On the whole orchards with a thrifty, succulent growth seemed to suffer most.

As a result of all our observations throughout the infested area, it appears that the most suitable conditions for the undue increase of this pest are shady orchards with closely planted, thick growing trees, with a certain amount of herbage at their base, but for the most part thrifty and vigorous in other respects. Nevertheless, these factors are not essential, as the insect is capable of doing injury under a wide range of conditions.

Natural Enemies.

Ants seem to be the only natural enemies that exert any appreciable influence on the control of this pest. These have been frequently noticed carrying away nymphs on their jaws. On one occasion, when a number of nymphs were liberated at the base of the tree, four of them were seized by as many ants and carried off through the grass to the ant hill, which was distant fifteen feet from the tree. Spiders also destroy a certain number of nymphs, but it is questionable whether ants or spiders ever kill enough nymphs to noticeably reduce their numbers. The ant responsible for this work was determined by Dr. Wheeler as *Formica fusca.*

Control Experiments.

Control experiments were carried on under most unfavorable conditions this spring, the weather being almost continuously wet. This made it very difficult to apply the spray at the proper time or to observe its effect upon the insect. Two orchards were chosen, containing a large number of mature apple and pear trees of the susceptible varieties.

PLATE III.—*Lygus invitus.*

Fig. 1.—Injured pears.
Fig. 2.—Injured apples.
Fig. 3.—Injured plums.

Blackleaf 40, 1 pint, $1\frac{1}{2}$ or 2 pints to 100 gallons was used both alone and with soap, and also in combination with lime-sulphur. One spray was put on just before the blossoms opened, with another just after the blossoms fell, for the apples. Another block was sprayed in full bloom. Pears were sprayed just after their blossoms fell and again five days later.

Examination of trees directly after spraying showed them to be apparently free from insects, and large numbers of dead nymphs would be found stuck to the leaves by their caudal extremities in the characteristic fashion. Examined two days later, though the block sprayed in full bloom seemed to show best results, all the trees were found to be covered with bugs. As laboratory experiments had shown that the material used was quite effective in killing the insect when hit by the spray, even when the weakest strength was used, we knew that the trouble was not in the strength of the spray, or in the manner of its application.

Observations taken in the sprayed orchards showed large numbers of nymphs ascending the tree trunks. Even in unsprayed orchards it would appear that large numbers of nymphs fall to the ground, shaken off by the high wind or washed off by the heavy rains. Insects were found in abundance beneath the trees in such orchards or climbing up the trunks.

In order to determine to what extent nymphs were washed off during spraying and whether any considerable proportion of these succeeded in reascending the tree, one large tree was sprayed thoroughly with Blackleaf 40 and soap, after having been banded with tree tanglefoot 3 feet from the ground. Shortly after spraying the trunk of the tree beneath the band was green with nymphs. These were counted and removed each day for seven days, and at the end of that time the total number of insects captured beneath the band reached the total of 1,389. Large numbers, of course, went up adjacent trees, 538 being taken from one of these. It should be noted here, that this number represents but a very small proportion of the insects originally on the tree. By far the greater number were killed and their dead bodies could be found in abundance sticking to the leaves or on the ground. Nevertheless, where so many thousands were present they were sufficient in number to sting every fruit on the tree and so destroy the crop.

To determine whether the effect of the spray was merely mechanical or whether the insects that fell were partially overcome by the spray material, another tree was given a strong spray of water with a drive nozzle and at a pressure of 200 pounds. In this case the total for seven days was 308. This shows that there was something beside the mechanical effect responsible for the large drop from the sprayed tree. This may be due to the insects being hit by the spray, but not sufficiently covered to cause death. Again, it may be that the effect of the nicotine fumes is to make the nymphs relax their hold and drop to the ground. Laboratory experiments have shown that the fumes of the spray material alone are sufficient to cause death. Nymphs were placed on apple seedlings in cages and at the base was placed cotton wool soaked in Blackleaf 40 at the regular strength. The next day the nymphs were dead.

Experiments were made to determine the distance the nymphs were able to travel and reascend the tree. In an orchard that had not been cultivated for several days, four trees 30 ft. apart each way were banded and 300 nymphs liberated midway between them. The next day 17 insects were taken from beneath the tanglefoot band. A similar experiment was tried with 150 bugs in an orchard that had just been thoroughly cultivated. In this case 19 insects reached the trees. The same experiment was repeated in an orchard that was in sod and 300 nymphs liberated. In this case none reached the tree, but could be seen feeding freely upon the grass and clover. That the nymphs do travel through a sod orchard, however, is shown by the fact that a number were taken from a young tree of the current season's planting, placed midway between two trees thirty-five feet apart.

It was evident from the foregoing experiments that, in addition to spraying, some method must be devised to prevent the nymphs that fall to the ground from reascending the tree, and continuing their injury. Accordingly, another block of trees was sprayed, some of which were banded with the tanglefoot and others not. Subsequent examination showed that the unbanded trees showed insects in abundance, while on the banded ones it was almost impossible to find a single nymph. Experiments showed also that a thorough harrowing after spraying had the same effect as banding. Of all the unbanded trees, those sprayed in full bloom showed the least injury, but even on these trees the fruit was so badly scarred as to be practically worthless.

Another difficulty arose in this connection, viz., that the nymphs are capable of feeding and coming to maturity on grass or weeds growing beneath the trees. Cases occurred in which fruit which had been kept clean by spraying was rendered worthless by adults flying in from outside. For this reason, if this pest is to be controlled, the orchard must be kept under a system of clean cultivation until the end of the first week in July.

The control of the Green Apple Bug in Nova Scotia sets a new precedent in heavy spraying in that Province. Furthermore, the method of planting and heading frequently does not lend itself to the kind of spraying required. The trees are frequently very large, headed very high and planted very thickly, so that it is impossible to get through the rows with a tower on the machine, which is the only way that the tops can be reached. Furthermore, the trees are often very thick-headed, so that even with other conditions favorable, it is a matter of very great difficulty to hit every insect with the spray, and attempts to control the pest in such trees is certain to result in failure. All the foregoing facts must be kept in mind if this pest is to be eradicated from the orchard.

Summary.

The observations and experiments of the past season may therefore be summarized as follows:—

1. The Green Apple Bug is one of the most serious pests of apples and pears in Nova Scotia, though hitherto, owing to its elusive habits, it has not been recognized as such.

2. It is the cause of "woody pears" and one of the causes of gnarled, twisted apples. It is the most common cause of the continued failure to bear of Nonpareil and certain other varieties of apple. It attacks not only the fruit but also the foliage, stems, and blossoms of apples and pears, and in the adult state has been known to attack plums.

3. The nymphs are frequently caused to drop from the trees by high winds, heavy rains, sprays, etc., and may then either reascend the tree or feed upon the weeds, grass or clover at its base.

4. Though capable of coming to maturity on the foregoing plants, in the adult state they invariably seek the apple and pear to deposit their eggs.

5. In control, not only must the tree be thoroughly sprayed to kill as many bugs as possible, but those which have fallen to the ground must be kept there without food until they starve. If the orchard is in sod, or weeds are abundant, the insects on reaching the adult state, will fly to the trees and continue their work.

6. The orchard must, therefore, be kept in a state of clean cultivation, until all the insects have reached the adult state, which will be at the end of the first week in July.

7. The trees must be banded with tree tanglefoot to prevent the reascent of the insects that have fallen to the ground.

8. The trees must be properly pruned, so that all parts can be readily reached by the spray.

9. Apple trees should be sprayed with Blackleaf 40 in the strength of 1 pint to 100 gallons, just before the blossoms open and again after they fall; pear trees just after the blossom petals fall and again five days later.

10. A very heavy, drenching spray must be applied.

11. The insects are much more easily controlled on pears than on apples so that with light infestations in this tree, spraying alone should be sufficient to control the pest.

Conclusion.

The foregoing is only a summary of a single season's work. New facts will doubtless be revealed by subsequent study. The work was carried on under considerable difficulties, the pest being a new one and little known regarding its habits. The methods of control which have been given require considerable care in their application, but once the pest is eradicated it should not be so troublesome to prevent further serious infestations. The great need at the present time is an insecticide cheaper than Blackleaf 40, that will do the work as effectively. However, even under present conditions, growers who have lost entire crops from the work of this pest will not hesitate to take the measures recommended.

The President: Professor Brittain is to be congratulated on the amount of work he has accomplished in a single season, and also the extent of his work. I myself have noticed the corky pears in Nova Scotia, but I never performed the crucial experiments which induced Professor Brittain to undertake the eradication of the pest. I can personally testify to the extraordinary damage which is now being caused by this insect throughout Nova Scotia. I was down there about three weeks ago and was able to see the results of the damage. I was also able to appreciate the extent to which the fruit-growers in the Annapolis Valley are grateful to Prof. Brittain for discovering the cause of these corky pears and the cause of the injuries on the Nonpareil trees. I know there are a number of members here who wish to ask Professor Brittain questions, and the paper is now open for discussion.

Prof. Caesar: On account of the similarity of this paper to the next I think the discussion of this paper should be postponed until after the next.

The President: You move that the discussion of this paper be left over until after the next?

Mr. Treherne: I second the motion. Carried.

A CAPSID ATTACKING APPLES.

(*Neurocolpus nubilus Say.*)

H. G. CRAWFORD, WILTON GROVE, ONT.

In the Province of Ontario four Capsids, or Plant-bugs have been found attacking apples, namely: *Neurocolpus nubilus, Lygidea mendax, Heterocordylus malinus* and *Paracalocoris colon.* The nymphs of the second and third are the so called "Red-bugs" described by Crosby of Cornell. *Lygus invitus,* the False Tarnished Plant-bug, occurs in abundance in the Province, but, strange to say, has not been observed doing any damage either to apples or pears, though a great pest in Nova Scotia and causing considerable damage to pears in New York State.

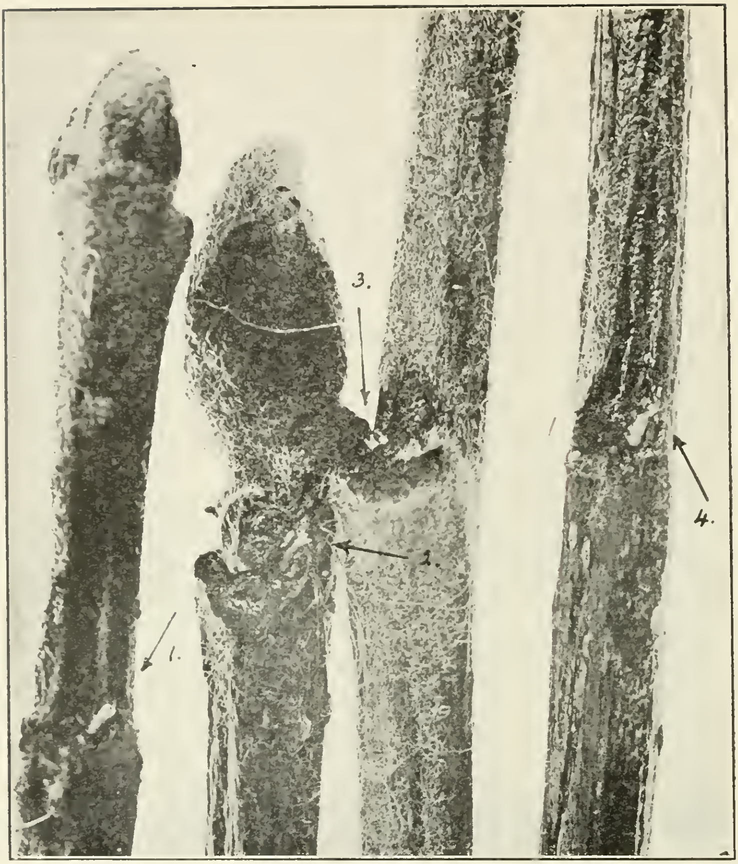
Of the above four injurious Ontario species the only ones of much importance so far as known at present are *Neurocolpus nubilus* and *Lygidea mendax.* Crosby in Bulletin 219 of Cornell University described the life history, habits and means of control of the latter; but very little was known about the former, and as this was the more common and troublesome Capsid in Ontario and, as requests for information on the means of control had begun to be made, Prof. Caesar decided to attempt to work out its life-history this year, being influenced also by the fact that this species was very common in the same orchard where he had planned to study the Leaf-rollers of the Apple. It was my good fortune to be chosen to do this work under Prof. Caesar's guidance and with his personal co-operation so far as his other duties permitted. The following is a brief account of the knowledge gained.

HISTORY OF THE INSECT IN THE PROVINCE.

There is no doubt whatever that this Capsid has been present for many years in Ontario, in fact it is apparently a native species. It is only very recently, however, that it has been discovered to be an apple pest. In 1909 Prof. Caesar was shown by Mr. Jos. Tweddle some deformed apples that caused him to suspect that a Capsid might be to blame. In 1910 he accordingly visited Mr. Tweddle's orchard at Woodburn when the apples were about the size of small marbles, and saw the nymphs at work, though at the time he was not sure of the species. In 1911 he again visited the same orchard, saw both these nymphs and those of *Lygidea mendax* feeding on the fruit, and from specimens brought to Guelph reared adults of three species: *Neurocolpus nubilus, Lygidea mendax,* and *Paracalocoris colon.* In 1914 he found the former two species were in a large orchard at Hamilton, and in 1914 found nymphs of *Neurocolpus nubilus* alone in abundance in the orchard of Johnson Bros. at Simcoe. This is the orchard in which the investigation was carried out. There has been no opportunity to examine many orchards to see just how important the pest is in the Province. We suspect that it occurs in a good many orchards but know that the great majority of them are free or almost free from the pest.

DISTRIBUTION.

This insect has a very wide American distribution. From literature at our disposal, records were obtained of its presence in a collection of Capsids made in Panama and Guatemala, in the States of Florida, New Mexico, California, Colorado, New Jersey, Maine and New York, as well as in the Provinces of Quebec



Eggs of *Neurocolpus nubilus in situ* on first-year Spy twigs, all, with the exception of (2) having had the leaves and buds removed. Enlarged about 5 times.

(1) Egg just as it was after the leaf and bud had been removed, half its length being buried in tissues of the twig;
(2) Egg, with leaf only removed, position at side of bud not normal, but curve of egg well shown;
(3) Two eggs close together, thrust very far down into tissue, and being completely hidden by bud and leaf;
(4) Eggs with tissue cut away from front, showing rounded lower end.

Adult *Neurocolpus nubilus*, and two nymphs.
(Natural size.)

and Ontario. In Ontario E. P. Van Duzee reported it as "common and highly colored" in Muskoka during July and August, 1888; he also saw a specimen that had been captured at Temagami in 1908. It has also been observed by Prof. Caesar, Mr. G. J. Spencer or the writer in the following additional places in Ontario: Woodburn, Hamilton, Fonthill, St. Catharines, Wilton Grove (Middlesex County), and in Norfolk County at Simcoe, Walsh and Tyrill.

Life History.

Eggs. Although we could never find a female ovipositing either in cages or in the orchard there seems no doubt that egg-laying extends over a long period, which this year would be from about July 15th to September 1st, most of it being over by August 15th, from which time the adults gradually decreased in number, completely disappearing by September 7th. The majority of the eggs are laid singly, but not infrequently two are found so very close together as to suggest that they might have been laid at the same time. They are invariably found behind

Adult *Neurocolpus nubilus* and nymph. (Enlarged.) Note the clavate hairs on antennae of nymph.

the buds which are situated in the axils of the leaves on the new growth. In addition to the Apple, eggs were found also on Sumachs. They were inserted into the tissues of the new growth. We suspect they are also laid in Elder though we are not sure. No eggs could be discovered on any kind of weed in the orchard. On apple trees they are so deeply pushed under the bud into the tissue that even the white tips are hidden from view. If the bud is removed the egg will be seen to be sticking out of the spongy tissue for from one-quarter in extreme cases to one-half its length, the average being about one-third of the length (see fig.). There is absolutely no external evidence of the presence of the egg when the bud and leaf are on the twig.

This year the eggs began to hatch on May 27th; the maximum hatching taking place between June 5th and June 9th. Freshly hatched nymphs, however, continued to be found up to July 13th.

In this connection it will be interesting to note the relationship existing between the maximum hatching of the various kinds of apple-attacking Capsids and the stages of the apple trees in each case. Thus this season at least (1915) the majority of the eggs of *N. nubilus* in Ontario hatched from *just after the* *calyces had closed up to the time when the fruit of the Spy trees was one-quarter inch in diameter. Lygidea mendax* in Ontario and in New York hatches most freely *just as the blossoms are opening out well.* Of *Lygus invitus* in Nova Scotia the maximum hatching takes place *during the period of maximum bloom,* and of *Heterocordylus malinus* in Ontario during the period from the time the Spy blossoms are *opening up to full bloom.* Of *Paracalocoris colon* in Ontario the records are not definite, but nymphs gathered at Woodburn in 1912 with *N. nubilus* were in the same instar, suggesting that they may have hatched about the same time. However, in 1912 *N. nubilus* seemed to hatch somewhat earlier than in 1915; thus making impossible the assignment of a date of hatching for *Paracalocoris colon.* From this comparison it can be seen that a spray designed to control the other Capsids and which could be applied at the time of the spray for the Codling Moth would fail to control *N. nubilus,* at least during the season of 1915, because it would be too early for this species.

Nymphs. The nymphs, which appeared first on May 27th, at first grew rather slowly but later seemed to grow more rapidly. By June 11th the largest were about 3 mm. long, and by June 20th many were found 5 mm. long, exclusive of antennæ. About June 22nd the largest were slightly over one-quarter of an inch in length and wing pads were then present on quite a number. The first adult was seen on June 30th. Thus we suppose the nymph stage requires in the neighborhood of a month in a cold season like that of 1915. In a warm season, however, it is quite probable that less time would be required.

Adults. From June 30th the adults increased in number until by July 15th they outnumbered the nymphs present. Many of the females at this date were distinctly swollen with eggs, which upon being examined seemed to be perfectly formed and, though as mentioned above, no egg-laying was ever witnessed, there is no doubt that oviposition began about the middle of July. It is perhaps worth recording that we never saw any mating of the sexes. Males do not live so long as females. Several of the latter which were in the adult stage when put in a cage on July 9th were still alive on August 12th, having lived at least 33 days. From July 15th for two weeks the number of adults seemed to be constant, then began slowly to decrease till by August 24th very few were observed, and these had disappeared entirely by September 7th.

Description of Life Stages.

Eggs. The egg is 1.5 mm. long by .3 mm. in average diameter, quite strongly curved, slightly club-shaped, nearly colourless, with a glistening white cap. The end which is thrust into the twig is slightly larger than the other, is rounded, and circular in cross-section. Towards the other end the egg gradually flattens, is oval in section and is surmounted by a definite, glistening, white, cylindrical hollow cap, which makes up about one-sixth the total length of the egg (see fig.). The cap appears as though it had been slipped on over the end and is deeply notched on the flattened sides. The tips of the projections so formed, draw more or less together after the eggs are laid, suggesting somewhat a minute lobster claw.

Nymphs. The nymphs, when freshly hatched, are about 1.5 mm. long, almost colorless, with large triangular head, large dull red eyes and with long stout antennæ and legs marked with faint reddish bands. They are quite sluggish and were mistaken by one of Ontario's best apple growers for aphids.

All the later stages of the nymphs have green bodies with dull reddish mottlings upon the back and sides; the second abdominal segment has a small circular black spot which persists in the adult though hidden by the wings. The antennæ are long and conspicuous, the first and second joints bearing a broad band of close-set, prominent, dark-brown, *clavate* hairs (see fig.). The legs are slender and distinctly marked with red bands. The nymphs, when in the last instar, attain a length of a quarter of an inch, and bear a pair of conspicuous wing pads. Nymphs in all stages after the first moult are very much alike, though the reddish mottling becomes more pronounced and darker as they grow older and increase in size.

ADULT. The adult is slightly more than a quarter of an inch in length being distinctly longer and narrower than the Tarnished Plant-bug (*Lygus pratensis*). (See fig.). The general colour varies greatly both in the case of those living on different hosts, where it is very marked, and also to a lesser extent among those living upon the same host. The dorsal aspect of those living upon the apple varies from a dull cinnamon brown with dark areas to a reddish black with light areas. It has a dull felty appearance due to the presence of numerous fine light to dark cinnamon hairs upon the thorax and thickened part of the wings. The sides are mottled with a dull, dirty red, and ventrally the colour is a light green. The antennæ are longer than those of the Tarnished Plant-bug. The basal joint is stout, dark in colour and densely clothed with dark brown hair, many of which in fresh specimens are distinctly clavate. The second segment is slender, elongate and slightly club-shaped, the distal half being dark brown and clothed with very short, dark brown hairs. The legs are slender and have the same reddish banding as those of the nymphs. Referring to this species Prof. E. P. Van Duzee states: "No other Capsid known to me has thickened, clubbed hairs on an incrassate first joint."

HABITS OF NYMPHS.

The nymphs, when they first appear, are rather sluggish in their movements and are found on the lower sides of the opened leaves, also in the unopened leaves, and in those leaves which had been rolled up by the Leaf-rollers. In these rolled leaves they remain at night and on cool or rainy days and in the cool part of the mornings, coming out and moving around somewhat during the heat of the day and feeding on the tender leaves. When the apples were about a quarter-inch in diameter these were attacked, the attack continuing for about ten days till the apples were a half-inch in diameter. Then the fruit was deserted and the great bulk of the insects made their way to the ground and soon were found feeding upon practically every plant growing in the orchard. The suckers at the base of the trees, red clover and curled dock were the favorite food plants. They fed also upon alsike clover, Canada blue grass, rye, evening primrose, peach trees, hairy vetch and timothy.

HABITS OF THE ADULTS.

When the adults began to appear the great majority of them were found upon the weeds and suckers, where they remained for about a week. At the end of this time a small proportion of them appeared on the trees where they moved slowly about constantly feeding upon the buds in the axils of the leaves on new growth. The proportion of those on the trees to those on the weeds seemed to remain nearly constant throughout the season, there always being some on the trees but never very many. On and about July 19th an attack upon the aphid-stunted apples took place and even a few sound Spys one and three-quarters of an inch in diameter were punctured, but this attack did not become at all general. However, at this time an attack of great severity was made upon the fruit of three trees of an unknown variety and lasted for a week. The adults feeding on the suckers, as before mentioned, confined their attention largely to the newly formed buds and the tender twigs, while those on the weeds showed a marked preference for the horseweed (*Erigeron canadensis*), which was abundant at this time. They seemed to be particularly fond of plants of this species infested by aphids. Other species of plants, however, were also fed upon, such as mullein, ragweed, pigweed, catnip, stinking mayweed, round-leaved mallow, burdock, golden rod, Hungarian millet, old witch grass, sumach, elder, orange milkweed (*Asclepias tuberosa*) and all the plants mentioned above as food plants of nymphs except where these had become too dry to attract them.

The adults, as a rule, were not very active and were quite easily captured, dropping from leaf to leaf when disturbed and only flying as a last resort.

Injury.

Fruit. The chief injury is due to the feeding of the nymphs upon the apples. It is done when the fruit is from one-quarter to one-half of an inch in diameter, and when the nymphs are still small. The first evidence of the attack is the

Injury due to the feeding of *Neurocolpus nubilus* nymphs upon young fruit very shortly after the attack. (Natural size.)

oozing of droplets of juice from the punctures which are made at any point upon the surface of the apple. These punctures in three or four days are evidenced by small, conical to rounded pimples, varying in height and diameter from 2 to 3 mm. In their apices are small, very dark green spots of tissue, beneath which is a very slight streak about 3 mm. deep. These pimples vary in number from one to twenty-five or twenty-six per fruit, and where abundant on a very small apple cause it to wither and fall; on a larger one they very severely stunt its growth, and if the pimples are massed on one side, they cause the growth on that side to be checked, and the apple to be much deformed when mature. Where the pimples are few or scattered the apple may grow to normal size and nearly normal shape, the pimples becoming gradually less distinct or forming small raised, brownish, corky areas or convex russet spots from 3-4 mm. in diameter.

The orchard in which the observations were made had almost no crop, so no proper estimate of the damage done by these insects was possible. One tree, however, which had quite a few apples, had about 40 per cent. attacked, but only about 10 per cent. rendered culls, the rest being quite saleable as second-class fruit.

About July 19th a few of the Spys were attacked by the adults, but the feeding was very slight and of no importance. At the same time a very severe attack indeed was made upon three trees of an unknown large, yellow, seedling variety. The attacked fruit soon rotted and fell, due possibly to inoculations of Twig Blight (*Bacillus amylovorus*) with which the trees were badly attacked, and to which they seemed particularly susceptible. It is probable that this Capsid was the chief factor in carrying this disease from limb to limb and from fruit to fruit.

Leaves and Twigs. No injury of any description was observed on the leaves

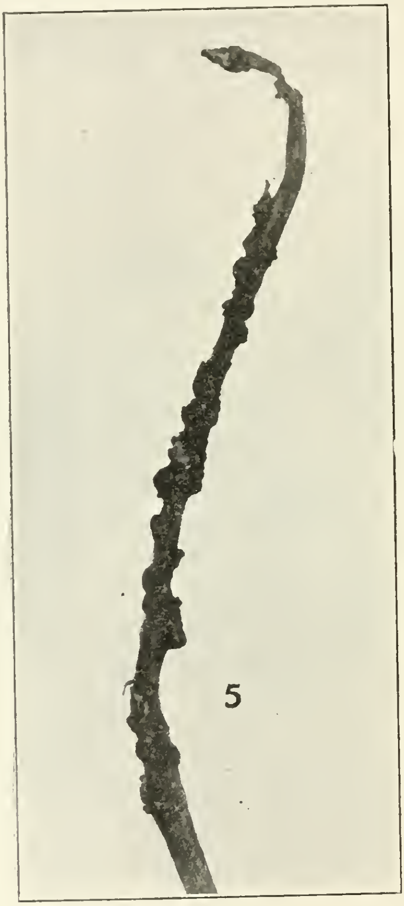
Injury due to the feeding of nymphs upon the apples when very small, about six weeks after the attack. Note the corky scars and pimples. (Natural size.)

themselves, but the tender buds in axils of the leaves of the young growth were punctured by both nymphs and adults, many of them being killed. The young twig itself was also punctured and, when badly attacked, the puncturing was followed by a small, very convex gall, which later in many cases split and became corky upon the top (see fig.). Both of these kinds of injury were confined largely to the suckers which became bushy and stunted with the tips of the twigs frequently dying. The new growth on the trees themselves was very seldom more than slightly injured.

Summary of Control Experiments.

In our control experiments kerosene emulsion and carbolic emulsion were both found to be almost useless for, even when applied with great thoroughness they failed to kill more than a small percentage of the nymphs.

Black-Leaf-40 was used alone with water in the proportions of one part of the solution to 1,066, 800, 400 and 250 parts of water respectively, but in no case was it at all satisfactory as it only killed a small proportion of the nymphs, even of the small ones. At first we thought that this spray would kill at 1 to 800 both by contact and by the fumes, but experiments showed that the nymphs were not dead but only stupefied and that they soon revived and appeared to be none the worse for the treatment.



Severe case of injury due to feeding of both adults and nymphs of *Neurocolpus nubilus* upon suckers at the base of the apple trees. (Natural size.)

The Black-Leaf-40, however, when used with soap—1 part of the solution to 800 parts of water, with 4 lbs. *Sunlight Soap* per 100 gals. of mixture—produced a spray which killed 96 per cent. of nymphs of all sizes, most of them being large. The tree was, of course, thoroughly covered with the mixture. Soap alone gave almost as good results but, owing to scarcity of nymphs at the time it was tried, was not given so many or quite so good tests. The results, however, were very gratifying. The efficiency of the soap spray was seen to depend chiefly upon its stickiness and power to glue the nymphs to the leaves and twigs. For this purpose Sunlight Soap was found the most satisfactory of any soap tested.

It should be mentioned that owing to the large number of rolled leaves due to the work of the three species of Leaf-rollers that were very abundant in this orchard, it was found impossible to get good results from spraying large apple trees because there was always a large proportion of the Capsid nymphs hidden in these rolled leaves where no spray could reach them. Consequently all experiments were performed on trees 4 to 5 years of age. Any rolled leaves on these were first removed, then large numbers of nymphs were placed on the trees and given plenty of time to settle down before the spraying was done.

We found also that the time of hatching of the eggs of this Capsid compared with those of the Red-bugs and of the False Tarnished Plant-bug was as mentioned above, so much later that the spraying just after the blossoms fell, recommended for them, would be useless for this pest, because only a very few eggs would be hatched at this date.

Suggestions for Control.

1. Practise a system of clean cultivation of the orchard, keeping down all weeds until the end of June or as late as safe for the trees in that district. This will destroy large numbers of the nymphs which drop to the ground and which, unlike some species of Capsids, have no instinct to lead them back to the trunk and so must perish if there are no weeds to feed upon.

2. Watch the trees closely from the time the blossoms fall to see when the nymphs hatch and are abundant enough to justify spraying. Then apply with great thoroughness both to the upper and lower side of the foliage either (*a*) 2 lbs. of Sunlight Soap to 40 gals. of water containing Black-Leaf-40 at the strength of 1 part to 800 of water, or (*b*) 3 to 4 lbs. of Sunlight Soap to 40 gals, of water, preferably rain water if available. Dissolve the soap first by slicing and boiling in soft water.

In exceptional cases it may be necessary to repeat the spraying in a couple of weeks.

It is of course well to test the mixture on a few trees and observe results before spraying the whole orchard.

The President: These two papers should provide a very interesting discussion as I know there are a number of workers here who are particularly interested in the injuries caused by these insects.

Prof. Brittain: In regard to Mr. Crawford's statement that he was able to destroy 96 per cent. of the insects with Black-Leaf-40 and soap, I may say that our results were about the same. Unfortunately, the insects were so numerous that the remaining 4 per cent. left many thousands to infest the trees and ruin the crop.

Mr. Treherne: The subject of Capsids affecting apples is a very important question in British Columbia. Blossoms in orchards, miles in extent, have been destroyed by Capsids and I am interested in the two papers that have been read.

Prof. Caesar: Do you remember by what species?

Mr. Treherne: As far as I know it was *L. pratensis*, but we have not given the matter much attention as yet.

Prof. Brittain: I am well acquainted with the injury referred to by Mr. Treherne. During my stay in British Columbia a good deal of this Capsid injury came under my notice and considerable material was sent in to the office. I looked into the matter and succeeded in finding the insect responsible, but was not able to get it determined. If my memory serves me rightly, it was neither *pratensis* nor *invitus.* One of its favorable food plants is the mullein.

Prof. Caesar: There are a number of interesting points of comparison between *Lygus invitus* and *Neurocolpus nubilus;* (1) The damage done by the latter is not nearly so great as that done by the former as described by Prof. Brittain, and there is none of that corky growth or rough brown surface mentioned by him. (2) *Neurocolpus nubilus* seems, unlike the other species, to have no instinct to cause it, if it drops to the ground, to find its way back to the trunk, but instead wanders aimlessly around. *Neurocolpus nubilus* will feed on a great number of plants. It is probable its native host plant is sumac.

It is strange that while *Lygus invitus* is to be found all over Ontario in just as great abundance apparently as the other species, it does not, so far as I can see, do any harm to apples or pears. As for the difficulty of seeing the insects laying eggs, both species must be much alike for we could never find *Neurocolpus nubilus* ovipositing or even copulating.

Mr. Petch: This year we had a frost in the blossoming period, and I think the injury was caused by frost to the blossoms. However, as the injury occurred on only one tree I cannot see how that can be the cause, and I do not know what the injury to blossoms by this insect is like. Does it give the appearance of having been frozen?

Prof. Brittain: Yes, it looks very much like fire blight. The blossoms are brown and dead and I attribute a great deal of the so-called frost trouble to *Lygus invitus.*

Mr. Petch: With the use of Black-Leaf-40 in the ordinary strength do you find it injurious to the foliage of apples?

Prof. Caesar: We found that where Black-Leaf-40 was put on very heavy along with lime surphur it did seem to injure the apple foliage to some extent.

Mr. Tothill: The two accounts we have had of *Lygus invitus* in Ontario and Nova Scotia suggest the possibility that there may be two species concerned. The species of American Capsidæ are, of course, based on a study of museum specimens only. They are not based on habits and as the group is an extremely difficult one to do anything with, and as no breeding work of any kind has been done, it seems to me from the great differences in the habits of the so-called species that it is just possible there are two species concerned.

Prof. Brittain: Mr. H. H. Knight writes me that he is convinced that the species in Nova Scotia is a new variety. He intended to describe it as such in the near future.

Mr. Tothill: That would seem to bear out this contention.

The President: If there is no further discussion on these two papers we will proceed to the next, which is a paper by Dr. Cosens entitled, "The Founding of the Science of Cecidology."

THE FOUNDING OF THE SCIENCE OF CECIDOLOGY.

A. Cosens, Toronto.

At a time when the problem of gall formation is exciting deep and increasing interest, it seems opportune to consider for a few minutes those investigators, who, lured by the fascination of the subject, laid the foundation for its scientific treatment.

Centuries before any serious attempts had been made either to describe the structure of galls or to explain their origin, these abnormal vegetable growths had been noted and commented upon. The early ideas concerning them were fanciful in the extreme; such terms as "thunder bushes," and "witches' brooms," still popularly used, have crystallized in them the superstitions that enshrouded the origin of these structures. Some of the primitive, whimsical notions concerning them have been adhered to with surprising persistency. Even as late as the 18th century, Reaumur states that a number of German savants still attributed the production of *Neuroterus baccarum* Linn. to Satanic agencies. At the far-off time when galls first began to have a prominent place in the ancient botanical writings, ignorance frequently ascribed supernatural attributes to anything at all unwonted, or even occasional, and events of outstanding importance were often supposed to have been portended by perfectly natural trivial occurrences. It is not surprising, then, that the earliest naturalists should have seen, in the unusual structure of galls, signs that forboded the future. If an uninjured gall, opened in January or February, contained a fly, war must inevitably occur; if a worm, famine was foreshadowed; while a spider betokened pestilence. "Always for ill, and never for good," were the auspices. That the data, presented by galls, could be interpreted as a representation of the future, was proposed first by Magnus, in the 13th century, but the omen was still accepted by Lonicer and Mattioli, in the 17th.

When the old writers first refer to galls, they are sufficiently well-known to constitute an important part of the list of prescriptions formulated by the physicians of that age. A solution of the gall substance in water, or wine, was the common form in which these remedies were applied. Their marked astringent properties were familiar to the ancients, and, in this connection, it is interesting to note that gall products are still found in the British pharmacopoeia as astringent ointments. Two eminent writers, before the Christian era, who have made somewhat detailed reference to galls, are Hippokrates (406 B.C.-377 B.C.) and Theophrastus (371 B.C.-286 B.C.). The former, a famous Greek physician, dealt with the subject almost exclusively from a medical viewpoint. At various places in his writings he makes detailed reference to the efficacy of galls as remedies in cases where an astringent action is desirable. The latter's work indicates more of the qualities of the naturalist in its author, who must have observed the specimens rather closely, as, in general, he refers to their many sizes and colors, and to the various shapes of particular forms. He especially mentions a gall covered with weak hairs, that would serve as a wick, and a particularly hairy specimen that exuded a honey-like juice. One of the most striking observations which he has recorded is that the elm galls of *Tetraneura ulmi* were suitable for caprification, since they contained animals. Although it is apparent that he must have observed the insect producers, he did not, however, appreciate the relation between their presence and the origin of the gall. Also, the galls on the ash and pistachia were familiar to him, and with them he compares those on the elm. Theophrastus may have been taught the importance of observational work by Aristotle, whose favorite pupil he was.

While the work on galls of Pliny the Elder, who died in the eruption of Vesuvius, A.D. 79, is better known than that of any other writer of antiquity, yet he contributed very little really new material to the knowledge of the subject. He treats chiefly of the oak gall of commerce, *Cynips tinctoria* L., produced on *Quercus infectoria*. He distinguishes several forms of it, and names the variety of oak upon which each is found. He mentions in this classification the green gall-nut on the "hémeris" oak as the one best adapted for the preparation of leather,

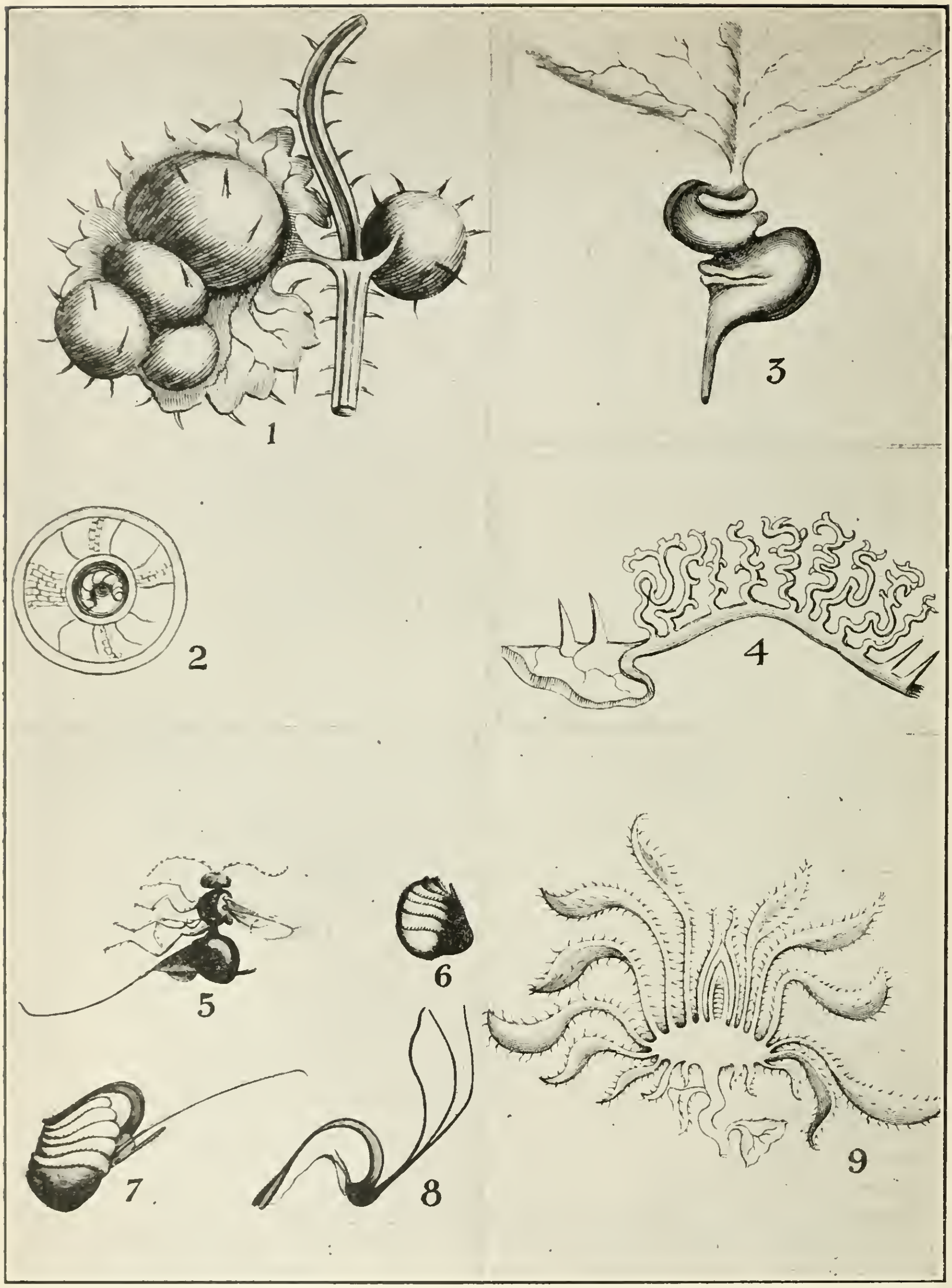


PLATE IV.—REPRODUCED FROM MALPIGHI'S "DE GALLIS."

Fig. 1.—Gall produced by *Aylax glechomae* Linné, on ground ivy. Fig. 2.—Section showing the larval chamber and the enclosed larva.

Fig. 3.—Aphid gall on the leaf of poplar.

Fig. 4.—Mite gall; the producer was unknown to Malpighi.

Fig. 5.—Cynipid producer; 6.—Abdomen of producer, with ovipositor retracted; 7.—The same with ovipositor protruded; 8.—Ovipositor.

Fig. 9.—Section of a willow gall, produced by a midge.

and the white gall-nut parasitic on "latifolia" as similar to the preceding, but lighter in color, and slightly inferior in quality. He includes, as well, the black gall-nut that grows on both the "latifolia" and the "robur" varieties of oaks. He states that the black gall-nut, when on the latter host, has holes in it, and is, in consequence, of much less value. The holes, that he notices apparently only in this form, were without doubt the exit channels of the producers. But, unfortunately for the progress of the science, this point escaped him entirely, and he saw in them nothing but a proof of the inferior character of the galls.

In common with his predecessors, Pliny shows the most perfect confidence, real or assumed, in the value of the medicinal properties of gall extracts. He recommends their use in the treatment of twenty-three different ailments, ulceration of the mouth, affections of the gums and uvula, burns, etc. Toothache may be allayed by merely chewing a little of the gall, but, to secure the best results in more serious disorders, the gall substance should be burned and quenched in wine, or in a mixture of water and vinegar. Pliny no doubt owed much that he has stated concerning the healing properties of galls to his contemporary, Dioscorides. This author named and described five or six hundred plants supposed to be medicinal, and included oak-galls in this primitive materia medica.

In addition to the oak-gall of commerce, the writings of Pliny contain references to other galls. He states that the "robur" oak produces one that can be used for illuminating purposes, and another that contains a sweet juice. These are clearly the same species mentioned by Theophrastus. In the axils of the branches of this same oak, Pliny has observed galls. Following his description of the species, it adheres to the bark without the medium of a stalk; at the point of junction with the host the gall is white, but is spotted elsewhere with black; the inner substance is scarlet in color, and has a bitter taste. Quite a concise and detailed description, considering the early developmental stage of the subject. It has been inferred that Pliny had seen Cynipid producers, since he speaks of a sort of gnat in watery pustules on the leaves of the "robur" oak. Clearly the correlation between the life-history of the insect and that of the gall was not noticed by him, and indeed it is not perfectly conclusive that he recognized the nature of the oak pustule as the same as that of the gall-nut, although he states that the two species mature in about the same way.

Many of the statements of Pliny incline us to the belief that he was influenced to a greater degree by tradition than by observation. Only some such charitable conclusion can explain his assumption that gall-nuts are a fruit of the oak, produced in alternate years with the acorns; or that the gall-nut develops in a single day, but shrivels up immediately if the heat strikes it.

The writers already considered may be regarded as representative of the ancient period of the literature dealing with galls. That era, in reality, contributed very little to our knowledge of the subject. Swellings on certain plants had been noted, and, in some instances, described, but, apart from that, nothing of scientific value had been accomplished. At that time, different hosts, such as the oak, beech, rose, and ash, were known to bear galls. They were supposed to be a fruit-like product of these trees, and it is extremely doubtful that the deformities on the various hosts were known to be of the same fundamental character. It is almost impossible that they could be so regarded, since the common and unifying element, their production by an insect, was unknown. The consideration of galls as fruits caused them to be looked upon as natural products, and made any attempt to explain their origin quite superfluous. During this period, confidence in the medical properties reached its maximum, and their extracts were recommended as infallible remedies for a long list of diseases.

For 1,600 years after the time of Pliny the scientific world slept, and, as a consequence, at the beginning of the 17th century the work on galls had been advanced very little beyond where the ancient naturalists had left it. During the time elapsed, while no appreciable progress was made, several writers had incidentally mentioned galls. Magnus (1193-1280), and Konrad von Megenberg (1309-1337), in particular, have referred to them in their general discussion of the oaks. The latter author introduced the term "oak-apple" as a synonym for the older name "gall-nut." Mattioli and Lonicer, about the year 1600, wrote on the subject, and, in imitation of the early physicians, recommended the gall extracts as a panacea for many ailments. Galls, acorns, and mistletoe were regarded as three varieties of oak fruit by these authors. Their belief in the oracular powers of galls has already been considered.

These desultory references to galls, however, do not indicate any special interest, and we may say that the subject had never been approached in a serious scientific manner until its importance attracted the attention of the Italian physiologist, Marcello Malpighi (1628-1694). This investigator was the outstanding figure of his age in medical science. He was physician to Innocent XII, and professor of medicine at Bologna, and afterwards at Messina. In his methods, he isolated himself entirely from the dogma of tradition, and based his conclusions upon his own observations. In his research work, he investigated the anatomy of the brain and lungs, and made a beginning in embryology by tracing the various stages in the development of the germ in the hen's egg. While his work along zoological lines has placed him in the front rank of the scientists of his own era, that on the botanical side has marked him out as one of the leading naturalists of all times. When a biologist of such ability penetrates into a practically unexplored region as that presented by the subject of galls, it is to be expected that the progress made will be quite phenomenal, and this has proven to be the case. The science of cecidology, with the founding of which Malpighi must be credited, was based by him upon taxonomic knowledge. His catalogue, "De Gallis," published in 1686, contains descriptions of a large number of Italian and Sicilian galls, and shows the intimate familiarity of the author with the included types. Prior to this work, the galls that appeared in the literature were, with few exceptions, confined to the rose, beech, and oak. But, in addition to such well-known forms as *Rhodites rosæ, Andricus fecundatrix, Cynips Kollari, etc.,* he has described others that are less common and more restricted in their distribution. For example, he collected *Aylax glechomæ* Linn. parasitic on *Nepeta hederacea*, a gall that has been widely introduced into America, and is almost certain to be found wherever the Ground Ivy is established. He was also the first to observe the beneficial gall nodules on the roots of Leguminous plants, and had noticed, as well, Erineum galls without being familiar with their production by mites. The deformities of this nature he has mentioned are those produced on Vitis and Populus. Malpighi did not concern himself only with the characteristics of the external form of galls, but applied his knowledge of plant anatomy to the investigation of their internal structure. By this means he became familiar with the course of development of several galls, and the typical stages of individual species.

Valuable as was the contribution thus made by Malpighi to our botanical knowledge of galls, it was overshadowed by the importance of his work along entomological lines. Indeed, the complexity and importance of the problem presented by the production of galls was never fully appreciated until he discovered their insect origin. Only then was the question seen clearly in its dual character, involving a stimulation by the producer, and a reaction by the host.

That he understood the nature of this reaction may be deduced from his statement that the plant is compelled to furnish a deformity that serves to nourish the deposited eggs of the insect. He must have observed the producers very closely, as he gives a detailed account of the curious ovipositor of the Cynipidæ, and mentions, also, the stalked character of their eggs. He further discovered that the galls are not left to the undisputed possession of the producers, but are inhabited by other insects. He seems to have grasped fully the importance, not only of a close study of the host plant, but also of the habits and structure of the insect parasite.

Malpighi has recorded a number of reflections concerning the biological relation between plant and insect in gall formation. His theory summarized in brief is that a poison, introduced at the time of oviposition, breaks down the substances of the cell sap, and diverts the currents of its transference into wrong channels, thus producing malformation by causing the growth energies of the plant to be wrongly directed.

Particularly interesting to us, as students of insect life, is the fact that the founder of the science of cecidology, realized the importance of the entomological viewpoint of the subject.

The President: As the writer of this paper is not present and as its historical nature rather frees it from any discussion, we will proceed to the next paper by Mr. Strickland on "The Army Cutworm in Southern Alberta."

THE ARMY CUTWORM IN SOUTHERN ALBERTA.

E. H. Strickland, Entomological Branch, Department of Agriculture, Ottawa.

The Army Cutworm (*Euxoa auxiliaris*) is new to Canada as a field pest, though it is a native species of the Western Provinces. Fletcher recorded it in 1903 as injurious to gardens in Regina and Calgary, but apart from this report the insect has not been described as one of any economic importance in Canada. Since 1898 it has been a frequently recurring field pest in Montana, where it was given its popular name.

In 1915 an extensive outbreak of this insect occurred in Alberta, and covered a territory of about 3,000 square miles. The resulting study of the insect from an economic standpoint brought to light several interesting features in its life-history and habits.

The eggs are laid in September and October, mainly upon weedy fields. We were unable to find eggs in the field, but in all the experiments in which we reproduced natural conditions in so far as we were able the eggs were laid in the soil—near, but never actually upon, vegetation. This suggests, therefore, that even though the eggs of this species may be found on vegetation the majority of them are laid in the soil. We believe that this will be found to be true of several other cutworms which are described as laying their eggs exclusively on vegetation.

The eggs hatch in the autumn, and the young larvæ hibernate in the soil. Soon after the frost is out of the ground in the spring they come to the surface and feed upon the weeds. When the cutworms are numerous they soon destroy all of the weeds upon the fields where they hatched and have passed the winter. Then, like the Army-worm, they move off more or less in a body in search of more food.

Their general trend of migration, in all cases observed, has been towards the northwest. We believe that they are oriented by light. As in the adult stage these cutworms display a positive phototropism to artificial light, and also to subdued daylight, such as is experienced soon after sunset. Also, like the adults, they avoid strong daylight. The latter tendency causes them to remain below ground on bright, sunny days. It happens, however, that when the cutworms are sufficiently numerous to assume the migratory habit, they have been unable to obtain enough food to appease their hunger. Hunger causes them to migrate, and it may become so intense that it overcomes their aversion to exposing themselves to direct sunlight, so that they come above ground by day, and crawl rapidly in search of food. This search is haphazard. They are not making for any definite feeding ground, of which they have some knowledge. They crawl, therefore, in the line of least resistance—that is, away from the sun, or in a more or less northerly direction. We have disturbed adults hiding under clods at noon time, and they too, in nearly every case, flew more or less due north. In the evening, when the sun is low, its weakened light seems to attract, as does that of an artificial light, and the cutworms crawl towards it. It is at this time of the day that migration usually begins. Once more this agrees with the adult habits; for the moths begin to fly at dusk, and an examination, soon after sunset, of the windows of a barn shows that most of the moths of this species are congregated on the western windows.

The food plants include practically all weeds, field, and garden crops. Larvæ even ascended young Manitoba maples and ate the bark off the twigs, thus killing the trees. They are entirely superficial feeders, and never cut off plants below ground as do the common cutworms.

The pupæ are found in the usual earthern cells made by the Agrotine species.

The moths fly from the middle of June till the end of September or early October. They may æstivate during the hottest part of the summer, and so appear to be double brooded. There is, however, one brood only. During the first flight the ova remain undeveloped, but the moths feed freely and accumulate fat body. After the period of æstivation the eggs have begun to develop, and they are laid during the autumn.

The moths are a serious domestic pest, and gain access to well screened houses. Contrary to general belief, very few of them are attracted into houses by the lights. A lighted lamp merely attracts around it the moths already in the house. The majority of moths enter houses between the shingles or through cracks around doors and windows. They enter these crevices in the early morning for protection from the daylight, working so far in that many of them are unable to find their way out again. Many of these crevices communicate, by however devious a course, with the interior of the building and the result is that a number of the moths gain admission to houses from which the smaller house flies, which avoid dark chinks and crannies, are effectively excluded. The moths are attracted only from a short distance by light, and in this connection it may be mentioned that light traps in the fields proved to be an absolute failure. The majority of moths migrate to buildings soon after they emerge, and remain there until they are mature.

The destruction of the larvæ by poison can be accomplished with comparative ease. This is done most economically by the use of a poisoned bait applied to specially prepared furrows. In wet seasons a vertically sided furrow can be used but under the conditions prevailing in southern Alberta the soil is usually too dry for its construction without expensive hand labor. Under such circumstances it can be replaced by a dusty sided furrow, made by drawing a heavy log through a deep plough furrow. For bait we used either sweetened shorts, which proved to be far superior to bran, or some green vegetation, such as Stinkweed (*Thlaspi arvense*), or alfalfa, poisoned with Paris green. The cannibalistic tendency of these larvæ proved to be of great benefit, since the poisoned larvæ, which soon lined the treated furrow, were eaten readily by subsequent arrivals, and definite experiments proved that under these circumstances they themselves furnished a very effective poisoned bait.

The cutworms appear early in the season, before the spring grain is sown. If they are observed in large numbers in a field which is being prepared for seeding, extra care is taken to remove all traces of green growth, a poisoned furrow is prepared right round the field, and seeding is proceeded with as usual. The lack of food results in a rapid migration of the larvæ already on the field, and by the end of the week necessary for the germination and appearance of the crop, the majority of them will have entered a furrow and have been poisoned, while others attempting to enter the field from the outside also will be trapped. Sometimes it is advisable to make more than one furrow along the menaced side of the field, and if the season is so advanced that germination is rapid, it may be necessary to plough subsidiary furrows at intervals through large fields.

Fortunately, we have no evidence which would lead us to anticipate a frequent recurrence of the pest, and we feel that similar outbreaks to that experienced this year can be held in check by the control measures advocated above.

THE PRESIDENT: I think all will agree as to the very practical nature of Mr. Strickland's paper and at the same time its value on account of the very interesting points he brings up regarding certain biological questions. Mr. Strickland certainly won two victories in the West this past season. He won a victory over the Cutworms, and he won a more important one than that, the obstinacy of the farmer, who is always very chary about adopting any remedial measures from experts unless you can convince him by demonstration. The way he was able to break through that obstinacy on the part of those farmers who were not willing to accept advice unless they were shown is really one of the valuable lessons we learn from the method we now have of carrying out our work through the field stations. Secondly, the fact that Mr. Strickland had to begin the study right from the very beginning, and leave behind him all the previous historical matter regarding the treatment of Cutworms under other conditions and in other parts of Canada. shows what a difficult task he had. There are a number of points in his paper which might be the subject of a very interesting discussion; for example, the behaviour of the larva as compared with the behaviour of the moth. They behave practically the same both towards artificial light and towards the natural light of the sun. Apart from its practical interest, of course, this paper does bring forward very emphatically the necessity of studying the behaviour of insects, and I believe that in our practical work we are coming more and more to realize that we shall have to go in for behaviour studies in addition to the study upon which so much of our advice has been based in the past, that is, studies of the life-history. We have many instances of that, such as the recent work in regard to the Fruit Flies of various species and work in connection with the relation of the ants to the Corn Root Aphis, all of which tends to prove that life-history study only leads so far in many instances. That is one of the most important things that Mr. Strickland's paper brings out. The paper is now open for discussion, and I have no doubt that a number of the members would like to take up certain matters.

PROF. LOCHHEAD: Did Mr. Strickland say what effect the juice of lemon has upon the mixture as an attractant?

Mr. Strickland: We tried using the juice of both oranges and lemons when poisoning in the trench, but found that since the bait was not in competition with a growing crop there was no necessity to use it; and as a general rule we found that the fruit juices made very little difference. We have been using a series of cages sunk into the ground over a growing crop, 9 feet square, so that we can put in each a certain number of cutworms, apply poisoned baits, and tell exactly what our poisons are doing. We did some forty or fifty experiments in them this year with various poisoned baits, and generally about three days afterwards we would recover all of the larvæ, living or dead, from the soil, and in that way we were able to tell the relative values of the baits used. Here also we find that fruit juice has very little beneficial effect, and that cane molasses is very much inferior to beet molasses.

Mr. Winn: I would like to ask Mr. Strickland about the first stage of the insect, namely, the egg-stage. When the eggs were found were they attached in any way?

Mr. Strickland: We never found more than three together.

Mr. Winn: Did you notice where they were laid?

Mr. Strickland: Of course we disturbed them when we examined them, but we found that particles of earth were attached all around them, and therefore we concluded that they were laid in the soil rather than on the soil.

Mr. Winn: I have examined several of the eggs and it was very peculiar the way they were laid.

Mr. Strickland: Our examination of vegetable matter has been naturally far more thorough than that of the soil, and we have never found them on vegetation, so that we are rather forced to the conclusion that they are laid in the soil.

The President: Perhaps Mr. Gibson would have some remarks to make on this subject.

Mr. Gibson: I am afraid I can add very little to what Mr. Strickland has already said. He seems to be working under conditions peculiar to Southern Alberta. In the East, here, we frequently find the eggs of Cutworm moths laid on leaves, and even on the stems of trees, but we have not ourselves, as Mr. Strickland has, located any eggs in the soil in eastern Canada. In the case of the Variegated Cutworm, which was so abundant in British Columbia in 1900, the eggs were laid on the leaves and stems of trees, windows, verandahs, and even on clothes hanging out to dry. In regard to the control of cutworms in the East, we this year used the locust poisoned bran formula with good results. Twenty pounds of this, if spread properly, is sufficient for two or three acres.

Mr. Criddle: I would like to say that I have also been carrying on a few investigations in Cutworms during the past season, and I found that market gardeners near Winnipeg had very little faith in oranges or lemons. They had remarkable success by using both bran and shorts (the majority were in favour of shorts) and just molasses in addition, and my results seemed to bear out what they said.

Mr. Tothill: I would like to ask Mr. Strickland if in connection with the Noctuids there is any special machinery in connection with any of the ovipositors for laying eggs beneath the soil?

Mr. Strickland: Whenever we disturbed moths in the day time they were always beneath clods and so beneath the soil.

Mr. Wilson: I would like to ask Mr. Strickland about what time the Cutworms appeared in Alberta this summer?

Mr. Strickland: They appeared as soon as the frost was out of the ground, the very first record being of larvæ attracted to light at the Provincial Jail on April

7th, and on about April 10th we had an account from the country where we found them plentifully.

Mr. Wilson: In 1900, about the 15th June, I received a report of damage by potato beetles up North and I proceeded there, but could find no potato beetles of any kind, and I had good evidence that cutworms were present.

The President: If there is no further discussion on this paper we shall now bring this session to a conclusion.

Mr. Gibson: Several of the members undoubtedly would like to spend some time looking over our collections here, and as I think we have plenty of time for all the papers on the programme to-morrow morning, I would move that the session begin at 9.30 instead of 9.00 o'clock.

Mr. Tothill: I second that motion.

The President: To-night we are to have the privilege of hearing a public lecture from Dr. H. T. Fernald, State Entomologist of Massachusetts. Dr. Fernald has been most kind in stepping into a breach which was made by the unfortunate accident to Dr. Howard, who would otherwise have delivered this lecture, and I take it for granted that everybody here will be there to-night as we ought to give Dr. Fernald a good audience, and I hope the members here will do their best in bringing their friends to hear Dr. Fernald. The lecture starts at 8.00 p.m.

The meeting is now adjourned.

Thursday, Nov. 4th.

EVENING SESSION.

LIFE ZONES IN ENTOMOLOGY AND THEIR RELATION TO CROPS.

H. T. Fernald, Amherst, Mass.

From the time when the late Alfred Russel Wallace published his epoch-making volumes on "The Geographical Distribution of Animals," this subject has been one of extreme interest. Wallace used his discoveries in this line as evidences of evolution, and provided many able arguments to support the theory from that source. The possibility of a practical application of distribution to agriculture, however, seems not to have received consideration by him, and it was apparently left for Dr. C. Hart Merriam to present this phase of the subject, though in a somewhat general way, in his paper on "Life Zones and Crop Zones in the United States," about a quarter of a century later.

Two years ago, Dr. E. M. Walker, in his presidential address before this society, discussed at some length the life zones as they are found in northern North America, and therefore only a brief reference to this phase of the subject is necessary at this time. Studies of the distribution of plants and animals all show that on any continental area, belts running from east to west across the country are inhabited largely by the same forms, while as we go north or south to the limits of these belts, we find other species beginning to present themselves, and these increase until finally we are surrounded by a fauna and flora almost entirely different, and belonging to a different belt.

Such belts constitute the so-called life zones and these are grouped into regions, that covering the tropical portion of the continent being called the Tropical Region, that next the north the Austral Region, and the northernmost, the Boreal Region. Naturally we are interested mainly in the last two of these areas.

Canada is, of course, largely within the Boreal Region, but the differences within her territory are such that three sub-belts, called zones, are easily recognizable. On the north, beyond the limit of the growth of trees, we find corresponding changes in plant and animal life, establishing the Arctic Zone of the region. Here are typically Arctic plants and such animals as the Arctic fox, polar bear, musk ox, and ptarmigan. South of this, stretching across the continent from Labrador to Alaska, and southward along the tops of the Rocky Mountains is the so-called Hudsonian Zone. Its southern limit extends from near the mouth of the St. Lawrence River to the southern end of Hudson Bay, thence passes northwest to near Great Slave Lake, then down the Mackenzie River to about 65 deg. latitude, after which, influenced by the mountainous heights, it extends again to the south to about latitude 55 deg., sending narrow tongues farther south along the mountain tops. As it approaches the western ocean, however, the moderation of climate due to the Kuro sivo, or Japanese Gulf Stream, makes its influence felt, and the southern edge of the zone is driven north and is only able to reach the western shore of the continent about five degrees farther north than it was when the effects of the ocean came within reach. As neither the Arctic nor Hudsonian zones of the Boreal Region has great agricultural value, we now turn to the third zone of this region—the Canadian—which with certain exceptions occupies the rest of the Dominion of Canada and a portion of the United States. Here we must look for the greatest agricultural returns and one of the best opportunities for the utilization of crops not as yet grown.

The Austral Region occupies but a small portion of Canadian territory, but what it does occupy is of great value, for here it should be possible to produce crops not raised elsewhere in the Dominion, and to produce to perfection crops only partially successful in the Canadian Zone. Like the Boreal, the Austral Region is divided into three zones, the northern one being known as the Transition Zone. How accurate our knowledge of the area occupied by this zone as shown on the map is, may be questioned, but a strip around the Bay of Fundy and along the shore of Lake Ontario, and the Southern parts of Manitoba, Saskatchewan, and Alberta, besides the shore belt in the region of Vancouver Island, are believed to belong to this section.

Next south comes the Upper Austral, and this appears to be present in Canada only as a narrow strip along the shore of Lake Erie. How correct this is must be determined by future investigation.

It is a safe statement that Life Regions and Zones are always limited by barriers, though these may be of many kinds. Every kind of animal and plant has an optimum temperature at which it thrives best. As we depart from localities where this is true, and pass to the north, we will reach a latitude where it can no longer exist, while if we pass to the south the same will hold. Sometimes the limits will be established, not by temperature but by absence of food or by a change from a moist to an arid climate or the reverse. A mountain chain of considerable height may so affect temperature that forms reaching it are unable to cross and enter a continuation of the same zone beyond. Near the shores of our continent the influence of the ocean is a modifying factor, and others might also be enumerated, all affecting the arrangement of the regions.

Evidence indicating the limits of these zones is gathered by a study of the plants and animals present. Many plants found only a short distance south of the international boundary disappear as we pass northward, and with them disappear animals feeding on those plants, unless satisfactory substitutes can be found. The cold of winter holds many forms in close agreement for their northern limit with certain isothermal lines, and by a study of these and other factors, a general understanding of the zonal areas can be obtained.

At the present time investigations on this subject are mainly by preparing faunal and floral lists for different localities, particularly from places presumed to be near the borders of the zones, and as a whole the latest results seem to indicate that the Upper Austral Zone extends farther north than was formerly supposed to be the case. It is, of course, recognized that no absolute line separates the zones, but that they overlap somewhat along their edges, leaving more or less of a "debatable ground," but despite this, approximate limits have a significance when it comes to the selection of the most successful crops to raise in any locality, and even local modifications are worthy of consideration.

The speaker regrets a lack of knowledge of local conditions of Canada as bearing on this point. Certain examples from cases with which he is familiar, however, may be suggestive and be possible of application here.

The State of Massachusetts is mountainous at its western end, numerous peaks reaching a height of more than 2,500 feet, and that whole portion of the state is more than a thousand feet high. East of this the state is crossed by the broad Connecticut River Valley, where, except for a few hills, the elevation is everywhere less than 500 feet. The central part of the state is higher again, the general elevation of the land except for narrow grooves cut by streams, being over a thousand feet. The eastern third of the state, however, is all less than 500 feet above sea level.

So far as elevation goes, therefore, the eastern part of the state and the Connecticut Valley should have much in common. Such differences in elevation in the state as have been indicated should not be of such importance as to affect apple raising, for instance, but they do result in the appearance of minor differences which all have their effect.

But even two such similar areas as the eastern end of the state and the Connecticut Valley have their differences. Nearness to the ocean has its effect in the former case, moderating the temperature somewhat in winter, and slightly checking excessive heat over extended periods in summer. But when southeastern Massachusetts is considered, yet another difference is found. Here the influence of the Gulf Stream as it sweeps northward modifies the winter and lengthens the fall, preventing frosts until much later than only a few miles farther inland.

The Gulf Stream is itself a somewhat variable factor. From time to time its course changes, sometimes swinging in quite close to the land, while at others it turns more out to sea, thus having less effect. In general, however, the result is that crops normally grown only much farther south can be successfully raised on Cape Cod and along the shore towns of the southern part of the state, besides insuring safety to late planted crops coming onto the market after the regular season has ended.

Small factors sometimes prove to be of considerable importance in establishing the limits of life zones, and this is illustrated by the Holyoke range of mountains in the Connecticut Valley. This range is by no means a continuous one, but its general trend is across the valley with an average height of perhaps a thousand feet. In spite of its numerous breaks which would seem to render it of no importance as a line of separation, we find many forms of life extending from the south as far as this range but no farther, and the season on the northern side of the range is about ten days later in spring than on the southern side. The steep northern slopes of the mountains are well covered by snow during the winter, and this is not quickly reached and melted by the sun in the spring, thus delaying the season north of the range. During the winter, too, increased cold results, and it is probably this which prevents a farther northward spread of the forms which reach the southern slopes, by establishing a winter temperature which they are unable to withstand. During the summer, northward migrations can and sometimes do occur, but the cold of the winter following is always sufficient to destroy these marginal settlements, leaving the northern limit of occurrence of these forms where it was before.

Closely related to the questions of distribution of our native animals and plants, are those of introduced forms of life. The Elmleaf Beetle, which reached this country nearly three-quarters of a century ago at Baltimore, has now spread far to the northward, and how much farther it can go is a question of considerable importance. It thrives in the Upper Austral Zone, but is noticeably absent in the highlands of the Pennsylvania mountain region, though it is present again west of them. To the north it has caused serious loss to the elms of New England, resulting in the appropriation of large sums for spraying of the trees to protect them from its ravages. Careful studies of this pest in Massachusetts show that while a serious menace to the life of the elms in the southern part of the state and in the river valleys, it becomes of little importance in the higher and northern parts, and many towns which formerly appropriated money for the protection of their elms from this insect have now learned that this was unnecessary, as the trees would suffer but little at most, in any case.

With the San José Scale similar facts are now coming to light. This pest finds the best conditions for its life in the Lower and Upper Austral Zones, where it has caused the loss of many millions of dollars. Even in the Upper Austral territory of Massachusettes, it is one of the most destructive enemies of the fruit-grower. As we pass into the Transition Zone, however, its ravages become less severe, and by the time the centre of this zone has been reached, it is of only medium importance. In this case, it has seemed to those studying this problem that this insect was originally limited by the Upper Austral, but has gradually acquired some degree of resistance to lower temperatures and has thus been able to extend into the Transition Zone. Whether this resistance of cold will continue to develop until it becomes a serious insect in this entire zone is a question which cannot now be answered. At least, it points out the possibility of the acquirement of resistant qualities as a factor which must be taken into consideration. The speaker has watched with much interest a small colony of these insects which about fifteen years ago was brought on nursery stock to a point near where the Transition Zone meets the Canadian. Here from year to year the insect has reproduced just sufficiently to maintain itself, doing no injury, and "eking out a miserable existence" and nothing more.

The Asparagus Beetle and numerous other examples might here be considered as illustrating the significance of life zones in their relation to the limits of spread of our insect foes, but time for their consideration is inadequate.

With life zones divided by mountain ranges we find that it is not usually the case that the same forms occur on both sides of the barrier. When this does happen, two explanations offer themselves. The barrier may be a recent one, at least geologically speaking, having arisen after the zone had been occupied by the forms concerned. Or the barrier may be a less complete one than it was supposed, and these forms have in some way succeeded in crossing it. More often the animals on the two sides are not the same, though they may play similar parts in Nature's economy, and again two explanations are possible. Where two similar but different forms occur, one on each side of a barrier, it has been suggested that a common ancestor of the two had established itself over the entire zone before the barrier was formed, and that development on the two sides since has been along sufficiently different lines to produce different species. The Peach Borer east of the Rocky Mountains, and its close relative, the Pacific Coast Peach Borer, on the western coast, are considered an example of this. Many forms, however, show little close relationship but much similarity to Old World forms, and here geology steps in to provide an explanation.

There is much evidence that in past ages the northern part of the world's surface was much warmer than it now is, and also that there were more or less complete land connections between Europe and North America on the east, and Asia and Alaska on the west. It is noticeable that many forms of life in the northeastern part of this country find their closest relatives among European forms, and similarly that many of our western forms closely resemble those of North-Eastern Asia. From these facts it seems at least probable that differences in the life of the same zone found on two sides of a north and south barrier may be accounted for as being the results of migration from the two opposite ends of the Eurasian continent.

Life zones then mean, not the areas continuously inhabited by a certain list of forms, but territory having fixed standards, which meeting the needs of animals and plants, able to live under such standards, can be populated by them if means of access is provided.

It has been said that certain places in Africa are perfectly fitted for some American forms of life. If this be correct, such American forms once placed there would establish themselves and thrive in their new home, the only difficulty being that of getting them across the ocean in the first place. This may remain a difficulty for years, but, so far as North America is concerned, the arrival of new forms from other countries is not only possible, but is actually occurring, and if favorable conditions are found on arrival, or, in other words, if proper life zone conditions and proper food are at hand, the establishment of new animals and plants in our land is certain.

Some of these arrivals in the past have been desirable, but certain it is that many have proved veritable pests. It is stated that about seventy-five of our one hundred worst insect pests are of foreign origin, and, in spite of all systems of inspection and care, new ones somehow creep in and establish themselves before we are aware of their presence.

To prevent this seems hopeless under our present methods, and the recent development of the nursery business, bringing in millions of all kinds of plants from all parts of the world, harboring insects many of which it may be difficult or impossible to find by any inspection, raises the question whether it would not be wise to absolutely prevent the importation of all plants from foreign countries, in order to protect ourselves from the pests of other lands which otherwise might join forces with those already here, in the destruction of our crops.

MORNING SESSION

FRIDAY, November 5th.

THE PRESIDENT: The meeting is now called to order and I intend to postpone the first item on the programme, that is, "Election of officers, etc.," and instead to ask Mr. Morris to read his paper on "Fresh Woods and Pastures New."*

Mr. Morris's paper was read.

DR. HEWITT: I am sure I am voicing the sentiments of the whole meeting when I say how pleased we are that Mr. Morris was able to come to this meeting and deliver one of his charming papers. It occurred to me, as Mr. Morris was reading his paper, what a pity that he could not be given charge of an expedition such as Bates had in South America, what charming accounts of those entomological journeys we should have when Mr. Morris returned. This paper is now open for discussion, if any of the members care to ask Mr. Morris any questions regarding his captures.

I hope, Mr. Morris, that you will take this silence as indicating that your paper was so fully detailed by you that no one wishes to discuss it. We will now pass on to the next paper, by Professor Lochhead, on "Some Notes on Nose and Other Bot Flies."

SOME NOTES REGARDING NOSE AND OTHER BOT FLIES.

PROF. W. LOCHHEAD, MACDONALD COLLEGE, QUE.

1. NOSE FLIES.

In connection with the "Farmer's Friends and Foes" department in the *Family Herald* and *Weekly Star* several interesting letters were received by me from the West regarding *Nose Flies.* I consider the information obtained of sufficient importance to bring before this meeting, for it became evident when I looked up the literature available that entomologists as a rule have much to learn regarding this group of flies.

The correspondence referred to began innocently enough through a question asked by a Saskatchewan subscriber: "Does the Nose fly that torments horses in summer time sting or bite the horse, or what makes them so afraid of the flies?" I replied as follows:—

Nose flies are a species of horse bot flies and have a peculiar habit of laying their eggs round the lips of horses, and the nostrils. For this reason they have been termed "Nose Flies." We all know that horses have an instinctive dread of this fly, and seem to recognize its presence. While these flies may appear to sting, they cannot do so, for they have no sting. Their mouth parts are aborted. However, this fear of the bot fly has been bred into the bone of thousands of generations of horses, who have suffered the effects of the bots in the stomach. There may be something in the fact that the bot fly resembles a wasp or a small bee and that the horse cannot very well distinguish between these insects which sting and the bot fly which does not sting. Personally, I am of the opinion that horses know instinctively that this insect is harmful to them. There are many things that we cannot explain, and this instinctive dread of nose bot flies is one of them.

*This paper will appear in the *Canadian Entomologist*, Vol. XLVIII, No. 5, May, 1916.

My reply led another Western reader to make a spirited reply to my statement that the bot flies cannot sting either with its mouth-parts or with its ovipositor. He says:—

My experience with "nose flies" that annoy horses dates back eight years. Previous to that time they were unknown in the district. A bunch of horses were brought in from the United States the year before and from them I think we obtained this pest. Of course we always had the long-tailed bot-fly, but this bob-tail is a curse both to horses at work and in pasture. Work horses can be given some protection in the shape of nose covering, but the poor horses outside cannot even feed in the day-time for them. If you could see the poor beasts huddled up together stamping, rubbing, etc., I am sure you would not think the laying of an egg by these pests so simple a matter. Come and hitch up a six-horse outfit without any protection sometime this coming summer and you will change your mind. Anyone who will take the trouble to examine these bob-tail bot flies will notice on the tail end a pair of tweezers when pressed slightly. It is from these tweezers the trouble arises.

In my reply to correspondent No. 2 I suggested that perhaps the real culprit was a Tabanid for these insects are known as Gad-flies, Breeze-flies, Greenheads and Ear-flies, but asked for specimens. Correspondent No. 2 was good enough later to send a few specimens of the Nose flies and made further observations regarding their habits:—

These pests have been some weeks later making their appearance this year, owing I presume to the late frosts. I think the description you once gave, namely, red-tailed bot-fly, was fairly accurate, but strange to say I have looked very closely for their eggs but have failed to find any—so different from the ordinary long-tailed bot, which distributes its eggs promiscuously. On squashing an ordinary bot fly one finds numberless eggs, but in these I have failed to see any. The habits of these nose flies are to hover around a foot or so above the earth, when they make a dart upwards and try to hit the horse on the lips or nostrils; it also seems to dig its hind part similar to a bee or wasp when stinging an object. It rarely hits but once at a time, when it seems to disappear for a few seconds, then comes again. I have examined its rear end for stinging apparatus, but can only see what to me appears a pair of tweezers. We have all the other kinds of horse flies you mentioned, but a horse will calmly endure being chewed up with the spotted winged horse flies, bull dogs and the rest of that family, but let one of these nose flies strike and he is up in the air at once and has to rub his nose on something or other. As I mentioned in my previous letters it is only a few years since they made their appearance in this district and I have heard that there are parts of this province where they have not yet made their appearance. They are the greatest pest we have got on horses. I think the Royal Humane Society should get busy and make all owners provide some building in which any stock in pasture could go in for protection. I have a pole and straw shed which I put up for winter and the straw has settled down a little, which leaves an air current at the top of walls. My stock appreciate it and it is also a protection from the bull dog flies, too, which are a great annoyance to cattle as well as horses. These nose flies don't touch cattle.

My reply was as follows:—

We were very glad to get four specimens of nose flies from Saskatchewan, for their arrival sets at rest the question of the identity of the flies that bother the horses so much in the western provinces. They are nose flies (*Gastrophilus nasalis*), and are one of the species of horse bot-flies. Now our friend S. H. differs from us on the power of stinging these nose flies possess. We maintain that these flies do not and cannot sting, for they have no stinging appliance. In all kinds of flies that sting the mouth-parts are modified to form a stinging or piercing apparatus; on the other hand, in all the kinds of bees and wasps that sting the egg-depositor at one hind end of the body is modified for piercing purposes. Now, as bot-flies are true flies we would naturally expect their mouth-parts to show piercing appliances if they can really sting, but examination reveals no such appliances. Moreover, the egg-depositor at the hind end of the body is rather long, but it is too soft and flexible to serve as a stinging instrument.

If these bot or nose flies cannot sting, why do they cause such panic among horses? The answer is, we believe, the persistent efforts of the flies to deposit their eggs on the hairs of the front legs. They resemble a bee or a wasp to a considerable extent, even to the humming noise, and their sudden darts coming continuously and persistently get on the horses' nerves and set up a panicky state of mind. The cattle or warble or bot fly is another instance where a fly that cannot sting causes cattle to go careering through the fields in a panicky condition. The real biting flies like the horse fly do not seem to produce the same effect, for the reason we suppose that once the horses get rid of it they have rest for a while. There is no doubt as to the name of the flies sent, and it is also certain that they do not sting. Three of the specimens submitted were males, hence would not have eggs.

Later still. a third correspondent from Saskatchewan writes me regarding Nose flies and gives further particulars as to the differences between the Nose fly and the Bot fly. He says:—

I have been reading in the issue of July 28 an article on nose flies. As the nose flies are a very troublesome pest among horses, I would like to add my mite of knowledge concerning them. Now they cannot be the same flies that deposit their eggs on the legs because they are much smaller and darker in color, and the mode of laying the egg is different; the ordinary bot-fly keeps buzzing and depositing her eggs (which are yellow) continuously; whereas in the nose fly it strikes upward swift and wickedly and then disappears, to return again possibly in half a minute; the egg is black. One fellow struck me on the back of the hand last summer and left an egg which attached to a hair; there was no pain, though the wicked way it does the trick is quite enough to scare a person or a horse either. When there is protection on the nose of the horses (rags are commonly used and wire screens are sold to cover the nose), they will strike at the person; often I have had them hit the underside of the brim of the hat.

My reply was as follows:—

The correspondence regarding nose flies has brought out much important information regarding these pests. Our friend (W. B.) tells us something really important in the way of distinguishing two kinds of bot flies of horses. It is likely, however, that there are at least three kinds of bot flies in the West, and this fact will account for the difference noted by the various observers. There is first of all the "common bot fly," which deposits its yellowish eggs on the legs and is of a general reddish brown color. The eggs may be deposited on the fore legs, knees and shanks. A second form is what is known as the "nasal fly," specimens of which we identified in our last note on nose flies in these columns. We beg to note a clerical mistake which we made in stating that they deposit their eggs on the hairs of the front legs; this should have been "on the hairs of the lips and the margins of the nostrils." This insect is smaller than the first, has white eggs and is of a darker color, but still with a considerable number of brownish hairs. The third form of bot fly is the "red-tailed bot fly." This has about the same general color as the nasal fly, but is not so large and deposits its eggs on the lips of the horses. The eggs are darker than those of the first or second. It must not be supposed, however, that the "red-tailed bot fly" is the only red-tailed bot fly. A confusion may arise here; there are different bands of color on the abdomen of both the nasal and the red-tailed bot fly, the bands being very much alike in both—a yellow band in front, black in the middle and orange on the last. The term "red-tailed bot fly" is, therefore, not a good one to use, because the nasal bot fly is also red-tailed. These facts regarding the three forms of bot flies may account for the differences observed by our correspondent, as we have already stated. There are other differences, of course, which are revealed on close examination under a magnifying glass or a microscope, but the foregoing are sufficient to identify them. We should be very much indebted to our readers in the West if they could send specimens of bot flies to us so that we may be able to give further information when questions are answered.

A fourth correspondent at this time contributes his mite as to the best treatment against nose flies:—

There is an objection to the use of rags tied over the horse's nose on account of difficulty in breathing. I have tried the following remedy with much success: Mix about 10 cents worth of oil of tar in machine oil (but other oils would be better), and wipe lightly around the muzzle of the horse—but use it very sparingly—whenever flies make an attack. I keep a bottle among the implements and flies never come near the horses. Mosquitoes dislike this substance also.

A fifth Saskatchewan correspondent writes as follows:—

I would like to add the following information, which I will vouch for being correct. The nose fly appeared in this district some ten years or more ago, brought I expect from the States or Mexico. In size, shape and color it closely resembles the bot fly, and is often mistaken for it, but it is a trifle smaller and more grey. The principal difference, however, to the horse and stockman lies in its method of depositing its eggs. The bot fly buzzes incessantly up and down the animal's legs, sticking a yellow-white egg on the hair every other moment, mostly below the hock or knee. In distinction from the bot fly, the nose fly uses its ovipositor like a hypodermic needle. It flies very swiftly back and forth, poises itself for a moment as though to judge place and distance, and then, darting upward, stabs a *black* egg into the lip or chin of the horse and retreats as swiftly, only to return at the next suitable moment. The horse can hear it and awaits the attack with nervous apprehension. On feeling the needle-like thrust it starts violently and rubs its lips or nose on the grass or against another horse. Often horses on the range will be seen standing with their noses buried in each other's manes or resting on another's back. I never saw a nose fly draw blood, and I think the "ear fly" referred to in the article is a very small grey-black fly that bites principally in the ears, across the chest and around the sheath. These are distinct from the flies, like very diminutive house flies, which congregate around animals' eyes. There is also the "deer fly," about the size of the house fly, but having a speckled or mottled appearance, whose wings when at rest stand out, giving it a triangular shape. Also the huge fly as big as a wasp, locally known as the "bulldog." The latter flies bite with nippers and generally draw blood. There is also another pest called the heel fly which I have not studied yet. Some people claim it is identical with the nose fly. It attacks the heels of cattle, which take refuge in water when possible. It is a common sight to see one or more individual animals break from a bunch or off the feeding ground and stampede for water, brush or, when neither is handy, a buffalo wallow or washout. Animals will be found thus upwards of a mile from any other cattle. In a country so large, individual attempts to destroy any of these vermin seem hopeless; but if any means could be devised to co-operate for their destruction, the relief would be tremendous both to man and beast. Of all the flies the "nose fly" is perhaps the worst, and we have to use some kind of porous net over our horses' noses, as referred to in the quoted article.

A reader from Alberta (Correspondent No. 6) writes as follows:—

I have been very much amused and interested at your articles on nose flies and bot flies. I imagined that every farm boy of an inquiring nature and over ten years of age knew all there was to know about those little pests. I have been a neighbor of theirs for the past thirty years and consider I am about as well acquainted with their habits as the ordinary man. I was a boy of thirteen when I first made the nose flies' acquaintance. I used to lead an old blind horse to the cultivator; on calm, hot days the horse would suddenly stand on his hind legs and start pawing the air with his front feet, sometimes bruising me in his flurry, so I naturally started in to investigate with a boy's curiosity, and the only thing I could notice for a while was a dark object about the size of a buckshot come from somewhere near the ground, strike the horse on the lip and immediately fall to the ground. One thing I noticed in particular was that when they struck the horse they were upside down and their tail struck in advance. My idea was that they were a variety of bee. The first one I caught I examined very closely for a sting but could not find any; then I started to squeeze the rear end to see if there were any eggs in the oviduct and did not find any eggs, but to my surprise I squeezed out two stings just below the oviduct shaped exactly like the mandibles of an ant, but considerably stronger and sharp as needles. So I came to the conclusion that was the cause of the horse's antics. The nose flies that I was acquainted with in the East were about the size of a house fly but shaped like a bee. You say that only bees have stings in the tail, and I believe you are right; but when you claim that a nose fly is a bot fly I think you are off. The nose fly is one branch of a large family of stock bees, and the bot fly may also be a branch of the same family, but it is the only one that lays the yellow egg which hatches into the bot inside the horse's stomach, and it will lay eggs on a horse from heels to ears and sometimes on cattle. It appears to be the strongest flier of any of the family and also the best known. Since coming to Alberta I have made the acquaintance of several other members of the stock bee family. First I will mention the brown-tailed light yellow nose fly; it is about the size of a blue-bottle fly but shaped like a honey bee. It also carried heavy mandibles just below the oviduct; they are sheathed in the body and cannot be seen unless the body is pressed between the thumb and finger, when they expose themselves.

Then there is another with a light yellow body, about the size of the female bot, which I imagined was the male bot; it also has a pair of mandibles, but they are frailer than those on the nose fly.

Now we get to the heel fly, which belongs to the same family and is the largest of the family that I know. It is about the size and shape of a small honey bee and carries the heaviest set of mandibles of any of the stock bee family; it is also the poorest flier; it hovers around in the grass or near the ground on calm, hot days, and darts up, striking the cattle on the first place it reaches, generally from the heels up to the hocks and sometimes on the rump; then up goes the animal's tail and it bolts. If there is a four wire fence in front of the animal it goes right on through, while the fly calmly drops to the grass and sails along until it comes to the next cow or steer, which also throws up its tail and has business elsewhere. By that time all the cattle have taken the hint and disappeared.

Another one I captured near the horses one day about as large as the heel fly and the same color; the only difference I noted was that its mandibles were jet black and very strong, while all the rest were brown. One thing I noticed with all of these insects is that they are always worse on hot, calm days and are very weak fliers, never appearing when there is any wind, excepting the bot which is with us all summer.

A correspondent (No. 7) from Chatham, Ont., writes:—

I think your correspondents of July 28th and September 1st are in error about what they call nose flies, as the flies do not strike on the horse's nose but underneath, just back of the opening of the jawbone. I have caught scores of them by placing my hand beneath the horse's chin. They do not deposit eggs, as they are males of the common bot fly. The eggs that are on the lips were not deposited there, but adhered when the horse was rubbing his legs, as the horse does not use the tongue for that purpose. The difference in colour of eggs can be accounted for in this way. When first deposited they are yellow, but turn darker until hatched; then the shells which still adhere to the hairs get quite light.

2. Warble Flies.

For the last two or three years reports have reached us from Chateauguay and Huntingdon Counties that certain flies were very troublesome on the dairy herds in pasture during June and early July. It was asserted that they stung the cattle and chased them about the fields. This summer a specimen of the pest was sent me, and on comparing it with type specimens of Warble flies sent me by Dr. Hadwen, of British Columbia, I identified it as *Hypoderma bovis*. Dr. Hewitt, to whom I submitted the specimen, corroborated my identification.

The explanation of this outbreak of *bovis* in the Chateauguay-Huntingdon district is clear when it is known that a large importation of cattle from Scotland has occurred annually for many years. The breeders of this district admit that warbles on the backs of the cattle are more common now than they were a few years ago.

Following is a table which may be of service in identifying the common genera and species of the Oestridæ.

Oestridae.

(Bot Flies.)

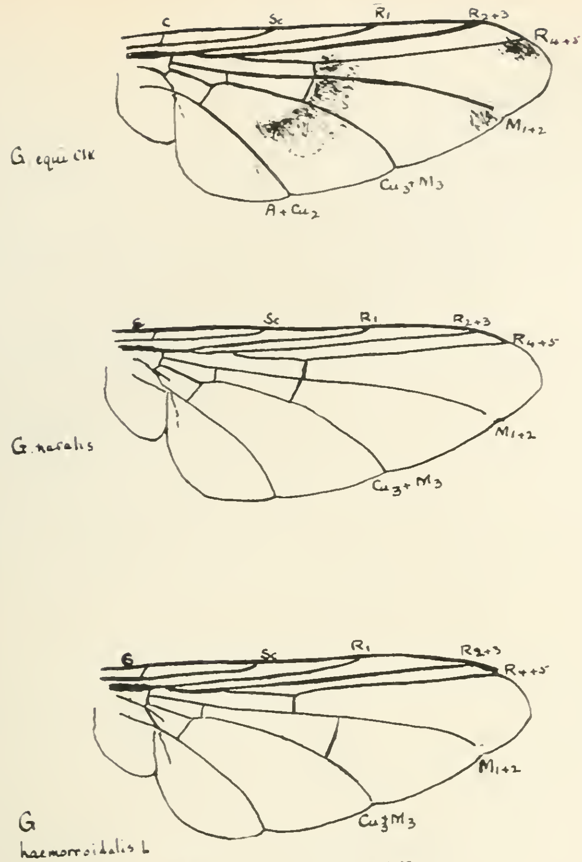
Common genera and species:

a. Costal vein ends at tip of R4+5; M1+2 is straight, not reaching the margin, and cell R5 wide open; squamae small, arista bare; ovipositor elongate. *Gastrophilus*.

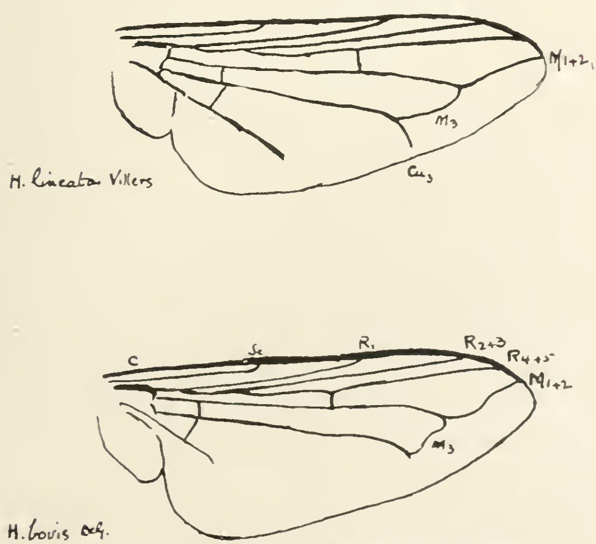
b. Wings with spots and smoky median cross band. *G. equi* (horse bot fly).

bb. Wings without spots.

c. Posterior cross-veins (M-Cu) beyond the anterior cross-vein (R-M); legs blackish brown. *G. hæmorrhoidalis* (red-tailed bot fly).



Wings of *Gasterophilus.*



Wings of *Hypoderma ilneata* and *H. bovis.*

cc. Posterior cross-vein opposite and nearer than the anterior cross-vein. *G. nasalis* (nose fly).

aa. Costal vein ends at tip of M1+2; M1+2 with a bend; cell R5 much narrowed or closed.

b. Facial grooves approximated below; cell R5 closed and petiolate. *Oestrus.*

bb. Facial grooves far apart; squamae large, ovipositor elongate. *Hypoderma.*

c. Prothoracic band of yellow hairs, mesothoracic band of brownish black hairs; media 3 sinuate; legs black with black hair; tips of hind tibiæ and tarsi yellowish brown. *H. bovis.*

cc. Thoracic band of hairs brownish; media 3 rounded; tibiæ and tarsi yellow; femora black. *H. lineata.*

The President: We are pleased to have Professor Lochhead's paper in our Proceedings, because this is a group of insects which is gradually coming to the front more and more. It is very apparent that, both in the case of the Nose Flies attacking horses and in the case of the Warble Flies attacking cattle, these insects are becoming far more frequent. Our own correspondence files would display a somewhat similar series of letters as Professor Lochhead has read here, and the farmers who write to us about these things are very confident about their own observations and their own knowledge, as a rule. In regard to a brief note that Professor Lochhead mentioned about warble flies, I believe what he says is quite true, that we can trace the increasing prevalence of *Hypoderma bovis* in this country to the importation of cattle. In the old days the only species recognized in this country was *Hypoderma lineata,* which was considered to be a truly native species, but more recently, owing to the investigations of Dr. Hadwen in British Columbia and my own enquiries from the Branch here, we were able to show that *bovis* occurred in this country in addition to *lineata,* and further that *bovis* was pretty widely distributed, particularly in the Province of Quebec, and it is on this suspicion that Dr. Hadwen has based most of his very valuable investigations, but before passing on to this paper I think there are a number of points in Professor Lochhead's paper which might be discussed. We might discuss the two papers together.

Prof. Lochhead: Since the two papers deal with almost the same subject, I think it would be preferable to have the discussion on the two papers at the same time.

Dr. Hewitt: We shall now have Dr. Hadwen's paper entitled "Further Notes on the Warble Fly, *Hypoderma bovis.*"

Read by Mr. Treherne.

THE SEASONAL PREVALENCE OF *HYPODERMA BOVIS IN* 1915, TOGETHER WITH OBSERVATIONS ON THE TERRIFYING EFFECT *H. BOVIS* HAS UPON CATTLE, AND LESIONS PRODUCED BY THE LARVA.

Seymour Hadwen, D.V.Sci., Agassiz, B.C.

The observations and experiments on *H. bovis* which were conducted at Agassiz this year, are all preparatory to the work which is contemplated for next year, on the prevention of egg laying and destruction of larvæ.

A previous paper has been written on the seasoned prevalence of *H. lineatum.* It is remarkable that so little is known about the seasonal activity of these flies, and if any treatment is to be undertaken it is absolutely necessary to know when they come and go. As I have already pointed out, the statements made by the European writers about the length of the season, especially for *H. lineatum*, are very vague.

The following table gives a complete record of the observations. The cattle, ten in number, were kept in a field directly in front of my laboratory. The animals were under almost constant observation. Whenever they were seen running, either myself or assistant went out to look for flies. If flies were noticed in the morning, then no further trouble was taken for that day. It is of course possible that we may have failed to observe them on some occasion or other, but this seems hardly likely, seeing that *H. bovis* invariably causes alarm among cattle.

The most likely error made was in the catching of flies, but these were mainly caught when they were abundant. It may be that on one or two occasions the flies which were taken would have lived over night and attacked the cattle on the following day. The only dates on which this may have occurred was on June 15th and 22nd. The meteorological records were kindly supplied by Mr. Moore, Superintendent of the Experimental Farm. In comparing them with my records, I was delighted to find that the changes of temperature coincide almost perfectly with the appearance and disappearance of the flies.

THE SEASONAL PREVALENCE OF HYPODERMA BOVIS IN 1915.

June.	—	Sunshine.		Rain.	Temperature. °F.	
		Hrs.	Min.	Inch.	Max.	Min
1....	Cattle quiet, no flies.................	5	42	.47	64	48
2....	" "	1	48	......	62	49
3....	" "	2	54	......	72	42
4....	" "	11	06	......	78	43
5....	Flies seen, cattle running............	11	54	......	82	50
6....	1 *H. bovis* taken.....................	7	24	......	81	52
7....	Cattle quiet, no flies.................	2	00	......	65	47
8....	" "	Dull		0.8	64	46
9....	" "	1	18	......	64	51
10....	" "	5	30	......	59	45
11....	" "	......	18	.6	58	46
12....	" "	1	00	.35	64	51
13....	Flies seen, cattle running............	......	18	......	67	50
14....	1 *H. bovis* taken.....................	4	30	......	70	53
15....	Cattle quiet, no flies.................	8	36	......	78	55
16....	" "	2	42	......	67	51
17....	" "	Dull		.65	64	50
18....	" "	......	54	.06	62	46
19....	" "	Dull		.05	64	47
20....	1 *H. bovis* taken.....................	5	54	......	67	45
21....	5 *H. bovis* taken.....................	11	48	......	81	43
22....	2 *H. bovis* taken.....................	11	42	......	82	43
23....	Cattle quiet, no flies.................	1	06	.02	74	46
24....	Flies seen, cattle running............	3	24	.03	78	46
25....	" "	2	12	......	76	45
26....	Cattle quiet, no flies.................	Dull		.05	70	47
27....	1 *H. bovis* taken.....................	3	42	......	76	46
28....	6 *H. bovis* taken.....................	9	24	......	80	43
29....	Flies seen, cattle running............	11	36	......	84	48
30....	2 *H. bovis* taken.....................	10	48	......	91	49
July.						
1....	Flies seen, cattle running............	11	36	......	93	56
2....	" "	11	42	......	89	55
3....	Cattle quiet, no flies.................	11	18	......	84	56

The Seasonal Prevalence of Hypoderma bovis in 1915.—*Continued.*

July.	—	Sunshine. Hrs.	Sunshine. Min.	Rain. Inch.	Temperature, °F. Max.	Temperature, °F. Min.
4....	Flies seen, cattle running............	10	48	......	82	59
5....	" "	4	42	.03	77	52
6....	Cattle quiet, no flies.................	1	42	.18	76	55
7....	Flies seen, cattle running............	9	18	.02	84	43
8....	Cattle quiet, no flies.................	6	6	.25	70	44
9....	1 *H. bovis* taken.....................	5	48	......	69	44
10....	Flies seen, cattle running............	6	00	......	71	42
11....	" "	......	36	.04	68	40
12....	Cattle quiet, no flies.................	2	30	.16	70	43
13....	" "	Dull		.08	69	41
14....	" "	Dull		.02	68	42
15....	" "	Dull		.58	64	40
16....	Flies seen, cattle running............	2	12	......	66	47
17....	" "	5	18	......	70	46
18....	Cattle quiet, no flies.................	6	00	......	79	34
19....	" "	11	06	......	88	42
20....	Flies seen, cattle running............	11	54	......	95	56
21....	Cattle quiet, no flies.................	11	36	......	84	50
22....	Flies seen, cattle running............	11	30	......	78	49
23....	Cattle quiet, no flies.................	11	10	......	81	46
24....	" "	10	54	......	86	48
25....	1 *H. bovis* taken.....................	10	06	......	76	49
26....	Cattle quiet, no flies.................	Dull		......	70	49
27....	" "	......	36	.05	71	56
28....	" "	......	30	.02	72	58
29....	Flies seen, cattle running............	2	42	......	77	58
30....	" "	5	30	.08	75	56
31....	Cattle quiet, no flies.................	5	00	......	72	55
Aug.						
1....	Cattle quiet, no flies.................	7	08	......	78	52
2....	" "	6	08	......	76	50

No more flies seen for the rest of the season, nor were the cattle seen running.

Seasonal Activity of H. bovis at Agassiz.

In 1912, *H. bovis* was first noticed on June 8th, and the last appearance was on Aug. 2nd, a total of 55 days.

In 1914, *H. bovis* appeared on May 31st, and none were recorded after July 27th. On this latter date, the flies were seen attacking the cattle at 6.30 p.m. Total 57 days.

In 1915, the flies were either seen or caught on 28 days, from June 5th to July 30th, a total of 55 days. The height of the season was from June 20th to July 11th.

These observations coincide closely with the pupal period and with the time the last larvæ emerge from the backs of cattle; both at Agassiz and in Europe.

Emergence of Larvæ.

Carpenter (1915) says that most of the maggots emerged from May 27th to June 17th, "while a belated one occurred several weeks afterwards on July 3rd."

In my own article (1912) I recorded the last larvæ of the season on July 2nd.

Lucet (1914) says, "Sur 79 que j'ai recueillies, 24 l'ont été du 16 au 31 mai; 53 du 1er au 30 juin; 2 au début de juillet, époque a laquelle mes sujets d'experience en furent débarrassés."

Pupal Period for H. bovis.

Miss Ormerod (1900) puts the pupal period at 25-36 days = 32.5 days.

Carpenter (1908) at 31-32 days. (1914, about 8 weeks. Not included in average).

Hadwen (1912) at 34.7 days.

Glaser (1913) gives an average of 44 days.

Lucet (1914) records an average of 32.5 days.

Averaging all these records gives a result of 35 days.

If then, the last larvæ emerge about the first of July, the season for flies cannot extend far into August, and my records show this to be the case.

The Effect of Temperature on the Pupal Period.

I have already shown (1914) that if the pupæ of *H. lineatum* are placed in an incubator that the fly will emerge in as short a period as 13 days. This year I placed several larvæ of *H. bovis* in an incubator kept at 80°F. The pupal period was shortened to 17.4 days.

Pupæ Kept in Incubator at 80°F.

								Period.
2	larvae	pupated	May 1st......	Emerged	1* 1†	May	19th........	19 days.
3	"	"	3rd	"	3	"	20th........	17 "
1	"	"	4th	"	1	"	20th........	16 "
1	"	"	5th	"	1	"	21st........	16 "
2	"	"	6th	"	1	"	22nd........	18

As the temperature at which the pupa is kept causes early or late emergence, the situation in which the larva finds itself on leaving its host will make some difference also. An experiment I hope to carry out next spring is to place some pupæ in a situation such as the edge of a manure-pile; here the larvæ would derive heat much in the same way as if placed in an incubator. Others must find crevices in the floors of stables, etc., where they would be warmer than out of doors. These warm situations would mainly favor *H. lineatum* and the early larvæ of *H. bovis*. Later in the season, when the sun is stronger in June and July, I do not think the places the larvæ choose to pupate in can matter so much. But early in the year it is quite possible that some of the early appearances of *H. lineatum* may be accounted for in this way.

An Experiment made to prove how *H. bovis* engenders Fear in Cattle.

July 1st, 3 p.m. Two calves which had been kept inside since they were born, were turned out into a small paddock. The cattle which had previously occupied the paddock, had just been put into the stable, and the flies had been chasing them a few minutes before. The two calves on being liberated at once began to caper about and run as calves will after they have been confined. Finally they came to a halt just in front of me. They stood there panting. A moment or two later I saw a single *H. bovis* attack one of the calves. It struck several times before it was noticed. Finally I saw the calf give a kick or two, then it turned its head round to see what was annoying it. There were some more kicks and stamps, then the calf began to move away, its tail went up and it began to run and finally to gallop. The other calf remained standing for a short time

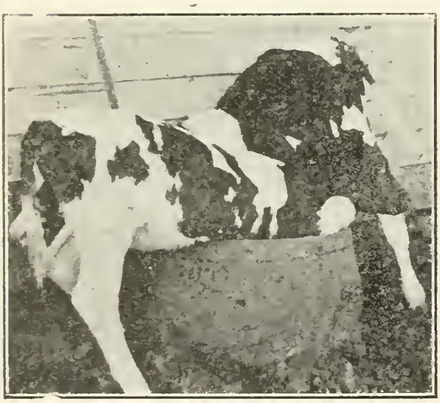
* Male. † Female.

after the first one left, but soon went through the same antics as the first. Both calves ran erratically about the paddock; they finally discovered a barrel used for watering the cattle; they both tried to get into it at once, and I was fortunate in securing a photograph of them in this position.

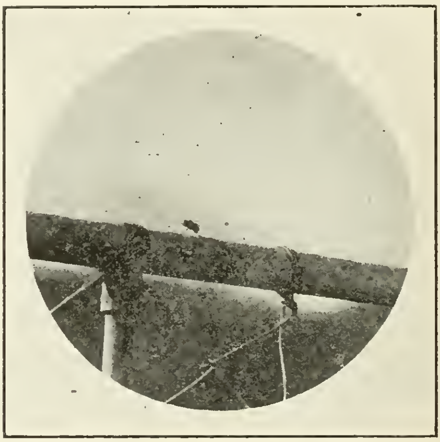
The flies (there were, I should judge, three or four in the field) kept on striking even when they were in the barrel. Later the calves found a corner behind some boards, there they lay perfectly quiet with their noses stretched out straight in front of them on the ground. Occasionally a fly would find them, they could stand the fly striking perhaps half a dozen times, but then, suddenly, they would get up and run as if possessed.

I have noticed the cows endeavoring to hide from the flies just in the same way. If they could find the least bit of shade along a fence or building, they would lie there quite motionless, until roused by the repeated attacks of the fly. In some cases cattle lie down also from exhaustion.

This experiment was also witnessed by Mr. Moore.



Calves attacked by *Hypoderma bovis* trying to get into a barrel of water.



Hypoderma bovis sitting on fence, waiting to attack cattle.

In my first paper of 1912, I gave my reasons for cattle being afraid of *H. bovis.* I quote the following: "It is this clumsy, persistent attack which I believe frightens cattle, and I would suggest that probably it is this cause which makes cattle stampede or 'gad.' When the *Tabanidæ* (or other flies) attack an animal and cause annoyance, the cow simply flicks her tail or brushes off the fly with her tongue, and feels that she has control or can get away from the insect. But a Warble fly comes buzzing along, strikes a time or two, and when the animal it is attacking kicks or stamps, it comes back just the same. Then the animal begins to lose its head and runs away, and when it still finds itself followed becomes wild with terror."

There have been so many false theories advanced for the fear which these flies engender, that I feel licensed to go fully into this question.

The commonest theory is that cattle are afraid of the fly because of its resemblance to a bee. The experiment just quoted refutes this entirely, because the calves had never seen a bee. Another idea is that cattle fear the fly because they are aware that it will cause them future trouble. This idea must have come from someone who thought that cattle were endowed with especial intelligence.

The only theory which all entomologists now agree upon is that the old idea of the fly causing pain is wrong, seeing that it has no organs capable of piercing the skin. Some authors claim that other insects as well as Warble flies cause cattle to "gad."

This is also entirely wrong, and can be refuted in several ways. For instance, I saw *Tabanidæ* and other flies worrying the cattle this year long after the last Warble fly had left, and did not see any of them stampeding. Besides as I have pointed out cattle only run one or two at a time from other insects. They merely show anger and not fear, when they run into the bushes or dust themselves. With *H. bovis* the fear is undoubtedly contagious. The only time I think it is permissible to make a mistake, is when cattle are at play, when they often run with their tails up. Or when, for instance, a steer has been roughly handled and dashes wildly into the middle of a herd of cattle, then one sometimes sees a stampede. In other words if a cow gets really frightened from any cause and runs, then those near her will often follow, and the fear spreads. This is exactly what takes place when an animal is chased by *H. bovis*.

The great difference between *H. bovis* and *H. lineatum* is in their effect upon cattle and in their methods of oviposition. I have shown that *H. lineatum* may not even be felt when it lays its eggs while resting on an animal's foot or on the ground. When it does grasp the hairs to lay eggs for instance on the hock, it does so gently, otherwise it would be brushed off before it had time to lay several eggs on the same hair.

H. bovis is rougher and clumsier in its attack and as it only lays one egg at a time, it can do so regardless of the fact that the animal may be kicking or running.

The Penetration of the Skin, and the Lesions Produced by the Larva of *Hypoderma bovis*.

Hewitt (1914) saw three larvæ of *H. bovis* work their way into the skin of a calf. I have not been fortunate in seeing the penetration of the skin by these larvæ, but can confirm Hewitt's observation in another way, by showing lesions on the skin of cattle, over which were found the eggs of *H. bovis*.

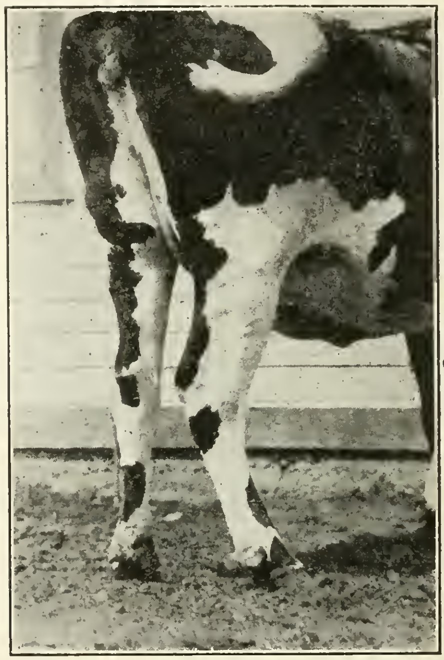
I have already described the skin lesions produced by the larvæ of *H. lineatum*, and of the disease caused by them, for which the name of *hypodermal rash* was proposed. The penetration of the larvæ was proved in three different ways—by removing bits of skin from cattle and placing larvæ upon them, by finding a larva in the act of passing into the skin of a cow, and finally by expressing two larvæ from the skin of an animal which I had under observation. The passage of the larva in *H. bovis* was proved by cutting circles in the hair round new laid eggs, and later, after the eggs had hatched finding the swellings underneath.

The swellings are somewhat different from those caused by *H. lineatum*, There is not so much exudation of serum, and they seem rounder and more raised. They are usually about half an inch across, but if several eggs are laid close together the swellings may merge. The explanation of the difference in the character of these lesions, is because in *H. bovis* the eggs are laid singly. In *H. lineatum* it is most likely that several larvæ choose the same follicle for entrance, seeing that a number of eggs are attached to the same hair. In my experiments I also noted that the eggs nearest the skin hatched first, due no doubt to the animal heat and to their having been laid first, and it would appear probable that the larvæ follow one another through the same opening. The result would be a larger opening than the single larva of *H. bovis* could make, consequently a bigger flow of serum. The swellings in the case of *H. bovis* are sometimes quite large, but there is not so much dermatitis or exfoliation of the skin.

It is clear that the amount of damage done would depend on the variety of bacteria introduced beneath the skin, and to the resistance of the animal against the particular organism.

One remarkable fact I have noted which applies to both species of larvæ, is that the swellings and skin lesions are confined almost entirely to the older animals, the calves only show slight effects. This peculiarity can be observed in several

Lesions on outside of cow's leg.



Lesions on hindquarters; note large swelling on left leg behind the udder.

microbial diseases. It is a sort of natural immunity which breaks down as they grow older, and is all the more interesting because young cattle are more parasitized than the old by Warble flies.

No appreciable lesions have been noticed below the knee or hock. The skin while it is very thick on the legs, is quite porous and open; perhaps owing to its tightness and thickness the swellings are not so evident. *H. bovis* does not lay as many eggs round the hoof as *H. lineatum*. This is an important difference, for it is probable that many of the lamenesses resulting from swollen feet are due to the larval penetration. For three years in succession, lamenesses among the cattle have occurred here during the season for *H. lineatum*.

Situations in Which Eggs are Laid.

There is little to add to my previous descriptions, except to emphasize the irregular distribution of eggs as compared to *H. lineatum*. The photographs show the scattered lesions. The irregularity must be due to the fact that cattle are running when the fly is laying, so that the eggs are deposited at random. On a number of occasions *H. bovis* was seen flying beside the animals just about level with the stifle joint, striking repeatedly at the outside of the leg. This is. I find, the most common manner of ovipositing during rapid flight. Another favorite way is to follow a foot or two behind, then catching up and striking just below the pin bones. But the first few strikes prior to the animals getting away are almost invariably on the legs, lower down.

Summary.

The seasonal activity of *H. bovis* at Agassiz is from the beginning of June to the beginning of August.

The last larvæ to emerge from the backs of cattle, leave during the first days of July.

In *H. bovis* the pupal period averages thirty-five days.

High temperatures shorten the pupal period.

The fear cattle have for *H. bovis* is due to the insect's persistence and manner of egg-laying.

Hewitt's observations on the penetration of the skin by the larvæ of *H. bovis* are confirmed.

The lesions caused by the larvæ, differ from those of *H. lineatum*. Older animals show more lesions than the young.

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Note.—I am indebted to Dr. F. Torrance, Veterinary Director-General, for permission to publish this article.

The President: Mr. Treherne is to be congratulated on the excellent manner in which he has presented another man's piece of work. It is very difficult to present in so intimate a manner the work which another man has been responsible for, but it shows how closely Mr. Treherne has watched and been interested in the work of Dr. Hadwen. I think it is one of the most important papers that has been discussed at this meeting. The question of the method of entrance of *Hypoderma bovis* has been a disputed point for many years and we have had observations and evidence supporting now one view and now another, but in view of Dr. Hadwen's conclusive experiments, which have been supported by photographs, I think he has cleared up this question. We are pleased to have with us this morning Dr. T. Torrance, the Veterinary Director General of the Health of Animals Branch, Department of Agriculture, and perhaps he would have something to say in connection with these two papers.

Dr. Torrance: Mr. President, ladies and gentlemen, it affords me very great pleasure to be with you to-day, especially as one of our men has contributed something towards the programme. The work which Dr. Hadwen has done is very much appreciated by his chief, and I think, will be appreciated by all when it is better known. He has proved a very diligent and careful investigator, and I think the facts which he has brought out will bear the closest scrutiny. He has succeeded in throwing light upon a very difficult problem, the problem of the migration of newly hatched warble larvæ to their final resting place beneath the skin of the back. The importance of this work will be realized when I tell you that in Canada the leather produced is damaged to the extent of perhaps 70 per cent. by the presence of this larva. After the larva has escaped from the back the scar tissue which repairs the damage causes that portion of the leather to be unsuitable for the manufacture of the better grades of harness. You are, perhaps, aware that in making harness, especially traces, it is necessary to take long strips of the thickest leather from along the back. This is the part that is chiefly damaged by the warble flies, so that the best portion of these hides is unsuitable for the manufacture of harness. In correspondence with practically all the tanners of Canada referring to the damage done by this parasite, the opinion was expressed that it was the greatest source of injury to the leather that they knew of. There were not many other things that caused the same amount of damage. The injury caused by barbed wire fences, warts, etc., was trivial when compared with the damage caused by this warble fly. It is only by the close study of the life-habits of a parasite that we can arrive at the best possible means of combating it and we hope that the result of this work of Dr. Hadwen's will be some practical method whereby the damage caused by this insect can be avoided. I was greatly interested, too, in the paper read by Professor Lochhead, in the damage he describes in horses, as we have had practical experience with the effects of these parasites on horses. The more common is the one to which he did not refer, the *Gastrophilus equi*, an extremely common parasite of horses. In my experience covering thirty years of active practice I may say that I have seldom found a horse not infested. Every horse that passes a portion of its life in the open is sure to contain these parasites. In cities horses may possibly avoid them but it is very common to find them in a horse's stomach. Among farmers the presence of bot larvæ in a horse's stomach is looked upon as the cause of the horse's death in very many cases, but when we find them in horses that have died from any cause we may realize that the presence of a moderate number of these parasites may be tolerated without injury to the animal's health. On the other hand, we know that where they are present in very large numbers they affect the function of the stomach to such an extent that many derangements may take place, such as ulceration of the walls of the organ. These larvæ are harmless when in small numbers but in large numbers cause much trouble and sometimes death. The Nose Bot Fly, which give so much trouble to the farmer in the North-west when he is hitching up his horses, does not cause so much trouble; it is not nearly so harmful to the horses and we have very few examples of its doing much injury, the annoyance it gives is about all the harm it does. Why the ovipositing of these two flies, the Bot Fly of the horse and the Bot Fly of the cow, should occasion such intense fear in the victim I do not know. We are assured by scientists that neither of these flies have any stinging apparatus and yet the animal affected shows every evidence that the fly must inflict much pain. I cannot imagine that the depositing of the eggs upon a hair would give so much discomfort to the animal. I think we will have to search a little further, probably, and gain more experience before we learn the actual cause of the terror in cattle and horses caused by the Bot and Nose Flies. The contributions that have been made on this subject to-day are of great importance and I wish to express the feeling of pleasure that I have in meeting you all to-day and to assure you that my Branch will assist Dr. Hadwen in carrying on the work he is now engaged in.

The President: The Society is very much indebted to Dr. Torrance for his valuable contribution and for the information which he has given from the veterinary side.

Dr. Torrance: Mr. President, I have brought up with me some specimens and pictures which Dr. Hadwen sent me.

The President: The question of the effects of internal parasites which Dr. Torrance brought up is one which has been always of great interest to me, and it becoming more generally realized that the importance of these parasites is not so much because they are present but owing to the fact that their presence may be responsible for the penetration of the mucous membrane of the alimentary tract. Now these two papers have a number of important points and I have no doubt there are other members who would wish to discuss them.

Mr. Tothill: Mr. Chairman, this paper to me is one of the most interesting that has been presented for some years on account of its extremely interesting biological points and on account of its significance. It may be interesting to recall that the origin of the Oestridæ is quite uncertain, but at the same time they are undoubtedly related to the parasitic dipterous families Tachinidæ and Dexiidæ. In my studies on life-histories of the Tachinidæ some years ago it became evident that there was something the matter with the supposed life-history of the Bot Fly. In the Tachinidæ there are flies which deposit eggs which are taken into the alimentary canal. The larvæ migrate from the alimentary canal to various tissues of the host. In every known case in which this habit obtains the egg is modified for passing down the alimentary canal without injury. In the eggs of these warble flies it is evident that there is no such modification for such a habit and this work of Dr. Hadwen's clearly shows that the larvæ do not pass through the alimentary canal, is very interesting.

Mr. Sanders: In regard to the date of introduction of *Hypoderma bovis* into Canada, we have a pretty fair idea as to when it first became common in Nova Scotia owing to the fact that oxen are worked so much more down there than in the rest of Canada. Farmers will tell you that the Gad Fly became a nuisance in Nova Scotia about fifteen years ago. It causes a little damage that has not been mentioned in these papers, that is, the damage that the oxen do when they are attacked by these insects. It drives the oxen almost frantic; appearing about the 10th July and attacking the oxen all through haying time. Sometimes they will be driven so wild as to run away with the loaded hay waggons, and often will break wheels, axles, tongues or yokes in their efforts to get away from the insects. We find that cattle are mostly attacked in the open, and when a Gad Fly appears in a herd of cattle they will at once take to the bush where they seem to be free from attack. From Dr. Hadwen's work, can Mr. Treherne suggest any method of control?

Mr. Treherne: I don't think it would be letting Dr. Hadwen's secrets out if I told you that he is pretty well satisfied he can effectively control these flies. Now that the penetration takes place through the skin, he thinks he can dip every ten days or so and give the larvæ a dose of arsenic.

Dr. Torrance: Might I be allowed to say another word in connection with the last fact brought out by Mr. Treherne. There is a portion of the North-west territories in which the disease known as Mange of cattle has been in existence for some time. This is known as the "Mange Quarantine Area," in which we require the dipping of all cattle. It has been found that in this area it has also had the effect of lessening the ravages of the warbles. The skins of the cattle in this district are more free from warbles than they are anywhere else.

Dr. Fernald: It certainly seems that the two papers here this morning have contributed much of interest to this subject. I am very glad, indeed, that I can now change a statement made to my junior students that the eggs of the warble fly are licked off into the mouth, and give something that is more accurate. I have thought for many years that there was room for more work on this subject, but certainly in the regions where I am now living these flies are not abundant enough to cause much attention and the opportunities for their study have been few. In connection with Professor Lochhead's paper, the attitude some of his correspondents have taken has been paralleled by an experience of my own. A case was recorded this fall of a house having been so infested by fleas that it was impossible to live in it. The members of the family were very anxious to know what could be done. I naturally, under the circumstances, gave out the remedy for fleas. When the specimens came in accompanied by the statement that it was unbearable to live in the house on account of the bites of these fleas, the specimens were those of the Pomace Fly.

Mr. Payne: I understand, Mr. Treherne, that Dr. Hadwen has found in the migration of the second stage larvæ that they pass down the spinal cord, is there anything in that?

Mr. Treherne: As far as I understand, Mr. Payne, the eggs, if laid on the knee, for instance, hatch and the larva passes up by the fibrous tissue route until it reaches the stomach, and after stopping there for some time it proceeds in a direct line to the back of the animal, emerging, however, horizontally in the last stage.

Mr. Petch: *Hypoderma bovis* in the counties of Huntingdon and Chateauguay has proven to be a very injurious insect, and as these two counties are practically a dairying district, I would like to know if Dr. Hadwen has found any appreciable effect on the milk supply.

Mr. Treherne: The irritation produced by larvæ within the bodies of cattle does not seem to affect the milk supply to any great degree, but the presence of the fly in the pasture field and its terrifying effect, may easily be understood to affect milk yields.

The President: The only damage caused, Mr. Petch, seems to be that the cattle are bothered while feeding.

Prof. Lochhead: There is a suggestion in connection with one of the letters which I received and which, I think, this Society could take up, that is, the removal of the warbles before spring from the backs of the cattle. If all the farmers co-operated and removed the warbles before the first of April I think it would soon control this warble fly and, at any rate, it would be worth while trying. I would like to hear what the Society thinks of such a move.

The President: As Professor Lochhead no doubt knows, that system has been followed in Europe, especially Germany and Denmark. It is customary to appoint a man to go around extracting the warbles, making a small charge per head and it certainly accomplishes much good, and I recommended in my annual report a few years ago the importance of such co-operation. This could be helped along very much by the use of the press.

If there is no more discussion on these two papers we will pass on to the next paper on "Forest Insect Investigations in Canada." I regret to say that Mr. Swaine, who was to have read this paper, has been suffering very severely from grippe during the past week or so, and while he hopes to be at the meeting this afternoon he did not feel sufficiently well to give his address this morning, so we will postpone the paper until this afternoon. Therefore, I will take this opportunity of making a few brief remarks in regard to the progress of our work.

PROGRESS OF ENTOMOLOGY IN CANADA DURING 1915.

C. Gordon Hewitt, Dominion Entomologist, Ottawa.

As I remarked in opening our meetings yesterday I do not consider that it is necessary or even desirable for the President to give a presidential address on re-election, apart from the fact that we have a very full programme. Nevertheless, it may be of interest to review the progress of our work in Canada during the past year, especially as we have a number of visitors from other countries. As you may remember, the Minister of Agriculture arranged for a campaign to be carried out shortly after the outbreak of war for the purpose of securing greater production and in this work the Provincial Governments co-operated fully. That this campaign has proved successful is shown by the fact that the other day the Minister of Finance, in Montreal, said that on a conservative estimate our agricultural products would exceed those of last year by three hundred million dollars; such a result at the present time when the question of food supply is a vital one is very encouraging. As entomologists we have played our part in this successful effort to increase our production. Everyone realizes that increased agricultural production is dependent very frequently on the control of insect pests. One of the most important steps to be taken in order to secure production is to reduce or eliminate those factors which check or reduce production; of these factors insect pests are one of the most important. For this reason we have all endeavoured to exert ourselves harder than ever during the past year with a view to persuading the farmers and fruit growers to take steps in an increasing measure to control those factors which are responsible for loss of production.

I feel sure that those of our officers who have been working at the Branch Laboratories in the various provinces will feel that their work has been very successful in this direction. In Nova Scotia, the energetic work that has been carried on so successfully by Mr. Sanders has done more than anything else, so I am informed by the fruit growers of that province, to increase spraying and spraying along successful lines in the Annapolis Valley. This means more fruit and fruit of a better grade.

Mr. Petch has been carrying out similar educational work in Hemmingford County in Quebec, with good results, and has shown the value of insect control in the production of more fruit and fruit of a higher grade.

Our work on Locust Control in the Province of Quebec will be described by Mr. Gibson this afternoon. The depredations of locusts in certain parts of the Province of Quebec have been serious and extreme during the last few years. In some sections farmers had to abandon their farms on account of the repeated total destruction of their crops by locusts, and the number of abandoned farms in some parishes caused serious apprehension. We have been carrying on experiments in the control of locusts by means of poisoned baits and decided to carry on the work on a larger scale during the past season. In certain parishes we were fortunate in having the co-operation of the parish priests, who were of great assistance in bringing about co-operative effort on the part of the farmers. We have been able to demonstrate to those farmers the value of poisoned baits and the change that has been wrought is most satisfactory. Serious losses year after year had disheartened these farmers to the extent in many cases of compelling them to abandon their farms as I have remarked. Now they have found the means of controlling the locusts at a comparatively low cost and of saving their crops, and the saving in the aggregate has been very great during the past season. The farmers have not only returned to their farms, but those who had remained, although disheartened, now see a brighter prospect and will improve their farms on account of the possibility of removing the cause of the depression.

Mr. Strickland described to us yesterday his work on the control of Cutworms in Alberta, and I do not think that this subject requires further discussion on my part. He described very clearly how by his investigations and demonstrations to the farmers he was able to prevent serious losses which otherwise would have occurred in Southern Alberta.

I have only mentioned a few cases. In such manner our work has been of direct assistance in the movement for increased production. Similar work has been carried out at all our field laboratories and from headquarters, and each of the Provincial Departments of Agriculture who maintain an entomological staff has been increasing the activity in their efforts.

This increased assistance has created a greater demand for such assistance and we are now finding that as the farmers and fruit-growers realize that this work has been done for their direct benefit there is an increased call for assistance. It is the creation of that demand which will enable us to carry out to a greater degree the objects we are striving to obtain, namely: to bring ourselves in touch with a larger number of people whom we are able to assist by the information we are securing. All must feel that we are making the best use of our abilities in this time of great crisis.

During the past year we have discovered several new pests in Canada. Probably the most important of these is the Pear Thrips, *Tæniothrips pyri*, which Mr. Treherne reported from the Victoria district on Vancouver Island, British Columbia. The serious nature of this pest will be realized from the fact that in California it is estimated to cause an annual loss of about ten million dollars on prunes alone. At present it appears to be confined to a very small territory near Victoria, but we fear its spread to other sections. Mr. Treherne also reported the occurrence of the Currant Bud Moth, *Eriophyes ribis*, at Duncans on Vancouver Island in British Columbia. This pest has evidently been imported from Great Britain, where it is one of the worst pests of black currants occurring there, as I know from personal experience. Every step will be taken to prevent the spread of these two new and serious fruit pests.

We referred, in our session yesterday morning, to the increased organization of entomology which had taken place in Canada and I spoke of the formation of the Entomological Society of Nova Scotia, for the organization of which great credit is due to Professor Brittain. Before the outbreak of war the Council of your Society had under consideration the improvement of the organization of

Entomological Societies throughout Canada. We hoped to develop other branches and bring together a large number of people interested in entomology who are at present unattached to any society and in turn to bring them into touch with the active workers; but as this question involves financial consideration it must necessarily be postponed. Nevertheless, the Society has every reason to be proud of the manner in which entomology is now organized throughout the Dominion and the increased attention that is being paid to this study. Throughout the country we are finding more and more people who are becoming interested in the subject and in time we will endeavor to create a sentiment which will be productive of pleasure to themselves and of value to us in our practical work.

You will be pleased to learn that increased facilities have been provided for the work of the Entomological Branch during the past year and I think it will be of interest to all the members of the Society if I describe the new laboratories that have been erected during the past year.

The pressing need for increased accommodation for the entomological work that is being carried on in various provinces by the Field Officers of the Entomological Branch, and a demand on the part of farmers and fruit-growers for further assistance in controlling insect pests, have been responsible for a decision on the part of the Minister of Agriculture, to have entomological laboratories erected where they were most necessary. Accordingly four new laboratories have been built during the past summer at the following places: Annapolis Royal, N.S.: Fredericton, N.B.; Treesbank, Man.; and Lethbridge, Alta. These laboratories I will briefly describe.

Entomological Laboratory, Annapolis Royal, N.S.

Since 1912 a small laboratory at Bridgetown, N.S., served as headquarters for the entomological work of the Branch in Nova Scotia. The increase of the work and of the staff employed necessitated increased accommodation. Annapolis Royal was selected as the place for the new laboratory on account of its situation in reference to the area of the Brown-tail Moth infestation, convenient railroad facilities and the presence of a promising fruit-growing district in which the orchards were not at present properly cared for. The laboratory is erected on an excellent site on the County School Grounds which the School Board of Annapolis Royal have kindly provided.

The building measures twenty-six feet square and consists of basement, ground floor and attic. In the roomy basement accommodation is provided for field and spraying equipment; it also contains a dark-room and laboratory. The ground floor is divided into three rooms, namely, an office for the Field Officer in charge, a large laboratory and a general work room. The commodious attic is specially well-lighted to serve as a photographic room and work room. Steam heating is installed.

From this laboratory the campaign in Nova Scotia against the Brown-tail Moth is directed. In addition, investigations are being carried out by Mr. G. E. Sanders, Field Officer in charge, on the more important insects affecting fruit* such as the bud-moth and fruit-worms of apples. Experimental work in spraying and the investigation of insecticides has already rendered very valuable assistance to the fruit-growers of the province. The former entomological station at Bridgetown will be used as a sub-station whenever it may be most needed.

*To prevent duplication of work and to secure the best co-operation, the Dominion Field Officer confines his attention to the biting insects and the Provincial Entomologist, Prof. Brittain, studies the sucking insects (aphides and bugs).

Entomological Laboratory at Fredericton, N.B.

In 1912, a small laboratory was established at Fredericton, N.B., in connection with the Brown-tail Moth and other work in New Brunswick. The University of New Brunswick provided a site on the University campus. The increase in the infested area, and the large amount of work consequent upon our efforts to establish the parasites of the Gipsy and Brown-tail Moths imported from the New England States and the carrying on of an extensive study of the natural control of certain native insects such as the Tent Caterpillars, the Spruce Bud-worm and Fall Web-worm, rendered an increase in the laboratory accommodation immediately necessary; the University had kindly permitted us to use one of their large laboratories during the summer.

The building is of solid brick construction and measures twenty-four feet by thirty feet. It consists of basement, ground floor, first floor and attic. The basement contains the water supply for the building, comprising a well, tank, and electrically driven pump, and provides storage room for field equipment and supplies. The ground floor contains at the front offices for the two officers in charge of the work; Mr. J. D. Tothill has charge of the colonization and study of the parasitic insects and Mr. L. S. McLaine has charge of the field work against the Brown-tail Moth and the collection of parasites in the New England States: at the back is a work room. On the first floor a large laboratory occupies the front half of the building and behind a specially lighted room is provided for photographic and other work; a dark room and bath room are also provided on this floor. The high pitched roof furnishes a roomy attic for storage purposes. Steam-heating and electric light have been installed. The building is well situated on the University campus on a site which the University authorities have generously provided.

The work that is carried on at this laboratory comprises some of the most important investigations that the Branch is prosecuting on the natural control of insect pests. The thoroughness with which the Brown-tail Moth campaign is carried on is evidenced by the fact that by taking the necessary measures from the time of the discovery of the first infestation, it has been possible in New Brunswick to prevent this insect from becoming established in the Province; whereas it is established in Nova Scotia owing to a lapse of some time before the infestation was discovered in 1907 and eradicative measures were begun.

The small laboratory will be used as a sub-station in another part of the Province.

Entomological Laboratory at Treesbank, Man.

Mr. Norman Criddle was appointed in 1913 to carry on investigations on White Grubs (*Lachnosterna*) and other cereal pests in Manitoba and adjoining territory. As the temporary quarters he occupied did not afford adequate accommodation for his work a small wooden laboratory measuring twelve feet by sixteen feet has been erected during the past summer on a site kindly provided by Mr. Percy Criddle on his farm where excellent facilities occur for field and experimental work.

Entomological Laboratory at Lethbridge, Alta.

Investigations on insect and other pests in Southern Alberta were commenced in 1913 by Mr. E. H. Strickland, Field Officer for Alberta, who was provided with temporary laboratory accommodation at the Dominion Experimental Farm at Lethbridge, Alta. During the past summer a permanent laboratory was built on the Experimental Farm.

The building measures twenty-three feet by twenty feet and contains four rooms, namely: office, laboratory, spare room and dark room. By arrangement the Director of the Experimental Farms and the Superintendent of the Farm have kindly furnished for experimental purposes a small plot of ground adjoining the laboratory.

I will not take up more of your time with any rambling remarks of mine; but before closing I should like again to express to our visitors our gratitude to them for coming so far to take part in our proceedings, their presence and contributions to the programme and the discussions are a source of great encouragement to us and I think they will admit that though our numbers are not large the character of the work that has been described is of the highest nature judged by any standard, and that our enthusiasm could not be excelled.

THE LIFE HISTORY OF *CHERMES COOLEYI* GILLETTE IN STANLEY PARK, VANCOUVER, B.C.

R. N. Chrystal, Field Officer for Forest Insects, Entomological Branch, Department of Agriculture, Ottawa.

As a result of an enquiry into the serious injury done to the Sitka Spruce in Stanley Park, Vancouver, B.C., by the attacks of the above species of gall-making insects of the Genus Chermes, the following notes of its life history and habits in that region are presented. This species was named and described by Professor Gillette, Fort Collins, Colorado, in his paper, "Chermes of Colorado Conifers," Proc. Acad. Nat. Sci. Philadelphia, Jan., 1907; its life cycle also being discussed. The following account in a large measure confirms the results given in the above paper, differing only in the species of spruce attacked, and some minor details.

The hibernating stem mother on the Spruce, is oval in outline, flat, .5 to .7 mm. in length, .3 mm. in width, dark brown to black in colour, with a slight fringe of white waxy threads along the edges of the body, and down the middle of the back. The body of the louse is closely appressed to the twig, and the setæ are deeply sunk in the crevices of the bark. The location on the twig varies, from immediately below the terminal bud to 3 inches down the stem.

During the first week of April, 1915, the stem mothers, having cast their winter coat, began oviposition on the spruce, the waxy secretion increasing to such an extent by this time, as to hide the dark coloured, and now much swollen body of the insect from view. Several hundred eggs may be laid by this Chermes, as many as 500 being counted in one egg mass; in cases where several stem mothers are located in close proximity to each other on the twig, the egg masses come together, and the waxy secretion becomes very conspicuous. The eggs are light brown in colour, lightly dusted with a whitish powder, each attached to the stem by a fine thread. They hatch in about 5 or 6 days, and the young, which are light reddish in colour, locate themselves at the inner bases of the young needles, then just breaking from the bud scales. A gall begins to form, and develops with great rapidity, the complete formation taking only a few days in some cases.

The Galls: The galls vary in length from ½ inch to 3 inches, the size apparently depending on the strength of the twig attacked. The following conditions may prevail:

(*a*) The whole twig may be completely galled.

(*b*) The twig may be galled on one side only, causing twisting and bending of the stem.

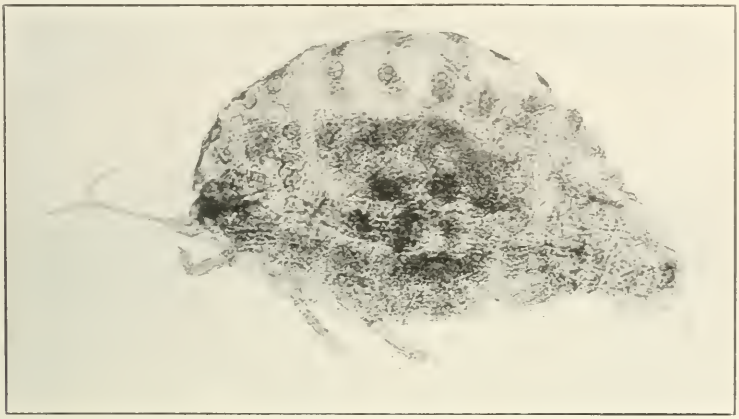
(*c*) Rarely, the upper part of the twig may be galled all round, and the lower part only half way round.

In Stanley Park the first condition was by far the most common, but it may be said, that even in cases where the twig was not completely galled, its ultimate destruction through weakness was, in nearly every case, assured. The number of

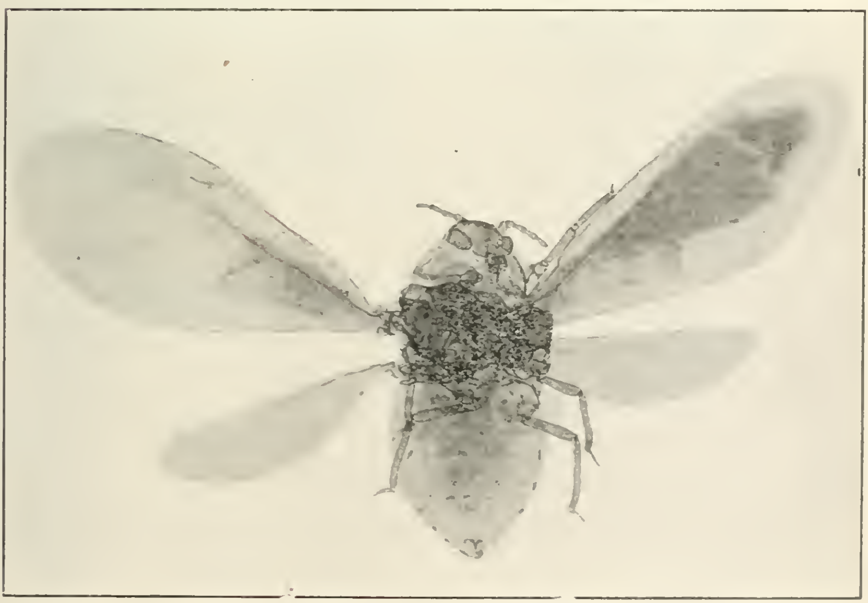
A Sitka spruce killed by chermes galls.

chambers varies from 40 to 200, the number of young in each chamber varying from 1 to 15, with an average of 5. The young are seen to be covered with a waxy coat, which, as Professor Gillette indicates, provides them with a very efficient protection against the superabundance of liquid excretion which they exude. If galls, which are nearly mature, be opened, cast skins of the young may be found filled with this liquid. These very remarkable objects are also mentioned by Professor Gillette in this connection. A few days before the galls begin to open the young inside change to pupæ, the rudiments of wings being readily seen. The earliest date recorded for the opening of the galls in Stanley Park during the summer of 1915, was June 25th. This is the earliest record for this locality so far, and doubtless a direct result of the unusual earliness of the past season, the previous year's (1914) date being about two weeks later.

When about to moult for the last time the pupæ crawl out of the gall chambers, and settle on a needle, the head facing the point of the needle. The pupa is reddish in colour with an outer coat of wax. This outer covering begins to split from the head down the middle of the back, the complete operation of moulting lasting some ten minutes. When the moult is completed the cast skin, a ghostly replica of its former occupant, is left hanging to the needle.



Details of wax glands, var. *coweni*.



Winged migrant to Douglas fir.

The newly emerged winged form has the antennæ and legs very light yellow, almost transparent; the eyes dark red and very conspicuous, the head, prothorax and abdomen rufous red, the mesothorax yellowish, streaked with red. The wings are crumpled up at first and dark green in colour, with the exception of the costal nerve, which is yellow. The green colour remains for some time after the wings are finally resting roofwise over the back of the insect.

The waxy excretion does not make its appearance in any quantity until some twenty-four hours after the winged form has emerged from its pupal covering.

Migration. Experiments were carried out in Stanley Park two years ago with the object of confirming the former observations on the secondary host tree. Opening galls were placed in cages along with fresh branches of Sitka Spruce

Stem mother on Sitka spruce.

Experimental cage in Stanley Park.

(*P. sitchensis*), Douglas Fir (*Pseudotsuga mucronata*) and Western Hemlock (*Tsuga heterophylla*), these three trees being the only conifers within the precincts of the Park. The experiments showed beyond all doubt that the secondary host tree was the Douglas Fir; only a few lice locating on the spruce and hemlock, on which they apparently do not thrive; whereas they were found settling freely on the needles of the fir, as many as 7 being found on the same needle, 2 or 3 being a common number. A few figures of the cage experiments are given below:

	Nos. of Lice Settling on Each Tree.		
Cage.	Spruce.	Douglas Fir.	Hemlock.
1	0	221	0
2	1	672	5
3	15	216	0
4	0	275	2

No success attended the attempts to breed the specimens through on spruce and hemlock at this time. In the open, winged migrants were found locating on the Douglas fir, confirming the experimental results, but in no case was any winged migrant found on a spruce or hemlock in the open. Within a very short time of settling on the needle of the Douglas fir the winged migrant commences to oviposit, about 100-150 eggs being laid. These hatch in 6 to 7 days, and the young, which are elongate oval in shape, and almost black in colour, with only a trace of wax present, settle on the needles of the Douglas fir. There they remain motionless, without any apparent increase in size, through the rest of the summer, fall and winter of the year, until the following spring; when having moulted once, they commence oviposition as stem mothers on the needles of the Douglas fir, laying from 30 to 40 eggs, which hatch in numbers about the end of May and the beginning of June.

This life cycle was traced out for Stanley Park by observations on marked twigs of Douglas fir, through the summer, fall and winter of 1914-15. During

Stem mother on the Douglas fir.

the first half of May, 1915, this generation on the Douglas fir was observed to be dimorphic, about 50 per cent. of the lice developing wings and migrating back on to the Sitka spruce, while the rest remained like the parent on the fir.

The migration back to the Sitka spruce began about June 6. Experiments were started in this case as well as in the case of the former migration to the fir. to endeavour to determine for certain that the Sitka spruce was the return host. Young trees, of the three coniferous species, spruce, Douglas fir, and hemlock, were used, being enclosed in a cheesecloth cage. The fir was heavily infested with the Chermes and gave promise of good results. The numbers of migrants located was disappointing, but gave clear indications that the Sitka spruce was the chosen tree. the migrants found settling on the Sitka spruce in the cages were compared with winged migrants found settling on the spruce in the open and proved identical.

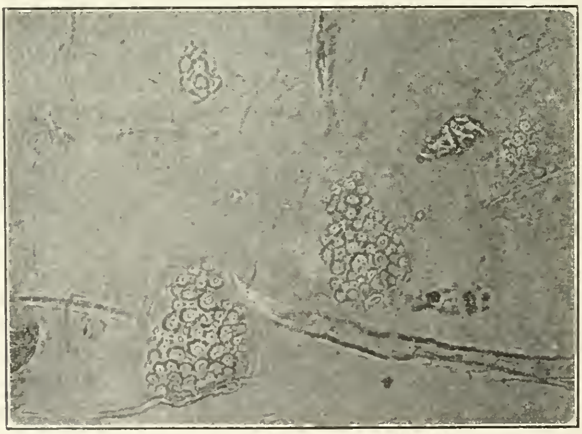
This form on the fir is Professor Gillette's *Chermes cooleyi* var. *coweni*. The apterous forms left behind on the needles of the fir, increase in size, and amount of wax secreted; lay a small number (30-40) of eggs, and the young on hatching take up their location on the needles of the spruce, there to remain until the following spring when they become stem mothers. The winged migrant to the spruce lays 30-40 eggs, and then dies, the eggs hatch in about a week and the young, which were kept under observation until the winter, remain on the needles, and probably, although this fact has not yet been actually followed in the case of Stanley Park, remain stationary until the following spring, when they become stem mothers for the new broods on the Sitka spruce.

Full descriptions of the various forms of this species and its variety *coweni* have already been published by Professor Gillette in the paper already cited: the writer would like to take this opportunity of acknowledging the assistance rendered by Professor Gillette in the identification of the material submitted to him.

A careful study has been made of the various forms, using Professor Gillette's published descriptions, and these have agreed in every case.

Mention may be made here of the principal differences between the various corresponding stages of the two forms on the fir and the spruce.

Chermes cooleyi Gillette.	*Chermes cooleyi* var. *coweni* Gillette.
Winged Migrant to Douglas Fir.	*Winged Migrant to Sitka Spruce.*
Antennal joints slender.	Antennal joints robust.
Antennal sensoria larger.	Antennal sensoria smaller.
Pores of wax glands small.	Pores of wax glands large.
Stem Mother on Spruce.	*Stem Mother on Douglas Fir.*
Wax glands large, with small pores.	Wax glands small, with large pores.
Beak long and slender.	Beak short and stout.



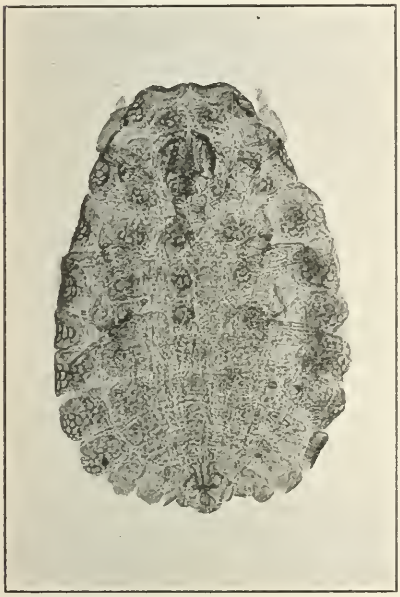
Winged migrant to spruce; details of wax glands.

Damage to the Spruce. The damage done to the Sitka spruce in Stanley Park by this form has been very considerable, a large number of trees have been killed, whilst many others are in a dying condition and beyond hope of recovery. The fact that in most cases the whole of the young twig is destroyed makes the injury very much more serious.

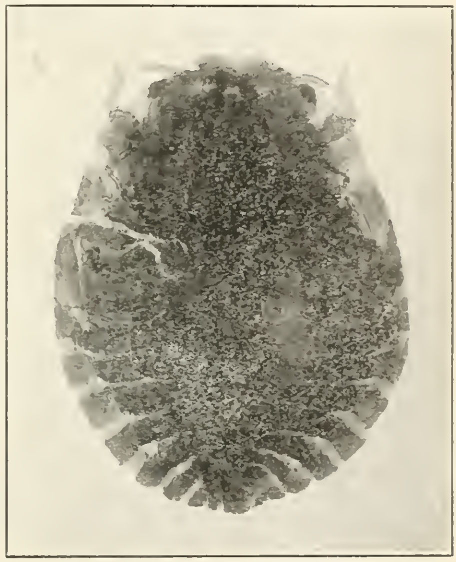
The Douglas Fir. The damage done by the form *coweni* on the Douglas fir has never been particularly noticeable, no deleterious effect on the health of the fir in the Park having been noticed. Only in one case outside Stanley Park, in a garden where a Douglas fir and Sitka spruce were growing alongside each other, the spruce being very heavily galled, did the needles of the fir show effects of heavy infestation later on in the summer. The nature of the damage on the fir is to cause the needles to curl and bend at the points of attack.

NATURAL ENEMIES. Syrphus fly larvæ and coccinellid larvæ have been observed feeding upon the pupæ in the galls, but not in sufficiently large numbers to produce any appreciable effects.

THE PRESIDENT: We are very pleased to have this account of Mr. Chrystal's work from himself for the benefit of those who are here and who may know when I say that Stanley Park, in which Mr Chrystal is working, is one of our finest pieces of natural woodland in the whole Dominion, and is known to all foresters in Canada; but unfortunately, owing chiefly to the depredations of certain species of insects, its beauty is fast passing away. When I visited the Park last summer I was abhorred to find the enormous destruction which has been caused in a few years by various species upon which Mr. Chrystal has been working. They really are the reason of Mr. Chrystal's presence in Stanley Park. There are whole areas



Stem mother from Douglas fir.



Stem mother, from spruce.

of hemlock there which are absolutely dead, places which Mr. Chrystal has named "the graveyard." I had with me Mr. James White, the Assistant Chairman of the Commission of Conservation, and we were able to demonstrate to him the enormous destruction of these trees by insect pests. I fear the time has nearly come when Stanley Park may no longer be considered Canada's most beautiful natural park. This paper is now open for discussion and perhaps Mr. Macoun, the Dominion Horticulturist, who is with us this morning, might have some remarks to make in regard to this paper.

MR. MACOUN: I am afraid I have not much to add to what you have said, Dr. Hewitt. Stanley Park is one of the sights of Canada and certainly everything possible should be done to preserve it.

PROF. CAESAR: I would like to ask if this species is native to North America and also whether Mr. Chrystal has yet in mind any plan of a practical means of control.

Mr. Chrystal: Prof. Gillette states in his paper that on seeing the species of *cooleyi* he described it as a new species and said that this species was confined to the Rocky Mountain region. The state of the spruce in the Park was very bad; on careful examination about 60 per cent. were found to be beyond hope of control, but the rest could be sprayed, even to a considerable height.

Prof. Caesar: It is quite an interesting matter of observation at Guelph to note that *Chermes abietis* and *Chermes similis* have, the last few years, been almost totally controlled by some natural enemy. Since this western species is a native insect one would expect that sooner or later we should have natural means of control of it too.

Mr. Tothill: There has been an outbreak of presumably *Chermes* in New Brunswick. This outbreak was exceedingly conspicuous about three years ago and Professor Caesar will know fully well, the outbreak has been brought under complete control.

The President: If there is no further discussion on this paper we will pass on to the next and last of this session. There are really two papers but they will be taken as one and read consecutively.

THE CABBAGE MAGGOT—AUTUMN DEVELOPMENT IN BRITISH COLUMBIA.

(*Phorbia brassicæ.*)

R. C. Treherne, Field Officer, Dominion Entomological Laboratory, Agassiz, B.C.

The matter of autumn development in the life-history of the Cabbage Maggot is obviously of great importance in the control of this fly. On the basis of the knowledge obtainable in the autumn rests the question of autumn cultivation and the destruction of the refuse and debris resultant from the summer's crop. Still further great bearing will be obtained on the early spring development, inasmuch as little change is undergone by the spring by these forms entering upon the winter.

I do not propose, at this moment, to present all the information that has been obtained during the past few years in British Columbia on the life history and characteristics of this important pest, but merely to confine myself, in the time allotted, to a consideration of the developments that occur in the autumn.

Inasmuch as climate may offer changes and locality present differences, I shall confine myself strictly to conditions that prevail at Agassiz, B.C. (Lat. 49.15, Long. 121.40, 52 feet above sea level), which in themselves are comparable to the entire Lower Fraser Valley or what is known as the "Lower Mainland" of the Province.

It is my belief that opinions generally consider that the Cabbage Maggot Fly passes the dormant winter season mainly in the pupal state in the soil surrounding cruciferous roots or imbedded in the root itself. There are also opinions expressed from various quarters that there is a "possibility" that the fly may pass the winter in the adult condition. It is not my intention to enlarge on these expressions, but inasmuch as it is our duty to take careful observations in each locality where this fly is a pest and the growing of vegetable crops is a leading industry, I merely wish to offer a contribution on the life characteristics of the fly in the locality above mentioned.

Further I may say that up to the present we have little information in this Province on the habits of this fly and little knowledge, other than the generally accepted conceptions, on which to base the more approved remedial measures.

Without entering upon a detailed study of the complete life history of the fly, I wish to say that usually there are three complete and overlapping generations of this fly at Agassiz. It is possible for forms of the third generation to appear on the plants as early as July 18th, developing from the first eggs of each generation, while the second generation would ordinarily cease approximately about September 1st.

I will commence the discussion on the autumn development of this fly from this date, September 1st, and, in doing so, consequently, we will be dealing in all probability with third generation forms with a possibility that certain of the younger stages may belong to the fourth generation.

Autumn Fly Emergence.

Cabbages and cauliflowers are harvested mainly in the months of August and September. During the past three years larvæ have been observed at times during each of the months of October, November and December working on roots of cruciferous plants. This year particularly an attempt was made to account for these larvæ and to solve the question of the hibernating form.

In the process of harvesting, therefore, collection was made of all pupæ seen and these were placed under observation in a sheltered place, but under supposedly equal atmospheric conditions as would prevail in the open field. One was struck during the course of the field observations with the preponderance of pupal forms over the larval, and one might easily suppose that given a cold wet autumn with low maximum and minimum temperatures that pupal forms would continue as such for the winter and larvæ would complete their growth and pass the winter as pupæ also. Detailed observations in an autumn of such a nature are lacking up till the present. As it happened, the past two years, 1914, 1915, when the notes herein presented were recorded, have been open and mild, during September and October. Such a condition is not out of the ordinary in this part of the world, thus the facts recorded are of interest.

From puparia collected, therefore, the following emergence of flies is recorded. It will be seen that the number of puparia under observation is increased on certain days. This is explained by the fact that harvesting operations were continuing and more pupæ were being collected and added to the number under observation.

TABLE 1.—AUTUMN FLY EMERGENCE.

Date	Number pupæ under observation.	Number of flies emerging.	Sex. Male.	Sex. Female.	%
September 1st	137	1	1	....	.8
" 2nd	136	2	1	1	1.5
" 3rd	134	3	1	2	2.2
" 4th	131	0	....	....	0
" 5th	131	8	6	2	6.1
" 6th	123	0	....	....	0
" 7th	123	1	1	....	.8
" 8th	122	2	1	1	1.6
" 9th	120	1	1	....	.8
" 10th	119	7	5	2	5.8
" 11th	112	11	2	9	9.8
" 12th	101	0	....	....	0
" 13th	101	8	3	5	7.9
" 14th	93	5	1	4	5.3
" 15th	90 (2)	4	1	3	4.4
" 16th	96 (10)	6	4	2	6.2
" 17th	102 (12)	4	4	....	3.9
" 18th	108 (10)	2	1	1	1.8
" 19th	111 (5)	0	....	....	0
" 20th	111	9	3	6	8.1
" 21st	105 (3)	0	....	....	0
" 22nd	105	4	....	4	3.7
" 23rd	113 (12)	2	....	2	1.7
" 24th	117 (6)	5	3	2	4.2
" 25th	117 (5)	3	1	2	2.6
" 26th	114	5	3	2	4.2
" 27th	109	1	....	1	.9
" 28th	121 (12)	0	....	....	0
" 29th	121	0	....	....	0
" 30th	193 (72)	0	....	....	0

FLY EMERGENCE IN THE FIELD.

Inasmuch as the records given in Table 1 might have been influenced by unnatural conditions resulting from laboratory arrangements, the important point was to determine whether or not the same conditions were occurring in the field under strictly natural conditions. It was clearly proved that flies will emerge from September puparia under laboratory conditions, and, as will be seen later, eggs were being taken freely in the field. Hence it was probable that flies were emerging freely from the soil in the field. In order to determine this point careful examination of the roots of old cabbage plants was made. The roots were cut and the soil worked over to the depth of 6 inches. This was done on September 28th, 29th, 30th, and it was found that out of 78 plants examined, 48 plants were or had been infested. 30 plants did not show any sign of attack, and no puparia were taken. From the 48 plants, however, were found:

124 empty puparium cases from which flies had emerged.
96 sound and apparently healthy puparia.
14 large maggots more than 3 mm. long.
4 small maggots less than 3 mm. long.

Close examination for minute forms was not made, the important point being indicated that many flies were emerging in the field. It is hardly fair to claim a ratio between the empty puparium cases taken in the field with those under observation in the laboratory, because we could not be sure when the flies did emerge. However, the fresh nature of the puparium cases leaves no room for doubt that flies emerge freely from the soil during September.

Hence it is probable that Table 1 closely approximates the actual field conditions.

Adult Fly Mortality.

Having satisfied ourselves that many flies emerge from the soil in September, several important considerations open up, viz., length of life of the fly, mortality, whether copulation occurs in autumn and eggs are laid, whether these eggs are fertile, and if so what happens to the young maggots, and lastly what proportion, if any, of the adults winter as adults.

The question of the length of life of the fly and the mortality is represented by the following table 2. The flies as they emerged, as indicated in table 1, were placed in 6-inch tubes and kept under observation in a shaded box under outside temperature conditions. Periodically they were examined for mortality and the live ones fed a little syrup and water solution. This table 2, therefore, has direct reference to the "sex" column on fly emergence as indicated in table 1. To interpret this table read horizontally for fly emergence and perpendicularly for date of death.

TABLE II.—Male Mortality.

Date.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
September 1.....	1																			
" 2.....		1																		
" 3.....			1																	
" 4.....				0																
" 5.....					6															
" 6.....						0														
" 7.....							1													
" 8.....								1												
" 9.....									1											
" 10.....										5										
" 11.....											2									
" 12.....												0								
" 13.....		x			5x			x					3							
" 14.....			x		x									1						
" 15.....															1					
" 16.....																4				
" 17.....																	4			
" 18.....										x								1		
" 19.....																			0	
" 20.....	x						x			x			2x	x						3
" 21.....																				
" 22.....									x							x				
" 23.....																				
" 24.....																				
" 25.....										x			x		x	2x				
" 26.....																				
" 27.....											x									
" 28.....																x	x			
" 29.....										x										
" 30.....																	3x	x		2x
October 1.....																				x
" 2.....																				
" 3.....																				
" 4.....										x		(1 fly escaped)								

Female Mortality.

Date.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
September 1.....	0																			
" 2.....		1																		
" 3.....			2																	
" 4.....				0																
" 5.....					2															
" 6.....						0														
" 7.....							0													
" 8.....								1												
" 9.....									0											
" 10.....										2										
" 11.....											9									
" 12.....												0								
" 13.....					2x								5							
" 14.....														4						
" 15.....															3					
" 16.....																2				
" 17.....																	0			
" 18.....																		1		
" 19.....																			0	
" 20.....		x	x								2x		2x	x						6
" 21.....																				
" 22.....											2x			x						
" 23.....																				
" 24.....																				
" 25.....			x								x		x	x	3x	x				
" 26.....																				
" 27.....											2x									
" 28.....								x		x	x									
" 29.....													x							
" 30.....													x					x		2x
October 1.....														x						
" 2.....																x				3x
" 3.....					escaped															x

From these records it will be seen that the length of life varies from 7-25 days in the autumn. This is of interest as the average life of an adult during the summer is approximately only 4.5 days.

It will be seen that all the flies in the above table 2, which emerged from puparia up till September 20th, died.

Those flies that emerged after September 20th (table 1 indicating that emergence continued until September 27th), were treated in a different manner. It was felt that 6-inch tubes hardly gave a fair test of longevity, hence a large wire mesh cage was arranged to give the flies more liberty of flight. The records follow on this experiment.

Hibernation of the Adult.

As has just been seen a certain number of the flies that emerge as adults in the autumn live as long as twenty-five days, this period being passed in a six-inch vial. It was thought possible that the stage might be prolonged still more if the flies were allowed more room for flight and if this occurred we might persuade some of the flies to pass the winter in the adult condition. Accordingly a large cage was arranged consisting of wire mesh and suspended within was a large piece of rough fir bark, with many crevices into which flies might crawl should they desire to. This cage was suspended to the outside wall of the building. A small amount of sweetened water was placed on the floor of the cage, upon which, later, it was observed, the flies fed readily. No cabbage plant was introduced into the cage for fear the flies would be tempted to deposit eggs, and if they did so, their life functions would be over and they would probably die. Into this cage twenty-two flies of both sexes were liberated between September 22nd and 27th. Examination of the cage was difficult for fear of allowing the flies to escape. However, flies were observed dead on the floor of the cage on September 25th and finally on October 8th all the flies had died. On October 5th only six flies were observed dead on the floor of the cage, hence a rapid mortality must have occurred between the 6th and the 7th. The night of the 7th was the coldest night thus far experienced during the autumn, being 33 degrees F. This temperature may have killed the adults. At any rate we have nothing to offer which proves that flies winter over as adults although indications that such might occur were propitious. It might be noted again that no flies emerged from puparia after September 27th, despite the fact that 193 puparia were still confined on soil in boxes on that date.

I can only say that the number of flies experimented with in this instance was far too small to record an invariable and established fact I can merely say that those flies used did not survive the first touch of cold weather and hence did not pass the winter as adults. It might, however, be said with reason that it is highly probable that a small percentage of adults will winter as adults in a favorable season, although such has not been shown in our experiments thus far.

Egg Deposition in Field.

Not only do adult flies emerge freely from the puparia during September and probably part of October, but we find also that eggs are deposited equally freely during these months. These notes, recorded now, are a part of a long series of notes obtained throughout the summer on the question of egg deposition hence I shall not give the full details at this juncture. We are only interested now in the autumn development. To obtain this record 12 cabbages and 6 cauliflowers were examined daily between 4 p.m. and 6 p.m. and all eggs laid during the twenty-four hours removed by means of a knife blade and counted. By this method we would obtain an absolutely accurate record of the daily deposition. Further useful information may be deduced in reference to effects of temperature, sunshine, rain, wind, on egg deposition and the size and shape of the plant chosen for deposition.

The record follows in table 3. (For the sake of comparison the record of 12 cabbages is reduced to read for 6.)

TABLE III.—EGG DEPOSITION RECORD.

September.	No. of eggs on 6 cabbages.	No. eggs on 6 cauliflowers	Weather Notes.
1st	10	42	Morning, cloudy .... Afternoon, showers.
2nd	16.5	96	" fine .... " cloudy.
3rd	1	73	" fine .... " cloudy.
4th	15	116	" fine .... " fine.
5th	1	13	" foggy .... " dull.
6th	2.5	25	" cloudy .... " showers.
7th	3	24	" dull .... " showers.
8th	0	1	" rain .... " heavy rain.
9th	2.5	11	" fine .... " heavy rain and some sunshine.
10th	0	66	" fine and strong wind .... " fine.
11th	1	17	" fine .... " fine.
12th	7	15	Bright and sunny all day, night wet.
13th	0	0	All day cold and stormy.
14th	0	0	Warmer, but cool and cloudy.
15th	(no record taken)		
16th	0	10	Day fine, warm and sunny.
17th	0	49	Day fine, warm and sunny.
18th	0	21	Day fine, warm and sunny.
19th	0	32	Day fine, warm and sunny.
20th	9	61	Day fine, warm and sunny.
21st	10	38	Day fine, but smoky.
22nd	0	78	Day fine, warm, but dull.
23rd	(no record taken)		Showers fell throughout day.
24th	8	147	Day fine, warm and sunny.
25th	0	137	Day fine, warm and sunny.
26th	0	18	Day dull, but fairly warm; rain fell during the night.
27th	3	17	Morning dull; afternoon fair.
28th	6	80	Day fine and fairly warm.
29th	0	102	Day fine and warm.
30th	0	22	Morning dull, afternoon rain fell.
October.			
1st	(no record taken)		
2nd	(no record taken)		
3rd	0	99 (33 eggs per day)	Day dull with some rain.
4th	No further records taken on the cabbages	35	Day dull with slight sun, rain at night.
5th		15	Morning, fine; afternoon, bright and sunny.
6th		100	Windy, but fine and sunny.
7th		5	Day fine, warm, sunny; night coldest yet, 33° F.
8th		86	Morning sunny, afternoon dull and cloudy, night warm.
9th	....	1	Fine all day and sunny.
10th	....	48	Day fine and sunny.
11th	....	0	Rained.
12th	....	0	Rained.
13th	....	0	Heavy rain.
14th	....	13	Fine autumn day, cool but sunny.
15th	....	11	Fine autumn day, sunny, cool at night.
16th	....	11	Day fine, comparatively warm.
17th	....	0	Day mild but no sun.
18th	(no record taken)		
19th	(no record taken)		
20th	....	0	Dull and wet on past three days.
21st	(no record taken)		
22nd	....	4	Dull but mostly fine, rain in evening.
23rd	....	0	Rain.
24th	....	0	Showery.
25th	....	0	Dull with showers.

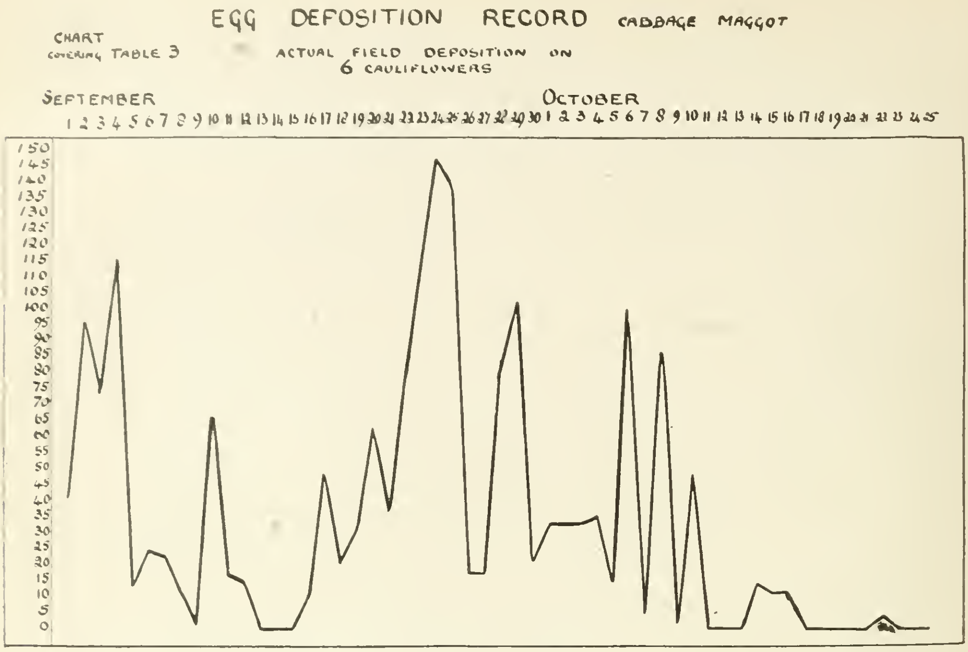
From this table 3, we find that flies were active up till as late as October 22nd; having since September 1st deposited 1,739 eggs on six cauliflower plants. The egg deposition on six cabbages for the month of September was 95.5, while the deposition on a like number of cauliflowers over the same period was 1,311. This indicates the importance of pursuing the life history on more kinds of plants than one. The records from cabbages alone would incline towards an entirely different rendering of the actual situation.

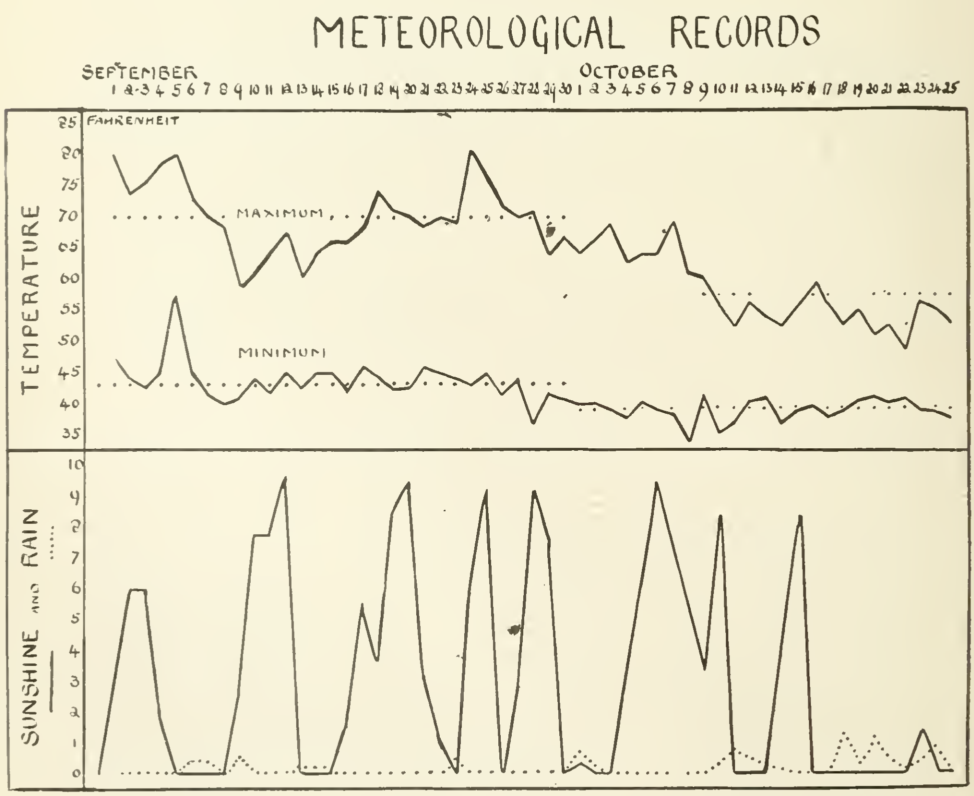
(See chart covering egg deposition on six cauliflowers.)

Autumn Larval Notes.

We are now satisfied, in the first place, that flies freely emerge from the soil in September, and in the second place that quantities of eggs are laid around plants until late into October. The high egg fertility percentage is maintained throughout the entire year, consequently we are justified in assuming that larval forms may be found working on the roots of plants during November and December. This assumption is supported by fact inasmuch as larvæ, freshly hatched, from late September eggs, having been placed on plants in pots, developed to 2 mm., 3 mm., and 4 mm. in length by the commencement of November. Inasmuch as these pots were sunk in the soil out of doors, we claim with assurance that the conditions were precisely natural.

Eggs taken from plants in the field between September 13th-26th, were hatched in the laboratory and placed on the soil around a potted plant (which was in turn sunk in the open soil), developed maggots 3 mm.-4 mm. long by October 25th. Larvæ hatching after September 26th and before 30th, treated in the same way developed maggots 2 mm. long by the close of October. There is no question of doubt that the larvæ found in both these instances would mature, pupate and pass the winter. It is true that no further notes were taken on them after this date, but their general thrifty appearance does not allow of much doubt that they will survive. Eggs hatching in October were also placed around the stems of plants and they developed slowly during the early days of November. Frost, it would seem, might affect them, especially the very small larvæ. Given no severe weather in November and December, there is, again, little doubt that October eggs will persevere also to puparia by the approach of winter. Real winter weather seldom sets in with any degree of permanence in this locality until the New Year.


EGG DEPOSITION RECORD CABBAGE MAGGOT
CHART COVERING TABLE 3
ACTUAL FIELD DEPOSITION ON 6 CAULIFLOWERS
SEPTEMBER
OCTOBER


METEOROLOGICAL RECORDS
SEPTEMBER
OCTOBER
FAHRENHEIT
TEMPERATURE
MAXIMUM
MINIMUM
SUNSHINE AND RAIN

The Meteorological Records.

The Meteorological records covering the notes given in this paper are as follows:—

	Temperature Degrees Fahr.		Sunshine in hours	Rain in inches
	Maximum	Minimum		
September 1st	80	47	....	....
" 2nd	74	44	6.2	....
" 3rd	76	43	6.4	....
" 4th	78	45	1.8	....
" 5th	80	58	....	....
" 6th	73	45	....	.04
" 7th	70	42	....	.03
" 8th	68	40	....	....
" 9th	59	41	2.5	.45
" 10th	61	44	7.8	....
" 11th	64	42	7.8	....
" 12th	67	45	9.7	....
" 13th	61	43	....	.08
" 14th	64	45	....	.05
" 15th	66	45	....	.14
" 16th	66	42	1.5	....
" 17th	68	46	5.5	....
" 18th	74	44	3.6	....
" 19th	71	43	8.5	....
" 20th	70	43	9.5	....
" 21st	68	46	3.1	....
" 22nd	70	45	1.0	....
" 23rd	69	44	....	.48
" 24th	81	43	5.9	....
" 25th	76	45	9.2	....
" 26th	72	42	....	....
" 27th	70	44	2.9	....
" 28th	71	37	9.2	....
" 29th	64	42	7.5	....
" 30th	67	41	....	....
October 1st	64	40	.48	.61
" 2nd	67	40	....	.12
" 3rd	68	39	....	....
" 4th	63	37	3.24	....
" 5th	64	40	6.24	....
" 6th	64	39	9.6	....
" 7th	68	38	7.18	....
" 8th	61	33	5.18	....
" 9th	60	43	3.42	....
" 10th	56	35	8.48	.12
" 11th	53	37	....	.63
" 12th	56	40	....	.57
" 13th	54	41	....	.49
" 14th	53	37	4.50	.12
" 15th	55	38	8.48	....
" 16th	58	39	....	....
" 17th	56	37	....	....
" 18th	53	38	....	1.22
" 19th	55	40	....	.39
" 20th	51	41	....	1.19
" 21st	53	40	....	.52
" 22nd	48	41	....	.15
" 23rd	54	38	1.42	.36
" 24th	55	38	....	.95

THE CABBAGE MAGGOT IN BRITISH COLUMBIA (*Phorbia brassicæ*).

THE NATURAL CONTROL BY PARASITES AND PREDACIOUS INSECTS.

R. C. TREHERNE, FIELD OFFICER, DOMINION ENTOMOLOGICAL LABORATORY, AGASSIZ, B. C.

The Cabbage Maggot fly is a very serious pest in the Lower Fraser Valley of British Columbia. Variations in prevalence occur one year with another, and certain locality differences are observed in any given season. These changes are not accounted for with any degree of satisfaction, but it is certain that autumn temperatures and precipitation play an important part in the conditions that arise the following spring.

The importance of this insect may be gauged by its long period of activity. Eggs may be frequently observed deposited on the stems of plants during the first week of April, and oviposition may continue intermittently but continuously until well in October. Nearly full-grown larvæ have been taken from roots in the closing days of April, and they may be found at all times until November and sometimes as late as December. These records were taken in the Lower Fraser Valley of British Columbia and apply only to that district, which ranges about 100 miles east of Vancouver. They are, further, notes gathered from three years' work with the fly, and are only given in this connection to indicate the serious possibilities that may follow an attack by the pest.

During the past summer an attempt was made to estimate the egg-laying proclivities of the fly. A number of plants, as indicated below, were examined every day, at the same time, from April 17th until October 26th. At each examination all eggs were removed and counted, so that as a result we find we have an accurate record of the total number of eggs laid per day throughout the summer. As an indication of the seasonal prevalence during the past summer, I may say that in a large experiment on control measures, out of 215 cabbages, untreated and used as checks, only 26 died strictly by reason of maggot attack (12.1 per cent.), and out of 210 cauliflowers, of the same nature, only 24 died (11.4 per cent.). Of course many plants were attacked and a diminution of weight was noticed at harvesting, but they survived the ordeal of the attack and a certain weight was recorded to their credit at the close of the season.

The fertility of these eggs, of which at least 2,500 were tested over the whole of the above period of time, was shown to be well over 80 per cent. This would indicate that if all the eggs as laid persevered through to puparia, the percentage of sound plants at the end of the season would be practically nil, despite the fact, as above noted, that the season was light in comparative prevalence.

Our field records, however, from careful root examination of both cabbages and cauliflowers, show clearly that during the past season rarely, if ever, were more than 25 larvæ and puparia found at any one time. In other years I have taken as many as 100 larvæ and puparia from single roots of cabbages, but not so this year, which is comparable to the egg deposition records in Table A.

The question then arises: What happens to all these eggs and small maggots?

One answer is that it is probable the larval mortality is high in the very early stages. I have experienced difficulty in bringing through young larvæ from the eggs under laboratory conditions, and further from observations taken on the movements of newly-hatched larvæ on the surface of the soil, I am convinced a great many never reach the roots at all. However, I am not prepared to say much on this point.

One may judge from these statements that the fly was not so serious as usual, but, nevertheless, under such a degree of prevalence it was found that large numbers of eggs were laid, as indicated in the following table:—

Table A—Egg Deposition Record.

Crop. No. Plants.	Dates or Month.	No. of eggs deposited, removed and counted.	Basis of 1 plant.
25 Radishes	April 17th–May 31st....	3,437 eggs	137.5
*12 Cabbages......	May 21st–May 31st.....	86 "	7.
	For month of June	3,126 "	260.5
	July......	2,477 "	206
	August ...	758 "	63.2
	September	155 "	12.9
	October...	....	....
			Total..6,602
* 6 Cauliflowers...	June 25th–July 31st	2,221 "	370.
	For month of August...	1,555 "	259.
	September	1,311 "	218.5
	October...	428 "	71.3
			Total..5,515

Another answer is that of the control by parasitic insects. On several occasions the Cynipid parasite *Cothonaspis gillettei* has been bred from puparia collected in the field. Unfortunately we cannot, from our study up to the present time, consider this parasite of any practical benefit in the control of the fly at Agassiz, B.C., its numbers are shown to be entirely too few. From the large numbers of puparia that have been taken and studied this past summer, only twelve Cynipid adults appeared. They started to emerge from puparia on August 16th and continued until October 18th. Further, there is little doubt that some carry over the winter within the puparia of the maggot to emerge in the spring.

Except for this Cynipid parasite, no other true parasite has been observed or recorded in British Columbia.

The third answer to the above question, and probably the most important, is the control by predatory insects and mites.

Red Trombidium Mite.

A Red Mite may very commonly be found on the surface of the soil in the vicinity of cruciferous plants. It has been shown by laboratory experiments that this mite will attack the eggs of the Cabbage Maggot fly. Several investigators have shown mites of this nature of great importance in the natural control of the fly, but our studies at Agassiz do not show that it is of such importance and not comparable in usefulness to certain Carabid and Staphilinid beetles.

Several Staphylinids are of importance, notably:

Orus punctatus Casey.

Xantholinus hamatus Say.

Hisperobium californicum Lec.,

* (Cabbages and Cauliflowers transplanted on May 13th and 14th)

and several species of Carabids, notably, *Celia farcta* (1)*, *Bembidium mutatum* G. - H., *Bembidium trechiforme* Lec., *Platynus cupreus* Dej., *Pterostichus lucublandus* (2)*.

An attempt was made to determine the appetites of some of these predaceous insects. The following methods were used in determining this point. Ordinary small vials were employed in which single specimens of beetles were placed. A small piece of moistened blotting paper was also inserted in the vial and the whole tightly corked. Eggs of the Cabbage Maggot fly, freshly-hatched larvæ, and more mature larvæ of varying lengths were placed in the vial on the blotting paper ever so often, and allowed to remain with the beetle under observation. Daily records were taken over a certain length of time and the amount of material devoured noted. In this way we have the maximum appetite of the beetles recorded.

Another system was employed in which two ordinary microscopic slides were laid over one another and kept separate by means of a small strip of thin linoleum placed around three sides and glued on both sides to the glass. The fourth side was left open to be plugged with a piece of cotton wool. In this way we have a flat glass-encased chamber which may be easily handled and operated under the microscope. A little pulverised soil was then sifted into the chamber thus formed and the beetles to be observed placed within. Food was regularly supplied and the amount devoured recorded.

It may be seen from both these systems that the beetles were confined within a small area and that the food supplied had no opportunity of escape. Hence due latitude must be given the appetite record. Attempts were made to carry on the work under more natural conditions, but it was felt that the results recorded were of little value. It was too difficult to give the beetles full liberty of action and at the same time keep them under observation. Furthermore, it was impossible to discover whether a small newly hatched larva had been actually devoured by the beetle when given full liberty of action, or whether it had died a natural death. It is true that we devised a cage over some plants in the field, consisting of ordinary chicken wire mesh, which was entirely covered with cheesecloth, with the exception of a couple of inches on the ground surface. In this way the flies were prevented from oviposting and the ground beetles were allowed free access to the plants, and provided one knew how many eggs were around the plant at a given time, a series of notes on this point would offer some evidence on the matter of the natural control. However, even this method did not give the results expected.

I shall give, nevertheless, the results of the vial experiments, which may be taken to record the maximum appetite and the length of life of the beetles.

In this Table B the symbol "n, h, m," represents the words "newly-hatched maggots," while "l m" represents the words "large maggots." The figures in brackets in connection with these symbols represent the amount of food offered throughout the course of the beetle's life.

The species involved in this work are as follows:—

Type 1.—*Bembidium mutatum.*

Type 2.—*Bembidium trechiforme.*

Type 3.—*Pterostichus lucublandus.*

Type 4.—*Orus punctatus.*

Type 5.—*Xantholinus hamatus.*

Type 6.—*Hisperobium californicum.*

* (1) Identified by Dr. E. C. Van Dyke.
* (2) Identified by Col. T. L. Casey.

All the Carabids were actually observed at work devouring maggots in the field, hence are predacious on the maggot under strictly natural conditions. The Staphilinids occurred in numbers in such close vicinity to infested roots, that there is little doubt they also are predacious under natural conditions. Their habits were mostly studied in confinement.

TABLE B—CARABID ADULT APPETITE RECORD.

Beetle Type No.	Vial No. Exp.	Food Consumed. n, h, m,	eggs	l, m,	Life of beetle in days.	Food consumed per day. n, h, m,	eggs	l, m,
1	1	305 (352)	53 (71)	7 (13)	51	6	1	.5
	14	262 (319)	34 (46)	½ (8)	81	3.2	.4	.09
2	4	210 (308)	82 (116)	7 (19)	120	1.8	.8	.006
	6	51 (79)	21 (31)	2 (4)	12	4.2	1.9	.18
3	21	....	....	10 (23)	10	....	....	1.

STAPHYLINID ADULT APPETITE RECORD.

4	2	497 (549)	78 (128)	1 (19)	87	5.7	1	0
	5	12 (12)	17 (22)	0	3	4.	6	0
	7	16 (25)	19 (38)	0	12	1.3	1.6	0
5	3	242 (313)	73 (112)	10 (22)	120	2	.2	.1
	9	185 (226)	10 (29)	0 (4)	76	2.5	.2	0
	10	165 (227)	45 (63)	0 (2)	51	3.2	.9	0
6	17	....	....	2 (5)	4	....	....	.5

To interpret the Table B correctly it is necessary to understand that the beetles were offered food according to what happened to be on hand to feed them, and further that on several days the beetles were deprived of their favorite food, i.e., small maggots and eggs and were fed on large maggots. In this way, in the first place, therefore, they were not allowed to choose their own food, hence the above record does not indicate any special choice of food, and in the second place while the beetles lived for some considerable time, part of that time they were starved, in the effort to induce them to devour the large maggots, hence the appetite record is lower per day than it would be if the diet had consisted entirely of small maggots and eggs.

The detailed daily record of these several beetles makes exceedingly interesting reading from the original notes. I do not consider it possible to include them in this paper, or to publish them in the proceedings, as they would occupy too much space. The Table B gives merely the bald statements without those fine points of interest incident to the feeding.

Control by Predacious Larvæ.

In addition to establishing the appetite record of the adult beetles, both Carabid and Staphilinid, an attempt was made to mature carabid larvæ. Carabid beetle eggs may frequently be seen on the soil surface, and at different times some of these were taken from the field, at other times some eggs were deposited in the tubes in the laboratory. Poor success seemed to attend the hatching of these eggs, and in fact many disappointments were encountered in bringing the larvæ to maturity. Without detailing all these troubles I will relate some of the facts obtained. The eggs and larvæ of these beetles were handled in the same way as the adults, in vials, etc.

Table C—Carabid Larvae Appetite Record.

Vial Exp. No.	Size of larva in mm.	Food consumed.			Remarks.
		n, h, m.	eggs.	l, m.	
11	hatched from egg	....	5 (5)	......	Larva died, having eaten 5 eggs in 2 days.
20 & 22	8 x 1	79 (100)	....	6½ (20)	2 Larva lived 20 days, having eaten per day 4 n,h,m, and 1 2 mm. maggot.
8	9 x 1	6 (6)	17 (37)	0	Larva died in three days.
12	9 x 1	2 (2)	4 (18)	......	Larva moulted and then died after 2 days.
15	12 x 2	....	7 (11)	4 (9)	Larva died after 3 days.
18	16 x 2	0 (20)	....	8 (28)	Larva died after 18 days, eating about 1, 2, 5 mm. maggot p r day.

Summary.

Even from these records it is impossible to state with accuracy the actual appetite record of any predacious beetle or its larva. The limitation in the manner in which the work was done does not allow us to form any definite conclusion.

We are justified in stating, however, that despite the artificial methods employed, these predacious beetles present an immense aid in the control of the maggots. Their voracious appetites in confinement and from the fact that they did not hesitate to attack the food offered clearly proves some marked similar action in nature. Further than this, on many occasions, both Carabid and Staphilinid beetles, and the larvæ, at any rate of the former, may often be found embedded in the roots of plants in close association with maggots, and have been observed actually at work devouring maggots. The actual amount of food they dispose of in a day or throughout their life is the point of which we cannot be too sure from the records obtained. We might, however, be perfectly justified in assuming that five eggs or five young maggots a day would represent a normal appetite. We have also seen that a beetle will live with food for four months (120 days). On the above ratio it will destroy about 600 eggs or young maggots. This in itself would just about equal the number of eggs deposited by a fly on a single plant in a season, under conditions we have mentioned. Possibly this may be a little high, but nevertheless, we cannot avoid the fact that the percentage of usefulness of these little beetles is exceptional, and of unquestionable value.

The President: There are so many points to be discussed in these papers that I think it would be best to postpone the discussion until this afternoon, when we will have more time, and when Mr. Treherne will have more time to bring out certain points.

FRIDAY, NOV. 5th.—AFTERNOON SESSION.

The President: We will now commence the afternoon session and will first take up, before proceeding with the regular business, the discussion which was postponed this morning of Mr. Treherne's paper on the Cabbage Maggot. This paper is now open for discussion.

Mr. Tothill: I would like to ask if the headings "May," "June," "July," "August," and "September," etc., represent generations?

Mr. Treherne: Not in this chart. As a matter of fact, there are at least three generations of this maggot in British Columbia; the first generation ends about the end of May, the height of the second generation is early in July, and the third generation towards the latter part of August.

Mr. Burgess: I would like to ask Mr. Treherne if he has any definite records of the maggot coming through any stage in the winter.

Mr. Treherne: We have no larval or adult records of hibernation, but only as yet pupal records.

Mr. Gibson: With regard to the question that Mr. Burgess has asked, last year and the year before we made observations at Ottawa in the hope of getting further information as to how the insect passes the winter. We found the puparia abundantly in an old turnip field at varying depths, the lowest being nine inches below the soil. We only found what we considered the larva of the Cabbage Maggot fly in one instance, in April. The species in Eastern Canada most probably hibernates to a more or less degree in the larval stage, in addition to the regular hibernating form, namely, the puparium.

The President: The only other point, I think, which might arise from this paper which might be discussed is the comparative absence of internal parasites, particularly the absence of Staphilinid parasites such as we find in the East.

We will now proceed to the business meeting of this session, which consists in the election of officers. As in the case of last year, the Council in order to facilitate the proceedings of the meeting has recommended a list of officers for the guidance of the meeting, and I might ask the Secretary to read the list of officers as selected by the Council:—

President, Mr. A. F. Winn; Vice-President, Prof. L. Caesar; Secretary-Treasurer, Mr. A. W. Baker; Curator, Mr. J. B. Spencer; Librarian, Dr. Bethune; Directors, to be re-elected, with the exception of Division No. 6, where J. W. Noble is recommended.

Dr. Fyles: It gives me very great pleasure to nominate Mr. Winn as President of the Entomological Society. I have followed Mr. Winn's work for a number of years, and think he is fully capable of holding the position.

Mr. Morris: I second the motion.

Dr. Hewitt: It has been moved and seconded that Mr. Winn be elected President of the Society. I am sure it is a matter of great gratification to all Mr. Winn's fellow workers to see him occupying the Presidential chair. We all appreciate the work which he has done in the Province of Quebec, especially in the production of those excellent insect lists which he is getting up. There being no other nominations. I declare Mr. Winn duly elected. I will call now upon Mr. Winn to take the chair.

Mr. Winn: I certainly do not deserve this honour. I never got it correctly into my head how I came into this office. Two years ago the Fiftieth Annual Meeting was held at Guelph and I was on hand. About two months later Mr. Gibson surprised me by telling me that I had been elected Vice-President, and as it was then too late to undo what seemed an inexplicable error, I came to the conclusion that an honour to the Montreal Branch, with which I have been connected since a schoolboy, was intended rather than on account of anything I may have been able to accomplish personally. It has been suggested to-day that in reality it is a form of punishment meted out for not attending all our meetings regularly.

In some of our sessions reference has been made to the work of professional or practical entomologists, and that of amateurs, who by inference are unpractical, as if there were two well marked divisions. Really I do not think such a distinction exists except in the application of the results obtained. If it does exist, I hope it will cease and that our Society will remain united from Atlantic to Pacific as we see it here to-day, and that some of those who attended our fiftieth anniversary will also be present at the one hundredth.

There is one point in particular that both the so-called divisions agree upon, and that is the importance of learning the life-histories of insects from the egg to the perfect stage, and this has been emphasized in nearly all the papers we have been listening to. This point reminds me of a matter about which I had some correspondence with Dr. Bethune a few years ago—the question of having a suitable crest and motto to use in connection with a book-plate, for, old as our society is, it cannot boast of owning either, "Ab ovo usque ad imaginem"—from egg to imago. No particular insect was mentioned to serve as an emblem, and as I do not know what views the members have on the subject, suggestions would be acceptable.

I feel sure, however, that thoroughness in following out the life-histories of insects, thus getting at the bottom of things, is one of the most important objects to keep before us, for we do not really know an insect till we know it in all its stages.

I shall not take up any more of your time except to thank you very sincerely for the honour conferred upon me.

The President: I think all who have had to do with the society have been impressed with Professor Caesar's ability. I do not think we could have a better Vice-President in support to Mr. Winn than Professor Caesar, and I have much pleasure in moving that Professor Caesar be elected Vice-President.

Seconded by Mr. Swaine. (Carried.)

(For complete list of officers see p. 6.)

Mr. Winn: I will now ask Mr. Sanders to read his paper on "Some of the Methods followed in Nova Scotia in controlling the Brown-tail Moth."

Mr. Sanders' paper read.

SOME OF THE METHODS FOLLOWED IN NOVA SCOTIA IN CONTROLLING THE BROWN-TAIL MOTH.

G. E. Sanders, Field Officer for Nova Scotia, Dominion Entomological Laboratory, Annapolis Royal, N.S.

The control of the Brown-tail Moth in Nova Scotia presents many difficulties peculiar to that Province which go to show in rather a striking manner the value of investigating each insect locally, in the light of a knowledge of local conditions and methods, extending even to such details as the method of fixing charges for packing out the staple crop in the warehouses.

The Brown-tail Moth has not yet become established in the forest areas of Nova Scotia, 92.6 per cent. of the total number found in the Province being on fruit trees; the few found on ornamental and forest trees being on trees near to or in orchards.

Area Infested.

The area infested with Brown-tails is about two hundred miles long and some thirty miles wide, including the Counties of Shelburne, Yarmouth, Digby, Annapolis, Kings, Hants and Cumberland; or, in other words, all but one of the Counties of Nova Scotia touching on the Bay of Fundy.

This area may be divided roughly into four districts, in each of which we have a different proposition. In the first district, which includes Cumberland, Shelburne, Yarmouth, and all but a small section of the east end of Digby, we have small orchards averaging less than twenty apple trees each; usually the orchards are separated from each other by strips of woodland or open fields. As apples in this section are grown on a very small scale, as a rule for home use only, practically no spraying is done.

In the second district, which includes Eastern Digby and Annapolis County as far east as Annapolis town, we find apple trees in profusion. This district was settled about the time of the American Revolution, and many old, gnarly trees remain of the orchards planted by the original settlers. The land throughout this section is full of granite boulders, and in common with all such land in Nova Scotia and roadsides, fence-rows, pastures, and even scrubby woods are filled with seedling apple trees of every age and description. As this district is for the most part the west end of the Annapolis Valley, it falls into the regular fruit district and the orchards are of moderate size, covering probably one-tenth of the cultivated land, and adjoin each other quite closely. In spite of the natural advantages that this section possesses in the production of fruit, very little care is taken of the orchards, not more than 5 per cent. of the trees being sprayed.

The third district extends from Annapolis to Middleton. The western end of this section is granite land similar to the second district, and seedling apple trees are to be found everywhere. Over 50 per cent. of the cultivated land is in apple trees, so the whole district is practically one continuous orchard. About seventy per cent. of the orchard in this district is sprayed.

The fourth district extends from Middleton to Windsor, and includes the largest orchards in Nova Scotia, probably sixty per cent. of the cultivated land being in orchard, with the exception of a small section south of Wolfville, seedling apple trees are almost unknown. The orchard is for the most part less than fifty years old, orchard that a man can spray or inspect for Brown-tail easily; and, according to Prof. Brittain's census, some 87 per cent. of the trees in the district are sprayed.

Comparison of Controls.

In the first district, Yarmouth and Digby Counties, where the orchards are small and widely scattered, we find it very easy to control the Brown-tails by having our inspectors pick the nests from the trees in the winter. One inspection of this district can be relied upon to give a decrease in ordinary years, the only increases coming from the adult moths, which occasionally are blown across the Bay of Fundy into the district from the New England States. This district is on the whole flat country, and the normal increase very small. Evidently the adult moths are for the most part blown out of the orchards in which they originated, and the orchards being scattered they perish before they find other apple trees.

In the fourth district, Kings County, etc., the orchards are large and practically continuous, so if a moth is blown out of one orchard it will more often than not blow into another. In spite of this the large amount of spraying done, and the scarcity of seedling trees makes it quite easy for our inspectors to keep the Brown-tail within reasonable bounds. Occasionally we have small outbreaks in the western end of this district, but a little persuasion usually results in the orchards being sprayed and the Brown-tails exterminated.

In the third district, which is situated in the eastern end of Annapolis County, where 30 per cent. of the orchard is unsprayed and we have a great quantity of wild seedling apple trees, we have great difficulty in controlling Brown-tails. In many sections we have had very large increases which we followed up by very careful work, often persuading the owners of the worst orchards to spray, and so obtained decreases in infestation.

In the fourth district, or Western Annapolis County, with practically no spraying, medium-sized orchards and plenty of wild seedling apple trees, we have had great difficulty in holding the Brown-tails. Practically all of the work there has been done by our inspectors with no appreciable assistance, either in spraying or in picking nests, from the inhabitants.

Normal Increase in Nova Scotia.

The coldest season ever recorded in Nova Scotia was 1913-14. The extreme low temperature in the Annapolis Valley was—21F. at Kentville, while at Yarmouth the lowest was —6.4F.; in the most heavily infested district, *i.e.*, near Annapolis, the lowest temperature ran —19F. and less here. Brown-tails came through with an average of about 10 per cent. winterkill. Counting the actual number of nests within twenty-five yards of old nests found in 1914-15, including those that gave no progeny, we found the actual increase the Province over to average 6.3 new nests from each old nest—this was not counting the number of female moths that had blown over twenty-five yards from the old nests. The increase in ordinary years is much larger than this.

Winter Drop of Nests.

Formerly we started the inspectors at their winter work on January 1st, but we found at that time a very large proportion of the nests hanging by a thread, and a few of the nests gone, leaving a bit of web attached to the tree where the nest had been. We placed some nests on the ground and found that the young larva lived over in them with a very small winterkill. In fact, at one station where all of the Brown-tails suspended in the air were killed by the winter, those on the ground lived over with only a small winterkill, having been protected from the extreme cold by the deep snow.

The questions that arose from this were: The proportion of nests that dropped from the trees, when they dropped, and whether the larva which lived over in the dropped nests would reach the trees from which they fell. We have not by any means finished these lines of enquiry, but we have one year's work on each, which shows up their importance.

On November 1914-15 we tagged a number of nests in each of two orchards, and in one we got 10 per cent. dropped during the winter, and in the other 25 per cent.

In regard to the time that the greatest drop takes place the heavy gale of Sept. 26, 27, 28, 1915, loosened a great quantity of nests, but the greatest drop appears to take place in November and December, soon after the leaves fall, and continues to a certain extent all winter. The heavy gales break down the nests and cause them to start swinging, but do not actually blow as many off the trees as one would expect, but the lighter winds following, constantly twisting the nests about, gradually wear the thread off and cause the drop to be spread quite evenly over the whole season.

In regard to the young larvæ in the dropped nests finding the trees, we found, from nests placed equidistant from four trees in an orchard planted 35 by 35 feet, that 11 per cent. of the larvæ contained in the nests found the trees and ascended to a tanglefoot band placed to catch them. The spring weather influences the movements of the young larvæ to a very great extent. In bright weather the larvæ will travel over the ground due south, toward the sun; in cloudy weather, such as we had when the larvæ were emerging in 1915, they will travel in any direction.

These preliminary investigations would indicate the importance of removing as many nests as possible before the nests begin to drop from the trees. These views are supported in practice by the ease with which the Brown-tails are controlled in districts where the drop is light, as compared with districts where the drop is heavy.

We now start our inspectors on November 1, when the leaves are about 90 per cent. off the unsprayed orchards, but have scarcely started to come off the sprayed orchards. They work the unsprayed orchards in the most heavily infested territory first, trying to get just as many nests as possible off the trees as quickly as possible, returning later to work every tree and bush in the district, and, if they have time, to return a third time to go over the trees again. As light and moisture conditions often prevent the best work being done in many orchards, a second thorough inspection is found to be of value in the most heavily infested localities.

Fall Picking of the Nests.

We have found that a large proportion of the winter nests can be gathered by the pickers when picking the apples in September and October, the cluster of brown skeletonized leaves that the larvæ feed on when forming the winter nest showing up for a foot around the nest against the dark green of the tree. At the beginning of the season we published notes in the papers requesting growers to have their pickers look for these clusters of leaves and destroy the nests when found. We have already had reports of a large number of nests collected and destroyed this season by the pickers.

Educational Work.

In addition to having our ten inspectors collect as many nests as possible from the trees, we plan to have them carry on as much educational work as possible, in order to persuade growers to examine their own trees and collect Brown-tail nests and to spray. All of our inspectors have all available data in regard to spraying right at their finger tips, and they are instructed to see the owner of every property giving over five Brown-tail nests, and endeavor to get him to spray his trees the next season.

More Spraying Campaigns.

The one thing outside of the work of our own inspectors in collecting nests that has had an appreciable effect in Brown-tail control has been the campaign for more spraying. In this we have the co-operation of the United Fruit Companies, whose warehouses extend over the whole fruit district, and of the Dominion Fruit Inspectors, who, under the Dominion Fruit Commissioner, Mr. D. Johnson, are now inspecting most of the fruit in the orchards and warehouses instead of at Halifax, so they come in direct contact with the growers and are a tremendous power in causing more spraying to be done. I am this winter spending two or three days with each of these inspectors, visiting warehouses, etc., and keeping them supplied with data on spraying. Mr. Johnson tells me that he wants his inspectors to be an educative rather than a police force—that they can do more good in showing people how to grow better fruit than, as he puts it, "going at the grower with a club to fine him if possible."

This attitude deserves the very highest commendation, and in teaching the Nova Scotia growers how to produce good fruit he must teach them how to control Brown-tails, for spraying, which controls the Brown-tail, is absolutely necessary in the production of good fruit in Nova Scotia.

The manager of the United Fruit Companies, Mr. A. E. McMahon, and his officials have been untiring in their efforts to get more and better spraying done. and their work has been particularly effective. About 60 per cent. of the total crop of Nova Scotia is handled through the 48 warehouses of the Companies, and all of the spraying material for their members is purchased by them. On their 60-ton order of lead arsenate, with other spraying material in proportion. they are able to get the very finest prices possible, and they give their members the full benefit of these prices and sell to non-members at a price that will barely cover expenses, preferring to take their profit in the benefits their members will receive from having their neighbors spray. The Fruit Companies' Inspectors, who visit every warehouse at least once a week, the warehouse managers and the packing foremen are every one active advocates of spraying, and persuade a great many people to spray by calling them into the warehouse when their poor lots are being packed out and comparing them with other well-sprayed lots.

The companies are also proving themselves of great value in the spraying campaign, by changing the methods of charging the cost of packing. In all of the warehouses, no matter under what system they are run, the culls, owing to the difficulty in apportioning them, are confiscated by the company and sold to be credited against general cost of packing. In most of the old companies the members were charged on the pack out of apples, that is, a member who delivered 50 barrels of apples from the trees which packed out 40 barrels of shipping apples, paid the same as the member who delivered 100 barrels, which packed out 40 barrels of shipping apples, the culls in both cases being confiscated, the larger amount of culls about offsetting the extra cost of packing. In some of the last formed companies the cost of packing was charged on the number of barrels delivered at the warehouse, so that the man who delivered 50 barrels which packed out 40 paid only one-half as much as the man who delivered 100 barrels which packed out 40, the culls still being confiscated. The companies that operated under this last system had no difficulty in persuading their members to spray. When a man has to buy a barrel costing 26 cents for cull apples, pay 20 cents per barrel for having them handled, and then have the apples confiscated, it is quite easy to persuade him to spend 15 cents per barrel on spraying, and make shipping apples of them. Where the last system is operating, spraying is increasing rapidly, and the executive of the United Fruit Companies are gradually persuading the subsidiary companies to change over to the last system, as they find it the very strongest argument they can use in getting more spraying done.

These three complete and far-reaching organizations, some of which are in direct personal touch with almost every fruit grower in the valley, at least once a month have, to use a military phrase, "to be kept in ammunition." We are carrying on a number of experiments and observations to find out just what insects are doing the most damage, the extent to which each can be profitably controlled, the profits derived from controlling them; the actual cost of spraying; the best nozzles to use and the best materials to use. In this work we have the co-operation of the Provincial Entomologist, Prof. W. H. Brittain, who has taken over the investigations on the sucking insects of the apple, leaving the biting insects to the Dominion Laboratory. We have demonstrated that in an ordinary orchard in the Annapolis Valley, the benefit derived from controlling bud moth, fruit worms, and Codling Moth will pay for the entire cost of spraying, at least twice over; in addition the grower has his insurance against blackspot or scab free, and the most progressive of the Nova Scotia growers are now realizing that they cannot operate an orchard profitably in the Annapolis Valley without spraying.

Newspaper Work.

The *Co-operative News,* a paper conducted by the United Fruit Companies, and mailed to every one of the members of the Companies, or about sixty per cent. of the growers in the Annapolis Valley, twice a month, has reserved a page for any articles we may choose to write or solicit on spraying problems. By this means we are able to publish timely articles, give advance notice of insect outbreaks and methods of combatting them, as we will do with the Tussock Moth next season; give the growers the benefit of our findings just as soon as we are sure of our results, and have our papers and articles in handy form for the use of our inspectors, in carrying on their personal canvass for more and better spraying.

The work in increasing the amount of spraying, we realize, is the most important part of the work of controlling Brown-tail in Nova Scotia, and a large portion of the summer is devoted to spraying experiments and demonstrations, in order that we may devise the most economical sprays possible for Nova Scotia, as the cheaper and more effective the spray is, the more growers we can persuade to use it.

Spraying to Control Brown-tails in the Fall.

For two years we have been working on the possibility of controlling Brown-tails with the last summer spray, and this year we demonstrated that where arsenate of lead is used with Lime Sulphur in the last summer spray, or that applied from June 28th to July 15th, the poison will adhere to the leaves enough to poison the young Brown-tails when they emerge from the egg and start feeding in August.

Parasite Work.

In addition to the spraying, which will control more and more Brown-tails every year, as the amount of spraying increases, Mr. J. D. Tothil, of the Entomological Branch, is supervising the colonizing of the various parasites. Besides the colonizing of parasites, we have devised in Nova Scotia a practical means of preventing the reducing in numbers of the imported parasite *Apanteles lacteicolor* by the destruction of the winter webs of the Brown-tail. We build a large matched board cage, about 5 feet high, 6 feet wide, and 12 feet long with an open top and earth floor: two narrow boards are placed edgewise on the inside, and tanglefoot placed on the underside as in the Fiske tray. All of the Brown-tail webs collected are saved, and each of these cages stocked with two or three thousand of them. The Brown-tails are fed on short, leafy twigs for about three weeks in the spring until the first Apanteles larvæ emerges to spin its cocoon, then they are fed on willow catkins three or four times a day, giving them plenty of food so as to have as little Brown-tail web as possible in the food containing the Apanteles cocoons. The willow catkins seem to be the best material we can find for the Apanteles to pupate in. After about one week's feeding on catkins and the majority of the Apanteles have emerged, we feed broad leaves of some sort, heavily dusted with Paris green. Two days feeding will usually kill all of the Brown-tails, and then the green poisoned leaves can be rolled off to one corner and the willow containing the Apanteles cocoons exposed, so that the adults can fly free as soon as they emerge.

OBSERVATIONS ON THE BROWN-TAIL AND GIPSY MOTH SITUATION IN RELATION TO CANADA.

J. D. Tothill, Field Officer, Dominion Entomological Laboratory, Fredericton, N.B.

The parasites and predators that Mr. McLaine has just spoken of are being introduced of course as a measure of protection against possible injuries in Canada from the Gipsy and Brown-tail Moths.

How great a nuisance these two insects could become under Canadian conditions is not known. The farther north they travel the more vigorous will be the climate and the general conditions for existence. Somewhere between their present range and the arctic zone they will cease to be injurious. If the exact location of this "somewhere" could be precisely forecasted, fewer difficulties would no doubt be experienced in dealing with the spread of the infestation in the future.

The Brown-tail Moth, the less serious insect of the two, is now endemic in the transition zone of Nova Scotia. This indicates that this insect could become, if once established, a serious pest in all parts of the Dominion falling in this zone. In the middle west, however, food supplies would be inadequate and the insect would not be expected to flourish. The endemicity of *Euproctis* in the transition zone of Nova Scotia indicates, therefore, that the insect would also be a pest in the transition portions of British Columbia, Alberta, Ontario, Quebec, New Brunswick, and Prince Edward Island, if it once became established in any of these places.

In boreal parts of New Brunswick, and most of the Province is boreal, the same insect is epidemic. It remains to be seen whether or not it will become endemic.

The Gipsy Moth is a very serious shade tree and forest insect of the transition zone. It would undoubtedly flourish were opportunity afforded in the transition zone of Canada, excluding again that part of it falling in the treeless region of the middle west.

The behaviour of this insect in the boreal life zone cannot be forecasted. In this zone Mr. F. H. Mosher has shown that the insect would have an abundant food supply. It is also known that the insect hibernates successfully in boreal parts of Northern Maine. These two straws seem to show the direction in which the wind is blowing; they seem to show that there is a very grave danger menacing over immense boreal forests from attacks by this insect.

It is primarily to affect this seeming danger that the parasites and predators are being introduced.

They are being hibernated at strategic points, that is at points in Canada nearest to the infested area in New England and nearest to international trade routes. One of these points is near the international boundary in southern Quebec; another is in New Brunswick, and a third in Nova Scotia.

During the last four years large numbers of these beneficial insects have been introduced at these places. One of these species, *Apanteles lacteicolor*, is doing well in its new environment; another, *Compsilura concinnata*, is expected to be doing well, the third, *Calosoma sycophanta*, is known to be at least holding its own.

These same insects in New England are now helping materially and perceptably to relieve the situation.

It is hoped that by the time the Gipsy Moth reaches the Dominion there will have developed a living wall of its natural enemies strong enough to prevent disastrous results.

THE WORK CARRIED ON IN THE UNITED STATES AGAINST THE GIPSY AND BROWN-TAIL MOTHS.

A. F. Burgess, in Charge of Moth Work, Bureau of Entomology, United States Department of Agriculture.

The Gipsy Moth and Brown-tail Moth work in New England, as most of you know, is carried on in each State concerned by State and local agencies. Work to prevent the spread of these moths outside the territory where they now exist is maintained by the United States Department of Agriculture through the Bureau of Entomology. All of the work is of importance, as upon its thoroughness depends the chances of these insects spreading rapidly to the Dominion of Canada. The Brown-Tail Moth flies strongly and is attracted to lights and has already become established in districts in Nova Scotia and New Brunswick. The Gipsy Moth does not spread in the adult stage, but the small caterpillars may be carried long distances by the wind. Greater spread of this insect is shown toward the north and north-west. This is due principally to the fact that the prevailing warm winds during the time the small caterpillars are active blow from the south and south-east. A large number of men are employed in the outside part of the territory to scout the area for the purpose of determining how far the gipsy moth has spread and to treat carefully the infestations in the outside towns. This work consists, aside from scouting and creosoting of egg clusters in the winter, of thinning out infested areas where trees are growing too closely, or where the stand is of favored food plants, and of destroying the caterpillars in the spring and early summer by the use of arsenate of lead spray and the application of bands of tanglefoot. This work has an important bearing on the spread of the Gipsy Moth. If tanglefoot bands are applied to trees before the caterpillars hatch it serves to keep any of those that may hatch from egg clusters on the ground from climbing to the tops of the trees and being blown long distances and establishing new infestations.

The territory inside the area known to be infested by the Gipsy Moth as well as that infested by the Brown-tail Moth, has been placed under quarantine by the Federal Horticultural Board, in order to prevent the shipment of trees or plant products which might disperse these insects to uninfested territory. For the purpose of enforcing these quarantines the infested territory is divided into sections in each of which an inspector is located, whose duty it is to examine all such plant products, as well as stone and quarry products which are shipped outside the infested area. This work has prevented the dissemination of the Gipsy Moth and Brown-tail Moth to many widespread areas. In connection with the inspection work, as related to the Brown-tail work, it should be of interest to residents of the Dominion to know that during the past three years inspectors have been maintained at junction points where long distance trains have passed out of the infested area in order to examine the trains and destroy any Brown-tail Moths that might be attracted to the lights. Large number of moths have been destroyed as a result of this work, especially heavy infestations having been destroyed on trains passing through White River Junction, Vermont, north bound.

Other phases of the work carried on by the Bureau of Entomology are largely experimental.

Silvicultural experiments are being carried on to determine the most resistant stands and the best composition of tree growth to withstand continued Gipsy Moth attack.

The parasite work was first begun in Massachusetts by a co-operative arrangement between the State and the United States Department of Agriculture. Parasites attacking these insects in different stages were imported for several years from Europe and Japan, and up to the present time, several species have become firmly established, and progress has been made toward checking the increase of these pests.

As has already been stated by Mr. McLaine, three of the species concerned, namely, *Apanteles lacteicolor, Compsilura concinnata,* and *Calosoma sycophanta,* have been introduced into Canada during the last two or three years, as a result of a co-operative arrangement between Dr. Hewitt and the Bureau of Entomology. These species have become so abundant in certain sections of the infested area that they can be collected in considerable numbers in the field, and they are secured in this way for colonization in areas where the species are not known to exist. This work is also being done by the Bureau in order to bring about the rapid establishment of these insects in the infested area.

Apanteles lacteicolor, which is a parasite of the Gipsy Moth, as well as of the Brown-tail Moth, has been colonized over practically all the area where these species are now known to exist. During the past year, many colonies were liberated in eastern Maine, and it is not considered necessary to make liberations next year.

Compsilura concinnata has been colonized over a slightly smaller area. It attacks both the Gipsy and the Brown-tail caterpillars, and more colonization will be necessary, particularly in eastern Maine next summer.

The spread of *Calosoma sycophanta* has been slower than the other species previously mentioned, although they are present in practically all the territory that is badly infested with the Gipsy Moth. Further colonization will be necessary next summer.

In addition to the parasites already mentioned which are the most prominent that have been liberated are two parasites of Gipsy Moth eggs, namely, *Anastatus bifasciatus* and *Schedius kuvanæ* which are doing excellent service. These tiny insects spread slowly, hence it is necessary to liberate large numbers of colonies. By the end of another season it is hoped that the area most heavily infested with the Gipsy Moth will have been thoroughly colonized with these species.

Since the work was begun at the Gipsy Moth Laboratory, an effort has been made to learn as much as possible concerning the life history and habits of the parasites introduced, as well as their behavior, both under laboratory and field conditions.

The principal effort that has been made, however, has been to secure all information possible that had any bearing on the methods of successfully colonizing the species in the field, and obtaining information which would enable the work to be intelligently handled.

Since it is not deemed necessary to recolonize the area where the parasites are known to exist, a limited amount of time has been given to studying more closely the habits and relations of the introduced species and of our native parasites as well as native hosts. This work is showing some interesting results, but much of the data is far from complete.

In closing, I would like to express my pleasure at the cordial and satisfactory relations that have already existed between the work which is being carried on at Melrose and that which is under the direction of Dr. Hewitt. A hearty spirit of co-operation has existed among the men connected with the work and most satisfactory results are being secured.

Mr. Gibson: I would like to ask Mr. Burgess what the total number of food plants now is upon which the Gipsy Moth feeds?

Mr. Burgess: I cannot say just at the present moment but there are a large number.

Mr. Treherne: We took some specimens of Gipsy Moth from Japan a few years ago. Has a study been made of the parasites of this insect there?

Mr. Burgess: There has been some work done in Japan on the Gipsy Moth. Professor Kincaid from the University of Washington made a trip to Japan for the Department some years ago and studied the Gipsy Moth to a limited extent while making collections of parasites for shipment to this country. As far as I know, that is the only study by an American that has been made of the Gipsy Moth of Japan. I should consider that it would be dangerous to import the eggs of the Gipsy Moth into any uninfested section of this country.

Mr. Winn: If there are no more discussions on the Brown-tail and Gipsy Moths I will now ask Mr. Gibson for his paper on "Locust Control Work with Poisoned Baits in Eastern Canada in 1915."

LOCUST CONTROL WORK WITH POISONED BAITS IN EASTERN CANADA IN 1915.

Arthur Gibson, Chief Assistant Entomologist, In Charge of Field Crop Insect Investigations, Department of Agriculture, Ottawa.

At the meeting of the Society held in Toronto in November, 1914, I gave an account of our experiments at Bowesville, Ont., with poisoned bran baits to control locusts.* Such work we considered very encouraging. During the present year, 1915, the Lesser Migratory Locust, *Melanoplus atlanis* Riley, was again enormously abundant in Ontario and Quebec Provinces and to a lesser extent the Pellucid Locust, *Camnula pellucida* Scudd. We were, therefore, able to conduct further experiments and to demonstrate the value of new poisoned baits which had not previously, under field conditions, been used in Canada.

Poisoned Baits Used in 1915.

In June last (1915) arrangements were made to conduct twenty-three experiments with various poisoned baits near Bowesville, Ont. Each experiment was on five acres and the land chosen was from adjacent farms upon which the Lesser Migratory Locust was exceedingly numerous. No poisoned bait had previously been used on any of this land. In addition to bran, shorts and sawdust were also used as carriers for the poison. Formulæ containing bran were easily mixed; shorts did not mix satisfactorily owing to the fact that it becomes sticky and lumpy which, of course, makes it more difficult to spread properly. Sawdust, if fairly well free of small pieces of wood, spreads easily, but in mixing the formulæ containing it care had to be taken to add the water slowly, as the sawdust does not absorb liquid as quickly as bran, otherwise the Paris green is liable to be washed off. In many districts where it is difficult to obtain bran sawdust may often be had for practically nothing.

The following table gives concisely the results of some of our experiments conducted at Bowesville:

*See Rep. Ent. Soc. Ont., 1914 (1915), pp. 97-100.

	Mixture	Crop (5 acres)	Weather	Infestation	Death counts per square yard, 10 made in each field, 4 days after application, beginning at one corner of the field and walking diagonally across to the opposite corner.				Cost of single application per acre including labour	Date of application
						Highest	Lowest	Average		
1	Bran, 20 lbs. Paris Green, ½ lb. Molasses, 2 qrts. Lemons, 3 Water, 2½ gals.	Millet, 6 in. high	warm and dry	Very heavy. Locusts in all stages. Some winged	75, 10, 7, 575, 10, 40, 100, 241, 70, 90	575	7	121.8	18½ cents	June 24
2	Bran, 20 lbs. Paris Green, ½ lb. Molasses, 2 qrts. Oranges, 3 Water, 2½ gals.	Pasture	warm and dry	Heavy. Locusts very active. Some beginning to migrate	155, 250, 163, 241, 54, 50, 65, 140, 200, 710	710	50	202.8	19 cents	June 29
3	Bran, 20 lbs. Paris Green, 1 lb. Molasses, 2 qrts. Lemons, 3 Water, 2¾ gals.	Oats, 9 in. high	warm and dry	Very heavy. Locusts active. Medium number of winged individuals	26, 736, 38, 300, 36, 50, 230, 100, 300, 25	736	25	184.1	21 cents	June 25
4	Bran, 20 lbs. Paris Green, 1 lb. Molasses, 2 qrts. Oranges, 3 Water, 2½ gals.	Oats, 9 in. high	warm and dry	Very heavy. Locusts active	819, 691, 84, 630, 121, 918, 63, 80, 540, 120	918	63	406.6	21⅓ cents	June 28
5	Bran, 10 lbs. Sawdust, 10 lbs. Paris Green, ½ lb. Molasses, 2 qrts. Oranges, 3 Water, 2½ gals.	Pasture	warm and dry	Heavy. Locusts from very small to winged state	127, 100, 15, 40, 360, 35, 30, 25, 100, 200	360	15	103.2	16½ cents	June 24

	Mixture	Crop (5 acres)	Weather	Infestation	Death counts per square yard, 10 made in each field, 4 days after application, beginning at one corner of the field and walking diagonally across to the opposite corner.				Cost of single application per acre including labour	Date of application
						Highest	Lowest	Average		
6	Bran, 10 lbs. Sawdust, 10 lbs. Paris Green, 1 lb. Molasses, 2 qrts. Lemons, 3 Water, 3 gals.	Oats, 6 in. to 9 in. high	warm and dry	Heavy. Locusts in various stages. Some winged	25, 400, 530, 44, 80, 60, 125, 90, 23, 15	530	15	139.2	18½ cents	June 25
7	Bran, 10 lbs. Sawdust, 10 lbs. Paris Green, 1 lb. Molasses, 2 qrts. Oranges, 3 Water, 2½ gals.	Oats. 6 in. to 9 in. high	warm and dry	Heavy infestation. Locusts active.	118, 116, 197, 33, 70, 258, 204, 200, 190, 104	258	33	149	19 cents	June 25
8	Sawdust, 20 lbs. Paris Green, ½ lb. Salt. ¼ lb. Water, 3 gals.	Oats, 9 in. to 12 in. high	warm and dry	Heavy. Locusts active. Many winged from adjacent uncultivated land	30, 121, 404, 46, 720, 650, 100, 35, 80, 100	720	30	228.6	7 cents	June 25
9	Bran, 20 lbs. Paris Green, 1⅙ lbs. Molasses, 4½ qrts. Water, 2 gals.	Oats, 9 in. to 12 in. high	warm and dry	Heavy. Locusts active.	246, 840, 509, 473, 210, 368, 230, 1,200, 616, 450	1,200	210	514.2	27 cents	June 30

From the above table it will be seen that in fields where mixtures Nos. 2 and 4 containing oranges were used, higher death counts per square yard were obtained. The mixtures in which sawdust was used are, indeed, very promising and further work with these mixtures will be conducted. The results obtained with mixture No. 8 are certainly remarkable and indicate the value of this new and very cheap poisoned bait. In the report of the Society for 1914,* Mr. Norman Criddle stated that he had experimented with sawdust and salt in Manitoba and claimed that with the salt and sawdust he obtained about the same results as with salt and bran. In the experiments tabulated above the highest death rate was obtained, as will be seen, in the use of mixture No. 9, which killed, on an average, 514 locusts per square yard of field.

As above mentioned each mixture treated an area of five acres. In the sawdust mixtures the amount of water necessary, of course, will vary with the dryness or otherwise of the material at hand. Two gallons may be sufficient, or more may be required. The carrier, whether this be sawdust or bran, should be noticeably moistened, not made into a mash, or moistened too much to prevent its being crumbled through the fingers. The farmers in general on whose lands the experiments were conducted were much pleased with the success of the mixtures. Those on whose fields mixtures 3, 4 and 8 were used have specially reported that the crops were saved by the treatment. In all of these experiments only the one application was made. The work of spreading the mixtures and making the death counts was satisfactorily accomplished by Mr. T. Rankin, a student assistant.

At Lanoraie, in Quebec Province, a series of similar experiments were conducted under my direction by Messrs. Beaulieu and Beaulne, officers of the Entomological Branch. Unfortunately, the work here was seriously interfered with by exceptional heavy and continuous rain and wind storms. In heavily infested fields where mixtures similar to Nos. 1, 2, 3 and 4, but with shorts instead of bran, the locusts were much reduced in numbers by the application, but the heavy rains which followed soon after the mixtures were spread made it impossible to make important observations as to the death counts. On June 17, mixture No. 6, as above, was spread in a field of oats. Five days later three counts only were made owing to a misunderstanding and these gave 300, 305 and 328 dead to the square yard. A heavy rain and wind storm took place between 3 p.m. and 9 p.m. on June 17, and undoubtedly many locusts which had fed on the mixture in the early morning were poisoned and later washed away by the deluge. On June 28, mixture No. 1 distributed over a pasture field resulted in an average of 129 dead locusts to the square yard. Sixteen counts were made across the field and on the date mentioned many of the insects were in the winged condition. On June 25 I visited Lanoraie and in a field of rye in which mixture No. 3 with shorts used instead of bran large numbers of dead insects were observed. The following counts in different parts of the field were made, 220, 635, 408, 235, 195, 523, 609, 395, 259, an average of 386 dead to the square yard. Dead locusts were found in numbers as far as 249 feet from the treated field.

Organization and Co-operation Necessary to Control Locusts Over Widespread Areas.

In 1915 the value of early organization to control serious outbreaks of locusts was strikingly illustrated in the Province of Quebec. In the Parish of St. Etienne de Gres where our Entomological Circular No. 5 had been freely

*Rep. Ent. Soc. Ont., 1914, p. 102.

distributed, and where control work had been conducted in 1914, the farmers organized under the immediate direction of Father J. I. Trudel, the resident Parish Priest and Agricultural Missionary. In this parish, practically all farm land—estimated at over 21,000 acres—was treated with mixture No. 1, using Paris green, however, in the strength of 1½ pounds for each 20 pounds of bran. The bran, Paris green, molasses and lemons were purchased in large quantities at wholesale rates, and the mixture distributed over the land during the week beginning June 4, at which time the locusts were from one-quarter to one-half an inch in length. Counts made a few days after the application in various fields ranged from 80 to 120 dead locusts to the square foot. I visited St. Etienne de Gres on June 23 and examined many of the treated fields. Comparatively few living locusts could be seen and the farmers generally were much pleased with the effectiveness of the mixture. Father Trudel estimated that 90 per cent. of the locusts had been killed. Of the area treated about 7,000 acres

Oat field at St. Etienne de Gres., Que., saved by one application of poisoned bait. (Original.)

were in oats. These crops, as well as fields of other grains and vegetables, were saved from destruction. According to the Parish Priest, not a single field was devastated and the pasture lands in addition were protected from injury. The cost of the application at St. Etienne de Gres was 15 cents an acre, exclusive of labor.

Following the advice given in our Entomological Circular No. 5, similar work was carried on in 1915 in the following additional parishes of the Province of Quebec: Mont Carmel, Pointe du Lac, St. Boniface de Shawinigan, and Almaville. The Quebec Department of Agriculture, I am informed by Mr. J. A. Grenier, Provincial Deputy Minister of Agriculture, made the following grants to assist the farmers in the purchase of bran, Paris green, etc.:

St. Etienne	$1,013 00
Mont Carmel	675 00
Pointe du lac	200 00
St. Boniface de Shawinigan	100 00
Almaville	100 00

I have already referred to the results obtained in the Parish of St. Etienne. In the Parish of Mont Carmel the farmers, under the guidance of Father E. Fusey, treated 7,400 acres, of which 2,000 acres consisted of farm land which had been abandoned owing to the continuous outbreaks of the locusts. In some fields, in 1915, crops of vegetables and grain were harvested for the first time in eleven years. The Parish priest reported complete success in the use of mixture No. 1, with Paris green used in the strength of 1½ pounds to the 20 pounds of bran, in his opinion 95 per cent. of the locusts having been killed. On June 22, I visited the parish and very few living locusts, indeed, were present in the fields examined. Mr. G. Beaulieu, Field Officer of the Branch, who was also present in the same district during the period June 20 to 29, could not find any fields sufficiently infested to enable him to undertake control experiments similar to those conducted at Bowesville, Ont. In some fields a second treatment was given owing to very heavy rains following the first spreading.

Part of abandoned farm, Valmont, Que., now a breeding ground for locusts. (Original.)

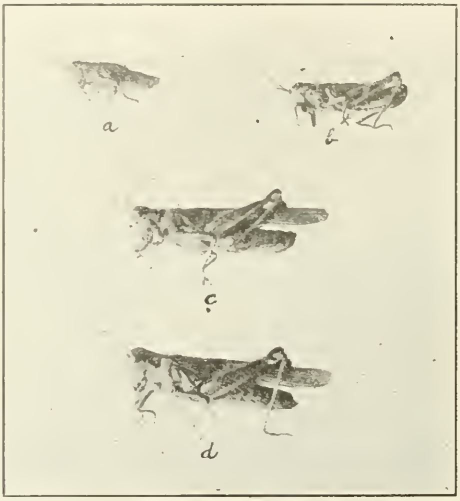
In the Parishes of Pointe du Lac, St. Boniface de Shawinigan and Almaville, similar satisfactory results were obtained and the farmers generally were well pleased with the poisoned bait, which certainly saved from destruction many fields of crops.

The question of the control of locusts is a very important one to many farmers in Eastern Canada, but we are extremely hopeful as a result of our experimental and field demonstration work, that the destruction of these insects in future outbreaks will be a comparatively simple matter—largely one of proper co-operation. Farmers living in districts where locusts are destructive should organize in early spring so that a sufficient quantity of poison, etc., will be readily available to distribute over the fields when the locusts are about the size shown at *a* and *b* of figure herewith of the Lesser Migratory Locust. The poisoned bait should be applied early in the morning (before or very soon after sunrise) on or about the same day. Twenty pounds of poisoned bait is sufficient to treat five acres. It is, of course, not necessary that the mixture be applied to all of the land, but by scattering it thinly here and there throughout the fields sufficient of the bait will be distributed to attract the locusts from considerable distances. In the preparation of the bait it is wise to guard against the breathing of the fine particles of the Paris green. This may be avoided by tying a handkerchief, loosely, over the mouth and nose.

DR. FERNALD: I would like to ask if there were any experiments made as to the variation in number of the oranges and lemons.

MR. GIBSON: In every case we used only the three fruits to the 20 pounds of carrier.

MR. TREHERNE: In British Columbia we have a lot of range land. Last year we had about 100 square miles destroyed by the Migratory Locust, *M. affinis.* I would like to hear from Mr. C. P. Lounsbury on this.



Lesser Migratory Locust, *Melanoplus atlanis: a, b,* young hoppers; *c,* adult male; *d,* adult female.
(Author's illustration.)

MR. LOUNSBURY: Our South African matters are so very different that I am afraid there would be very little advantage in my discussing them. All our work in South Africa for many years has been done with poisoned baits or spraying. We use arsenite of soda more than Paris green because it is cheaper.

We have never attained anything with the citrus fruits. Does the fruit juice add much to the attractiveness of the bait?

MR. GIBSON: The fruit juice is, of course, supposed to add to the attractiveness of the bait. We have never had any definite experiments to bear out this fact. In the case of the new sawdust mixture containing salt alone, the salt is undoubtedly the attractant.

MR. WINN: If there are no further discussions on Mr. Gibson's paper I will call on Professor Caesar to give his paper on "Apple Leaf-rollers in Ontario."

LEAF-ROLLERS ATTACKING APPLES.

L. Caesar, Ontario Agricultural College, Guelph.

On the discovery last year that in at least two well-cared-for commercial orchards much loss had been done by the Fruit-tree Leaf-roller* [*Tortrix* (*Cacœcia*) *argyrospila*], which has the last few years become a very troublesome pest in many parts of the United States, it seemed to me wise to study the habits and life-history of this insect in Ontario so that I might be in a position from actual experience to advise as to the best methods of control in case the insect should increase in numbers and attack more orchards. In this and other investigation work I had the assistance of my colleague, Mr. G. J. Spencer, for a few weeks, and of Mr. H. G. Crawford, a recent graduate, for the whole season. The investigations were conducted chiefly in the large apple orchard of Mr. Jas. E. Johnson, Simcoe, Norfolk County.

Species of Leaf-rollers Found in the Orchard.

We expected to find two species of Leaf-rollers [*Tortrix* (*Cacœcia*) *argyrospila*] and the Oblique-banded Leaf-roller [*Tortrix* (*Cacœcia*) *rosaceana*]. I knew, however, from the large number of unidentified egg masses on the trees that there was another insect present, but what it was I had no idea. Later on we found that it too, was a leaf-roller, which proved to be *Tortrix* (*Cacœcia*) *semiferana,* the Box-Elder (Manitoba Maple) Leaf-roller. We thus had three species working side by side.

A very peculiar circumstance in connection with our work was that though there were about 60 acres of large apple trees in one solid block, the three most important pests studied, the Fruit-tree Leaf-roller, the Box-Elder Leaf-roller and the Capsid (*Neurocolpus nubilus*) were all found together towards the centre of this orchard on a block of Spy trees of 6 to 10 acres in extent. Bordering rows of Baldwin trees were also attacked but those some distance removed, as also distant Spy and Greening trees, were very little injured. The explanation of this localization of insects is hard to discover. This part of the orchard had been in sod longer than the other parts but that scarcely seems sufficient explanation. Prof. Gillette has remarked upon the tendency of the Box-Elder Leaf-roller to appear at the same time and in the same neighborhood, but not on the same kinds of trees as the Fruit-tree Leaf-roller. It is well known that the latter very commonly centres itself in one locality injuring perhaps a single orchard severely and scarcely attacking at all another a few rods away.

Relative Abundance of Each Species.

Though the egg masses of *semiferana* were almost as abundant as those of *argyrospila* the larvæ of the latter were many times more numerous, at any rate towards the end of the season. This may have been due to the former species being less immune to poisonous sprays (Lugger of Minnesota reported that Paris green controlled this species) or to some other unknown cause. *Rosaceana* was not nearly so abundant even as *semiferana*. About nine-tenths of the total injury was done by *argyrospila.*

*Mr. August Busck states that the generic name "Archips" has been dropped and "Cacoecia" is tentatively retained as a subdivision of Tortrix.

Distribution in the Province.

Argyrospila is so common and so widely distributed all over the United States that it is not at all surprising to find that it exists almost, if not quite, all through the fruit districts of Ontario. I have either captured or reared adults from places here and there all the way from Ottawa to Norfolk County and feel sure I could, with a little searching, find them in almost all other fruit counties. This clearly indicates that it is by no means a new pest, but that through some peculiar absence of natural means of control has the last two or three years suddenly become a very destructive one in a few orchards and may yet become so in others.

Rosaceana was until the last couple of years considered our most common and destructive apple leaf-roller. It is seldom present, however, in large numbers. It, too, has existed all over the Province for many years.

Semiferana is very little known in Ontario. There is one specimen in the collection of the Ontario Entomological Society, but without any data as to where and when it was taken. A specimen was taken by Dr. Fyles at Levis, Quebec, and one is reported as being in Mr. Winn's collection, but he has no recollection of having seen or taken any. There is no record of it from Nova Scotia. In Ontario, Mr. Crawford and I have searched in several localities this fall for egg masses, but found none outside of the orchard at Simcoe. It is very probable, however, that a careful search of forests would show its presence in quite a number of localities, otherwise it is difficult to account for its abundance at Simcoe.

Host Plants.

At Simcoe we found the Fruit-tree Leaf-roller (*argyrospila*) preferred apple trees to any other kinds. A few were observed on pears, plums and peaches, and also on oaks. In the orchard it was seen that the larvæ fed freely upon almost any kind of succulent or moderately succulent weed beneath the trees. They were very fond, too, of the leaves and heads of clover and of vetch in such positions. A study of the literature on the subject shows that it has a very large number of food plants, including numerous weeds, forest and shade trees, and shrubs. So that it is by no means limited to fruit trees.

The Oblique-banded Leaf-roller (*rosaceana*) is found most commonly on apples and pears but from the list of host plants given by Slingerland and Crosby, which include several weeds and clovers, it must be almost as omnivorous as the Fruit-tree Leaf-roller.

The Box-elder Leaf-roller (*semiferana*) has never before, so far as I can find, been reported as attacking apples. A few wild cherries and currants beside Box-elders have been found by Lugger slightly infested. Its favorite food, however, is the Box-elder, often called the Manitoba Maple. In Colorado and Minnesota it has been reported as occurring at times in great numbers on these trees. It is recorded also from oaks and hickory.

Nature and Extent of the Injury Done.

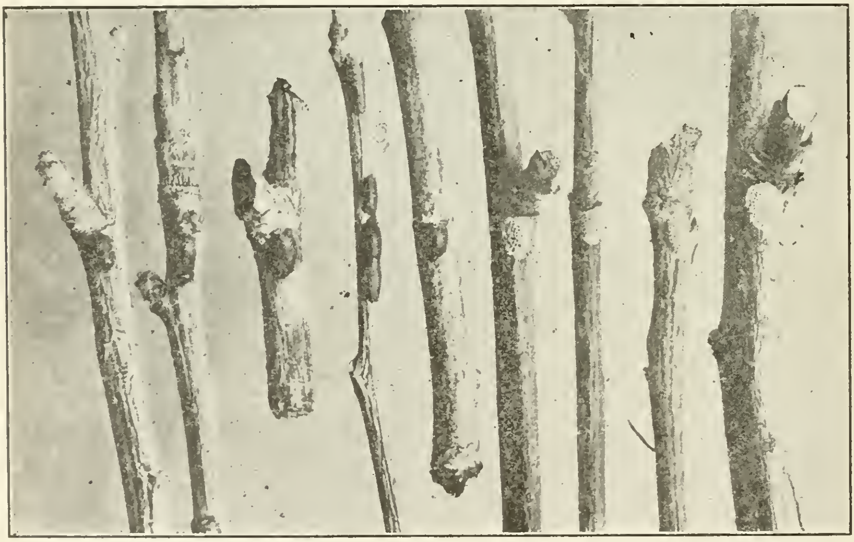
So far as we could see from a single season's work, the feeding habits and injuries done in the orchard by all three species were so similar that a description of what was closely observed in the case of the Fruit-tree Leaf-roller will serve for all.

We were not able to begin our work until May 3rd and by this time the majority of the larvæ had hatched and entered the opening leaflets of the infested Spy trees and were feeding on the interior. The larvæ had apparently begun to hatch, as stated by various writers on the subject, soon after the buds began to burst. By May 3rd, the leaflets were about one inch long but the blossoms were not yet ready to burst. Leaflets containing a larva inside were prevented by the silken threads from opening for some time. Later-hatching larvæ rolled the expanded leaves up, either the whole leaf being folded or only a portion of one side. When the fruit buds were ready to burst these were in many cases preferred to the leaves and the larvæ bored into them and fed upon the stamens, pistils or ovaries, thus destroying the promise of fruit. Sometimes, as the cluster of blossom buds opened, a silken web was spun around these and perhaps an adjoining leaf or two, and the larvæ fed on the parts inside the web. Under these circumstances the blossom stems were often cut off. When that was not done, the blossoms themselves were usually unable to open properly because of the web. When the fruit began to form many of the caterpillars deserted the leaves for this and ate large or small areas in it. Sometimes the areas were only shallow, but some-

Adults of (*a*) *Archips agryrospila:* (*b*) *A. semiferana;* (*c*) *A. rosaceana.*
(All natural size.)

times they extended right through to the core. In the case of plums they often reached right into the pit. Almost all apples with very deep injuries dropped soon. The others, if they remained on the tree, were always more or less deformed and as a rule rendered culls. A callous growth with russet surface soon formed over the injured area and protected it from the air and rain. Feeding on small apples was usually done under some kind of protection, such as a leaf fastened by the larva to the apple or a little web spun over the hole made. When the larvæ fed upon the large expanded leaves they nearly always chose those last formed and therefore most succulent. These they rolled either upwards or downwards, about 66 per cent. being rolled up so that the upper surface was the enclosed one, the remainder being rolled the opposite way. Migration from older leaves to younger seemed to be quite common and helped to explain the difficulty of killing the larvæ by arsenicals. The larvæ, when in the large rolled leaves, fed either by eating holes through the leaves or by devouring the apical or basal portions, leaving the rest intact. When disturbed they readily dropped down by a single thread and usually crawled back to the leaf when all was quiet.

Where the larvæ were very abundant they did a great deal of damage both to the foliage and the fruit. Large numbers of the terminal leaves in such cases, especially on the top of the tree, were badly tattered and riddled by them, but none of the trees were defoliated as had happened in some cases in Colorado and elsewhere. In the orchard at Simcoe there was so light a setting of fruit on most of the Spy trees this year that it was difficult to form any estimate of the amount of loss. On one well-laden tree, however, of another variety in among the Spy trees fully 50 per cent. of the fruit was ruined either by the destruction of the fruit blossoms or by the killing of the young fruits themselves or by rendering much of what remained culls. In an orchard near Hamilton I estimated that some large Greening trees had fully 50 per cent. of the crop destroyed. Mr. Sexsmith of Trenton estimated that in his ten or twelve acre orchard the crop had been lessened fully 50 per cent. in the infested orchard both last year and this. Another orchard of his, and all the neighboring orchards visited by me, had suffered almost no injury. In Norfolk County we found only the one orchard at all seriously infested, though a few larvæ were to be found all through the district.



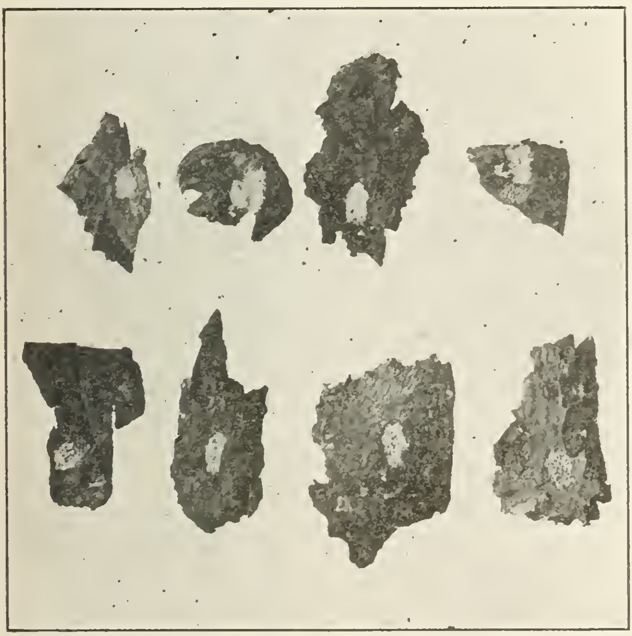
Egg masses of *A. argyrospila*. The four to the right have hatched. and are white; the remainder are unhatched and are dark brown. (Natural size.)

An examination of the only three badly infested orchards known to me showed that any variety of apple was subject to attack and that there was no reason to believe that there was any special attractiveness in the Spy over other varieties.

Brief Descriptions of the Adults of Each Species.

The adult of the Fruit-tree Leaf-roller is a moth with a wing expanse of from two-thirds of an inch to one inch. The general colour of the fore wings is a rusty brown with several silvery-white or silvery-gray markings which vary somewhat in different individuals, but are usually of the size and arrangement shown in the photograph. The hind wings are a light ashy brown color without any markings.

The Box-elder Leaf-roller adult resembles very closely in shape, size and whitish markings, the above species. It differs, however, from it in that the general color of the forewings is a much lighter brown, almost a fawn color. The hind wings in the former species contrasted strongly in colour with the fore wings but in this species they are practically the same pale brown or fawn color only a little lighter in shade. Moreover, the white markings, as seen in the photograph, usually continue farther in from the front margin forming in the case of two of them irregular oblique transverse bands reaching most of the way across the wing. In many males there is a noticeable dark brown spot, the size of the head of a pin, enclosed or nearly enclosed by white areas and situated in the middle of the front wing at about the outer part of the first third. There are some very light colored specimens in which the white markings are very indistinct.



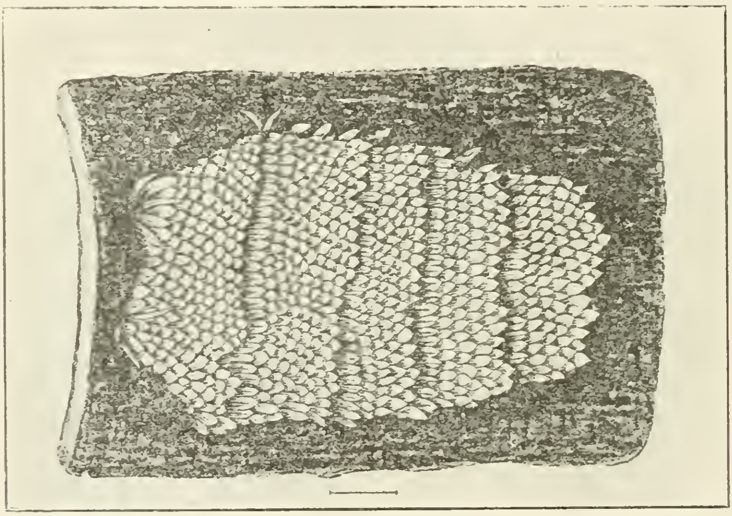
Egg masses of *A. semiferana* on pieces of apple bark. Those in the upper row, with one exception, are unhatched; the remainder have hatched. (Natural size.)

Egg masses of *A. rosaceana*, laid on glass. The little line to the side is a young larva just emerged from an egg. (Natural size.)

The adult of the Oblique-banded Leaf-roller is, as seen in the photograph, considerably larger than either of the above species though many specimens are smaller than those pictured. It can easily be distinguished from either species by the absence of white markings and by the front wings being a dull light brown with two wide darker brown transverse bands on the outer half running obliquely outwards from the front margin. The outer of these bands is sometimes incomplete. The hind wings are of a lighter brown than the front. There are some very pale specimens of this species, too, compared with the typical forms.

Description of Egg Masses of the Different Species.

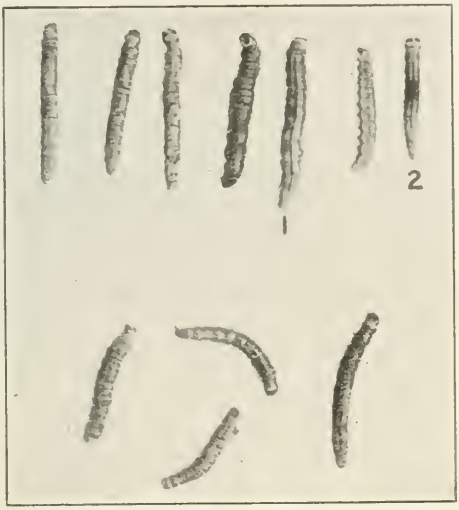
All three species lay their eggs in clusters as seen in the photographs. The egg masses of the Fruit-tree Leaf-roller are roughly oval in shape, about three-sixteenths of an inch in length, and are covered with a protective secretion. They are, with very rare exceptions, laid on twigs of two or three years' growth, and commonly on some slight slope on these such as occurs at the base of a branch or fruit spur. They are nearly always deposited on the upper surface or sides of the twig, only two or three having been found on the underside. Freshly laid masses are yellowish green but soon turn dark brown, a little darker brown than the twigs on which they are laid. After hatching they gradually become grayish white and are then more easily seen. The little openings show where the caterpillars emerged. Old egg masses sometimes remain on the trees for two years before weathering away. Each egg mass contains an average of about 95 eggs, the smallest number found being 6 and the largest 143.



Egg masses of *A. semiferana* much enlarged to show the scales from the moth's abdomen that form the covering. (After Gillette.)

The egg masses of the Box-elder Leaf-roller are easily distinguished from any other egg mass likely to be found in that they are covered over with scales. We have not observed the female laying the eggs, but there seems no doubt that after she has deposited and covered them over with a sticky secretion she presses her abdomen down upon this secretion and leaves all the scales there arranged as in nature. This would lead us to infer that only one egg mass is laid by each female. The masses are, as seen in the figure, roughly oval, are a little smaller than those of the Fruit-tree Leaf-roller and are glossy cream in color. They usually appear to contain from 20 to 60 eggs. Unlike those of the first species the egg masses are not laid on twigs but chiefly in the axils of branches of from about one to two inches in diameter, and on the bark of the larger branches of 1½ inches and upwards in thickness. A few are found on the trunk. The eggs are usually placed in a slight depression on the bark.

Only four egg masses of the Oblique-banded Leaf-roller were seen. Two of these were laid on the glass in rearing cages (one of these is shown in the photograph) one on a leaf in the orchard and another on the bark of a young apple tree. The mass is pale green before hatching and then becomes transparent and almost colorless. The eggs lap one over the other somewhat as shingles. The mass is a little larger than that of the Fruit-tree Leaf-roller and contains an average of about 100 eggs. When ready to hatch, as in the photograph, the black heads of the little larvæ show through the mass very distinctly and make it easy to count the eggs.



Full-grown larvae: 1 and 2 of *A. semiferana*, the remainder of *A. argyrospila*. (Natural size.)

Empty pupal cases (*a*) of *A. semiferana*, (*b*) of *A. argyrospila*. Note that the former are very much lighter in colour, often being nearly white. (Natural size.)

Comparison of the Larvæ.

The larvæ of all three species closely resemble each other both in appearance and habits, and therefore will not be distinguished by the fruit growers. In the early part of the season up to the time when the fruit begins to be attacked the larva of the Oblique-banded species will nearly always be the largest of the three because it reaches maturity earliest. It is, when full grown, nearly an inch long, green in color, with a black or blackish head and thoracic shield.

The full grown larva of the Fruit-tree Leaf-roller is usually more of a pale yellowish-green color; it also has a black head and thoracic shield in all stages except the last when these usually change to brown.

The full grown Box-elder larva is like the above two in being nearly an inch long. It is a very pale apple green color and can be distinguished from either of the above species by the head and thoracic shield being a whitish green instead of black. There is often a slight mottling of brown on these parts, and in some specimens at least, the segments are indistinctly divided by pale yellowish-white lines. There is a dark green line down the middle of the back.

Comparison of the Pupæ.

It does not seem worth while to go into details in regard to the differences between the pupæ, further than to remark that those of the Fruit-tree Leaf-roller and of the Oblique-banded species are brown, whereas those of the Box-elder species are whitish both before and after the adults emerge.

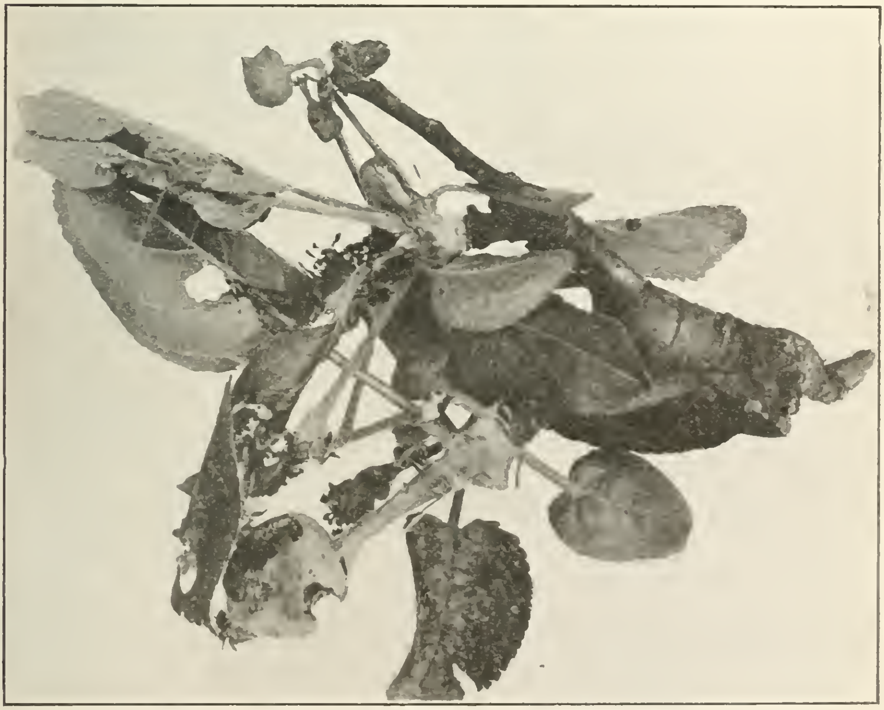
Life-Histories.

The winter is passed by all the species in the egg stage on the trees. We did not prove this of the Oblique-banded species because the larvæ of the second brood of this species all died in the cages, but Herrick, of Cornell, has shown that eggs are laid by the second brood adults and the winter passed in that stage. The eggs of all three begin to hatch near the same time, which is usually very soon after the buds are beginning to burst. Almost all those of the Box-elder Leaf-roller and also of the majority of the Fruit-tree Leaf-roller had hatched by May 3, which was a few days before the blossoms on the Spy began to burst. At this date the larvæ of these two species were still very small, being only about ⅛ inch long. Hatching of *argyrospila* eggs continued for a month, the last newly hatched larva being seen June 8th.

By May 25th the Oblique-banded Leaf-roller had begun to pupate and by June 10 the first adult was seen. The latter date was about two weeks after the blossoms fell from the Spy trees. The pupal stage of this species, judged from the few specimens reared, lasted about 13 days. The larvæ of the Fruit-tree Leaf-roller began to pupate about June 14, but larvæ were present for three weeks or more later. Adults were first seen in the orchard on June 26th. After this they soon became quite common. By July 12 they seemed to have reached the maximum, and then quickly decreased in number, the last being seen on July 22. The length of the pupal stage averaged 11.5 days. Adults in cages lived only five or six days.

The first pupa of the Box-elder species was found on June 26th, but there must have been pupæ earlier than this for adults were found on July 3rd, and cage experiments showed that the pupal stage lasted about 12 days on an average.

Young apples injured by Leaf-roller larvae. (Natural size.)



Work of Leaf-rollers on leaves and fruit clusters. Note the rolled leaves and the young dead fruit stems fastened to them. (Natural size.)

From July 3rd they increased rapidly and were still abundant July 20th, but soon after disappeared. They were seen, however, a week or more later in the orchard than the preceding species.

The above data shows that this year *T. rosaceana* adults began to emerge about two weeks earlier than those of *T. argyrospila* and the latter about a week earlier than those of *T. semiferana*.

Rosaceana and *semiferana* seemed to pupate almost invariably in the leaves, but much to our surprise fully half of the pupation of *argyrospila* either took place on weeds or in the grass or else the pupæ were shaken by the wind out of the leaves into the grass beneath. For instance, we spread a covering of cheesecloth, 8 x 10 ft. in size, on the ground beneath a tree on June 26th after emergence had begun and under this 320 pupæ or empty pupal cases were found and

Some of the parasites that help to control Leaf-rollers. On the left are Tachina Flies and their puparia; on the right Ichneumons.

upon it 84 pupæ, making a total of more than 400 which we estimated was a larger number than the total of the pupæ on the corresponding part of the tree above the sheet. There was no lack of food on the trees to force them to descend and very few weeds other than withered blue grass. Wherever there were succulent weeds under infected trees many larvæ fed and pupated in these.

None of the species of moth fly around in the day, unless disturbed, and then with a rapid zigzag motion they fly down into the grass to hide. Owing to the distance (2½ miles) of the orchard from our boarding places and the fact that the moths did not lay during the day time so far as we could tell, we did not see any of them ovipositing but know that the eggs outside are laid within a few days after the emergence of the adult, just as they are in the cages.

There is clearly only one brood a year of the Fruit-tree Leaf-roller and of the Box-elder Leaf-roller respectively, but there are two broods of the Oblique-banded species. The eggs of this last species, laid in the cages, began to hatch in seven days after they were laid. The young larvæ once they began to emerge out of the mass did so in a very short period and were seen to be very active from the moment of emergence. They were placed upon succulent shoots at the base of a tree and caged in but for some unknown reason died before reaching maturity.

Natural Enemies.

1. Spiders, ants, syrphid-fly larvæ and pentatomids each destroyed some larvæ but not a large number compared with the total.

2. A number of instances were observed where very active Leaf-roller larvæ devoured their more sluggish brothers, the sluggishness being due either to disease or preparations for moulting or pupation.

3. Birds feed to some extent upon them, but there were very few birds in the Johnson orchard.

4. Disease almost all through the larval season destroyed a considerable number, especially towards the end of the season. Pupæ, too, were evidently diseased, for many were found that shrivelled up and turned black. Some of these had been parasitized but many had not. The dead larvæ were not killed by spraying as they were found also on unsprayed trees.

5. Tachinid parasites were present in moderate numbers. There were two species of these: *Masicera eufitchiæ,* Townsend, and *Exorista cæsar,* Aldrich, n. sp. The latter were far the more numerous. (Dr. J. M. Aldrich kindly indentified the Tachinidæ for me.)

6. At least two and possibly three species of Ichneumons were common but we have not yet been able to get them determined.

Apparently not more than 5 per cent. of the larvæ were destroyed by parasites. They would probably have been much more abundant if the weather had been warmer. The month of June was very cold and on cold days parasites scarcely appeared at all. Disease evidently played a greater part in control than parasites.

For some reason more than half of the eggs of the first brood moths of *rosaceana* failed to hatch though the larvæ could be seen very plainly inside, but, as stated above, we found only four egg masses of this species.

Methods of Control.

We, probably like everyone else who has examined the work of *Tortrix* (*Cacœcia*) *argyrospila,* found it hard to believe that a caterpillar that left the leaves in such an eaten, ragged condition could not be satisfactorily combated with arsenical sprays but our experience this year leads us to agree with Herrick, Childs and several others that arsenical sprays are not satisfactory. They kill a considerable number but not nearly enough to prevent great loss. There are two reasons for the failure of these poisons to be effective:—(1) While the larvæ are still small and will die if they eat the poison, their habits of feeding prevent the great majority of them from getting access to it. This is because as soon as they hatch they usually seek an opening bud or leaf just beginning to unfold itself, and work into the centre of these, feeding in the interior and therefore unpoisoned part, and retarding for a considerable time the opening. On Spy trees, at least, unfolded leaves suitable for the later hatching larvæ to hide in are present until the blossoms are wide open, and are sought by the majority of the young larvæ in preference to open leaves. The undeveloped fruit buds are also sought. (2) When the larvæ become large they seem to be very little affected by the poison. We found many well poisoned leaves being eaten and the larvæ perfectly healthy.

That the poison will kill the younger larvæ if they eat it was proved by Mr. Crawford by immersing infested twigs in various strengths of arsenate of lead in water. He used 2, 3, 4 and 5 lbs. to 40 gals. of water respectively, and killed all larvæ with each strength except those in the undeveloped leaves that were so closely folded that the liquid did not get in. It entered all loosely rolled leaves. This sort of dipping, however, is very different from the very best spraying even with power machines that can be done, especially on large trees, because the spray fails to get into many a loosely rolled leaf, or mass of blossom clusters or leaves webbed together.

Unfortunately, I was too busy conducting spraying experiments for San José Scale, Canker Worms, Codling Moth and Apple Scab in an orchard in the Niagara district to do the spraying myself at Simcoe, and Mr. Crawford was too busy watching the three Leaf-rollers and the Capsid to devote much of his time to it. Mr. Johnson, however, had a good outfit and certainly sprayed more thoroughly than most men would do. He was just as eager to kill these insects as we were. Four applications with double strength arsenate of lead (almost 4 lbs. to 40 gals. of dilute lime-sulphur) were used. The first was just as the leaflets began to appear, the second just before the blossoms opened, the third as soon as the blossoms fell, and the last two weeks later. Black-leaf-40 was used at his own desire with the last of these to destroy Aphids. The foliage showed whitish all summer long with these heavy sprayings.

Mr. Sexsmith, of Trenton, on my advice also sprayed his orchard very heavily before the blossoms opened and used double strength arsenate of lead. He also sprayed heavily for the Codling Moth. Yet in both orchards the results were very disappointing for there were numerous larvæ left and many observations in the former by Mr. Crawford and myself convinced us that only a small percentage of the larvæ had been poisoned. I intend, however, to re-test this next year and supervise all the spraying myself.

Black-Leaf-40, it is claimed by some, will control this pest if applied while they are young. Gill, of Washington Bureau, tested this but did not get so good results as from arsenate of lead alone. It certainly had no lasting effect upon the medium sized larvæ at Simcoe, though for a little while it seemed to stupify some of them. It doubtless would help in the spray just before the blossoms burst, but would not kill the larvæ in the closely folded leaves and buds. It seems to me we could not possibly hope to get satisfactory results from it even with two applications. It is, moreover, very costly.

Lime-sulphur is known to be useless against the eggs.

Miscible oils alone have given really satisfactory results to most investigators. This spray is used only against the eggs.

I sent Mr. Johnson ten gallons of Scalecide and instructed him to dilute this 1 to 5 and to spray just as the buds were ready to burst. He was told to centre his spraying on the twigs of the infested Spys and pay no attention to the bare branches and trunk. He did so and used about from 4 to 5 gals. to a tree One Baldwin tree he sprayed heavily. The result was that this tree showed approximately 80 per cent. of unhatched eggs, unsprayed trees only about 2 per cent., and the lightly sprayed Spy trees not more than from 10 to 25 per cent. The explanation, however, of the poor result is simple but very instructive.

Scalecide will not kill the eggs unless they are thoroughly wet and 4 *to 5 gallons per tree was not more than half enough to wet all the twigs on these large 40-year-old Spy trees.* It only allowed for a fine mist. Both he and I were afraid to risk heavy spraying with a miscible oil without further experience with it. I also observed that on large Spy trees with their tendency for upright twigs and branches the same care would be necessary to do thorough work as if one were spraying for San José Scale, otherwise numerous twigs at the farther side of a tree would have only one side of their bark wet because of the failure of the spray to reach through that far. Most reported experiments with miscible oils have been done on trees 12 to 14 years of age, but these are vastly easier to spray thoroughly than trees twice or three times their size. A strong wind would help greatly in this spraying. Also well pruned trees would be a great boon. Mr. Johnson's, however, were very well pruned.

Scalecide and another as yet unnamed miscible oil, and also Caustic Soda solution, were tested this August on egg masses, and though used very strong, have had no effect upon the eggs of either *argyrosphila* or *semiferana,* so that fall spraying appears to be useless.

Recommendations.

From the experience gained this year, we feel like recommending the following methods of control:

1. Prune trees well, thinning out the excessive branches and twigs and lowering the trees where possible. This is to make spraying easier, cheaper and more effective.

2. Spray very thoroughly with Scalecide or some other good miscible oil, just as the leaf-buds are almost ready to burst but so as to finish before they have done so. Take care to wet well the top and both sides of all the twigs. There are scarcely any eggs on the underside of twigs or on any large branch at least in Ontario.

3. Use 3 to 4 lbs. arsenate of lead to 40 gals. of dilute lime-sulphur or Bordeaux mixture in the application just before the blossoms burst, and drench the foliage, covering even the underside of the leaves.

4. Spray again heavily for Codling Moth with 3 instead of 2 lbs. arsenate of lead.

Note.—If Scalecide or other good miscible oil is considered too expensive or cannot be secured, add Black-Leaf-40 or some equally strong tobacco extract to the spray before the blossoms burst, using a little stronger than for Aphids, and using lime-sulphur, not Bordeaux, with it.

5. If the fruit grower has many chickens and can establish these in the orchard, they will destroy great numbers of larvæ and pupæ whether the orchard is cultivated or not.

6. Cultivation up to as late as safe for the district, with moderately deep discing the last time, should help to destroy many larvæ and pupæ that reach the ground or that are feeding on the weeds that may spring up from time to time. Adults from pupæ buried 2 inches deep by Mr. Crawford were found by him to be unable to emerge.

Mr. Winn: I am sure you have all enjoyed Professor Caesar's paper.

Prof. Caesar: As to dust sprays for Leaf-rollers, I should say that there is some reason to believe that the dust spray would enter better into the places where these little larvæ are concealed than the liquid spray.

Mr. Treherne: May I ask a question? Have you tested the effect of sprays like Bordeaux and lime-sulphur in relation to the oil coating on trees?

Prof. Caesar: We could not make any definite statements in this connection.

Mr. Sanders: Did you find any variation in the color of the heads of *Archips rosaceana?*

Prof. Caesar: I may say that we laboured under difficulties as at first we did not know which larvæ were which. I am not sure how much variation there was. This species was rare in the orchard.

Mr. Petch: In regard to this new pest in the Province of Quebec for three years out of the last four we have not had them at all. Last year they appeared and attacked 75 per cent. of the fruit in some orchards; this year in the very same orchards after the ordinary spraying there was no injury. We have both species that were mentioned. It seems to me that this pest has, through some climatic conditions or through some assistance, come over to our fruit land and, through some other means which I do not know, disappeared. Previously I do not know that it has been recorded in the Province of Quebec as a serious pest.

Mr. Winn: I think there is some doubt as to where that species came from.

Prof. Caesar: I would like to say that there is little doubt that this insect will come under control within a few years.

Mr. Winn: There are fifteen minutes left to be devoted to questions that may be asked. The meeting is open for general discussion.

Mr. Treherne: I would like to start the discussion by asking for some information on the latest sprays, like Soluble Sulphur, Blackleaf 40, and the different kinds of oil sprays.

Mr. Sanders: We had very much experience with Soluble Sulphur this year, but we are not in a position to make any recommendations on this material, although some day we may be able to make a spray of it.

Dr. Fernald: I have had a little experience with soluble sulphur and I may say that under the conditions in which I used it it did did not prove a good poison. Some experiments made years ago and not published until after they had long been duplicated, beginning first with the analysis of the lime sulphur and determinations of the ingredients found in it, show conclusively that the results at that time under those circumstances were obtained with polysulphids and thiosulphate, and that when these reduced to sulphite we got absolutely no results whatever. I have some hope, however, for soluble sulphur, though I may have nothing whatever to base my hope on after all. It is, perhaps, among the possibilities that the Red Spider may yet prove to be more or less successfully attacked by such a substance as soluble sulphur. It is one of the things that I hope yet to carry on experiments with. I can only say, therefore, that I am hoping there is something in it, and yet I do not know.

Mr. Sanders: Did you ever have any experience with Barium sulphide.

Dr. Fernald: Yes. We tried it this year and watched the results carefully all summer on San José Scale. The results have been quite satisfactory. The same trees which a year ago last spring were treated with the lime sulphur, and this year with Barium sulphide, were on the whole in better condition than they were a year ago. That does not mean, you will realize, that the treatment was distinctly better than lime sulphur, because there might have been other factors this summer which did not appear a year ago, but if we can get anything like the same results we found it a much more convenient substance to handle. It is much more easily shipped.

Mr. Petch: I would like to say from our experience in Quebec, although small, that the use of these various spray mixtures ought to depend upon the insects which we have to control. For instance, we know that ordinary lime sulphur will largely control the Tent Caterpillar if sprayed at the proper time, and when we used a soluble sulphur we had absolutely no results at all in controlling the Tent Caterpillar. Furthermore, this year I have used arsenite of lime, one quart to forty gallons, and there has been absolutely no injury to the foliage. It was combined with Bordeaux mixture.

Mr. Sanders: The arsenite of lime we used burned the foliage very badly in almost every case.

Prof. Caesar: As for Soluble Sulphur, I may say we tested this mixture on old, badly infested apple orchards two years ago in the Niagara district and again this year, and found it gave very good satisfaction against San José Scale, just as good as lime sulphur or Scalecide. We have not tested Barium sulphide because the company could not supply us with it. We have also obtained good results from soluble sulphur as a summer spray, but found it, when used with arsenate of lead, more inclined to burn than the lime sulphur.

Arsenite of lime with lime sulphur is a decidedly dangerous spray to use. I have burned nearly every leaf off trees with it, but there are some people who still use it and get very little burning. When used with Bordeaux mixture it is usually safe. It is particularly good for spraying potatoes used along with Bordeaux.

The matter of injury from sprays to apple foliage depends to a great extent upon moisture condition. If the spray, particularly lime sulphur, dries quickly after being applied there is usually no burning, but if it remains in a liquid state on the leaves for some considerable time due to fog or rain, it may do a good deal of burning.

Mr. Sanders: I think that has been the experience all over the country this year; it has become a question of moisture.

Mr. Winn: I will ask Dr. Hewitt to make a few remarks about the smoker.

Prof. Lochhead: Before adjourning, I have much pleasure in rising to move a vote of thanks to our retiring President. I have observed him for the last three years, and during that time Dr. Hewitt has presided over our deliberations and carried the meetings through to a most successful conclusion. For the last two years he has been President by right of choice and he has brought the society to a most flourishing condition. Last year we had a most enjoyable meeting in Toronto, and this year it has been still better. I think all will agree that our proceedings have been most excellent. I would like also to include in my motion the thanks of the society to our visitors. We are very much indebted to Professor Fernald and Mr. Burgess for coming up to Canada, and we are also extremely pleased to have Mr. Lounsbury, of South Africa, with us. They are all distinguished visitors, and they have been helping us out wonderfully. I know that the society will show their appreciation in a fitting manner.

Prof. Caesar: There is not one of us here but endorses what Professor Lochhead has just said. Dr. Hewitt has certainly done wonders for the Society the last few years. Of course, behind Dr. Hewitt has been Mr. Gibson and the other members at Ottawa. It is really a great pleasure and a great source of benefit to be able in the discussions we have had to call upon those who have come from outside, and we have had a broader view of entomology and a greater amount of benefit from the presence of these men.

Mr. Gibson: I would like to move a vote of thanks to Dr. F. J. White, the Principal of the Normal School, for allowing us the use of the Assembly Hall last evening.

Mr. Tothill: In rising to second this motion I may say that this has been one of the most enjoyable meetings of this organization.

A PRELIMINARY LIST OF PARASITIC INSECTS KNOWN TO OCCUR IN CANADA.

R. C. Treherne, Field Officer, Entomological Branch, Department of Agriculture, Ottawa.

The following list of parasitic insects of some of the more common pests is presented to guide entomologists in Canada in the numbers and names of parasites recorded in Canada. This list does not claim to include all known parasitic insects recorded in Canada, but it is hoped that as times goes on it may be supplemented by additional data and become a more complete guide for reference.

In preparing this present list the following literature has been consulted:—

(1) The Reports of the Ontario Entomological Society, 1870-1914.

(2) The Reports of the Dominion Entomologist in the Experimental Farms Reports and separate Reports of the Department of Agriculture of Canada, 1884-1914.

(3) The Bulletins of the Division of Entomology and the Entomological Branch of the Dominion Department of Agriculture until the close of March, 1915.

(4) The Annual Reports of the Department of Agriculture, Ontario, 1880-1913.

(5) The various Agricultural and Entomological publications from Nova Scotia, New Brunswick, Quebec, and British Columbia, until the close of 1914.

(6) The Annual Reports of the Quebec Society for the Protection of Plants, 1909-1914.

An occasional reference is made to *The Canadian Entomologist,* but no effort has been made to include the many valuable records incorporated within the pages of this journal. This will be done on a later occasion. The same applies to the Proceedings of the United States National Museum, and other publications issued in the United States, in which many original records of parasites named from Canadian material may be found.

As a general rule I have recorded in the following list only the names of parasitic insects mentioned as definitely determined species, and further so as far as possible, only records in which the host and its parasite or parasites are clearly shown to be associated and to occur in Canada.

Alsophila pometaria Harris. The Fall Canker Worm.

Apanteles palæacritæ Ril.

Braconid.. *Report* XXIV., Ent. Soc. Ont., 1893, p. 25. Harrington, On larva. Ottawa, Ontario.

Hemiteles sessilis (Gmel) Grav. (? secondary).

Ichneumon. Rpt. XXIV., Ent. Soc. Ont., 1893, p. 25. Harrington. On larva. Ottawa, Ont.

Ambesa walsinghami Rag. The Hickory Leaf Roller.
MESOSTENUS THORACICUS Cress.
Ichneumon. Rpt. XXIV., Ent. Soc. Ont., 1893, p. 25. Harrington. On larva. Ottawa, Ont.
Ampelophaga myron Cram. The Lesser Grape Vine Sphinx .
APANTELES CONGREGATUS (Say) Prov.
Braconid. Rpt. Dom. Ent., Cen. Exp. Farm, Canada, 1892, p. 161. Fletcher. Ex pupa; generally distributed over Western Ontario.
Anosia plexippus Linn. The Monarch.
TRICHOGRAMMA MINUTUM Ril.
Chalcid. Rpt. XXI., Ent. Soc. Ont., 1890, p. 12. Harrington, Ottawa, Ont. On egg.
Apatela hastulifera A. and S.
RHOGAS INTERMEDIUS Cress.
Braconid. Rpt. XXV., Ent. Soc. Ont., 1894, p. 55. Fyles. Ontario. On larva.
Aphids.
See Macrosiphum, Aphis.
Aphis (Siphocorynæ) avenæ Fab. The European Grain Aphis.
APHIDIUS OBSCURIPES Ashm.
Braconid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1895, p. 137. Fletcher, Muskoka, Ont.
Aphis brassicæ L. The Cabbage Aphis.
LIPOLEXIS (APHIDIUS) RAPÆ Curtis.
Braconid. Rpt. Dom. Ent. Cen. Exp. Farm, 1904, p. 228. Fletcher, Ottawa, Ont.
Aphis—on Raspberry.
LYGOCERUS STIGMATUS (Say) Ashm.
Proctotrupid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1887, p. 36. Fletcher, Ottawa, Ont.
Apina.
See Bees, Megachile.
Argyresthia thuiella Pac. The White Cedar Twig Borer.
PENTACHNEMUS BUCCULATRICIS How.
Chalcid. Rpt. Dom. Ent. Cent. Exp. Farm, Canada, 1906, p. 231. Fletcher, Ottawa, Ont.
DEROSTENES TRIFASCIATUS Ashm.
Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1906, p. 231. Fletcher, Ottawa, Ont.
Asparagus Beetle.
See Crioceris.
Army Worm.
See Cirphis.
Aspidiotus ostræformis Curtis. The European Fruit Scale.
APHELINUS MYTILASPIDIS Baron.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.
Aspidiotus perniciosus Coms. The San José Scale.
APHELINUS FUSCIPENNIS How.
Chalcid. Rpt. XXXVIII., Ont. Ent. Soc., 1907, p. 53. Jarvis, Ontario. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

Aphelinus mytilaspidis Baron.
Chalcid. Rpt. XXXVIII., Ont. Ent. Soc., 1907, p. 53. Jarvis, Ontario.
Rpt. XLI., Ont. Ent. Soc., 1910, p. 74. Eastham, Guelph, Ont.
Aster Gall Moth.
See Gelechia.
Aulacaspis rosæ Bouche. The Rose Scale.
Aphelinus diaspidis How.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.
Bassus albosignatus Grav. See Syrphus ribesii.
Asaphes vulgaris Walk.
Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1899, p. 172.
Fletcher, Ottawa, Ont.
Bees.
Foenus incertus Cress.
Foenus tarsatorius Say.
Evaniids. Faune Ent. Canada, 1883, p. 246. Provancher, Quebec.
Rpt. XXI., Ent. Soc. Ont., 1890, p. 66. Harrington, Ontario.
Leucospis affinis Say.
Chalcid. Rpt. XXI., Ent. Soc. Ont., 1890, p. 71. Harrington, Ontario.
Birch Sawfly.
See Hylotoma.
Blackberry Scale.
See Eulecanium.
Brown-tail Moth.
See Euproctis.
Bud Moth.
See Tmetocera.
Cabbage Aphis.
See Aphis brassicæ.
Cabbage Root Maggot.
See Phorbia.
Cabbage White Butterfly.
See Pontia.
Cecropia Moth.
See Samia.
Cedar Twig Borer.
See Argyresthia.
Celery Caterpillar.
See Papilio.
Cigar Case Bearer.
See Coleophora.
Chionaspis furfura Fitch. The Scurfy Scale.
Ablerus clisiocampæ (Ashm) How.
Chalcid. Rpt. XXXVIII., Ent. Soc. Ont., 1907, p. 71. Jarvis, Ontario.
Rpt. XLI., Ent. Soc. Ont., 1910, p. 75. Eastham, Guelph, Ont.
Chionaspis pinifoliæ Fitch. The Pine Leaf Scale.
Aphelinus mytilaspidis Baron.
Chalcid. Rpt. XLI., Ent. Soc. Ont., 1910, p. 74. Eastham, Guelph, Ont.
Physcus varicornis How.
Chalcid. Rpt. XLI., Ent. Soc. Ont., 1910, p. 75. Eastham, Guelph, Ont.

Chionaspis salicis Linn. The Willow Scale.

APHELINUS MYTILASPIDIS Baron.

Chalcid. Rpt. XLI., Ent. Soc. Ont., 1910, p. 74. Eastham, Guelph, Ont.

Cimbex americana Leach. The Willow Sawfly.

OPHELTES GLAUCOPTERUS (L) Holmgr.

Ichneumon. Faune, Ent. Canada, 1883, p. 350. Provancher, Quebec.
Can. Ent. XIX., 1887, p. 80. Fletcher, Ottawa, Ont. On pupa.
5th Ann. Rpt. Quebec Society Protection of Plants, 1912-1913, p. 28. Fyles.

Cirphis (Leucania) unipuncta How. The Army Worm.

OPHION PURGATUS Say.

Ichneumon. Faune. Ent. Canada, 1883, p. 351. Provancher, Que.
Rpt. XXI., Ent. Soc. Ont., 1890, p. 67. Harrington, Ontario.
Rpt. XXVII., Ent. Soc. Ont., 1896, p. 51. Panton. Generally distributed in Ontario.

ICHNEUMON LEUCANIÆ Fitch.

Ichneumon. Rpt. XXVII., Ent. Soc. Ont., 1896, p. 51. Panton, Ontario. Generally distributed.

PANISCUS GEMINATUS Say.

Guelph. Ont. Treesbank, Man.

PIMPLIDEA PEDALIS (Cress).

Nova Scotia.

ICHNEUMON CANADENSIS Cr.

Ontario. Nova Scotia.

ICHNEUMON LÆTUS Br.

Nova Scotia. New Brunswick.

ICHNEUMON JUCUNDUS Br.

Guelph, Ont.
Ichneumons. Bull. 9. Ent. Branch Dom. Can. Dept. Agr., 1915. Gibson.

APANTELES MILITARIS Walsh. (Ontario.)

APANTELES LIMENTIDIS Riley. (Nova Scotia.)

METEORUS COMMUNIS Cr. (Ontario.)

Braconids. Bull, 9, Ent. Branch, Dom. Can. Dept. Agr., 1915. Gibson, Ont.

WAGNERIA (PHORICHÆTA) SEQUAX Will.

Tachinid. Bull. 9, Ent. Branch Dom. Can. Dept. Agr.. 1915. Gibson, Guelph, Ont.

EXORISTA FLAVICAUDA Ril.

Tachinid. Rpt. Dom. Ent. Cen. Exp. Farm, 1896, p. 238. Fletcher, Ontario.

NEMOREA LEUCANIÆ Kirkp.

Tachinid. Rpt. XXVII., Ent. Soc. Ont., 1896. p. 102. Fyles. Levis, Que.

WINTHEMIA QUADRIPUSTULATA Fab.

Tachinid. Bull. 9, Ent. Branch, Dom. Can. Dept. Agr., 1915. Gibson, Ontario; Nova Scotia.

PHOROCERA (EUPHOROCERA) CLARIPENNIS Macq.

Tachinid. Bull. 9, Ent. Branch, Dom. Can. Dept. Agr., 1915. Gibson, Guelph, Ont.

PHRYXE (EXORISTA) VULGARIS Fall.

Tachinid. Bull. 9, Ent. Branch, Dom. Can. Dept. Agr., 1915. Gibson. New Brunswick. Nova Scotia.

Coccotorus scutellaris Le Conte. The Plum Gouger.

SIGALPHUS CANADENSIS Prov.

Braconid. Faune. Ent. Canada, 1883, p. 530. Provancher, Que.

Can. Ent. XXII., 1890, p. 115. Gillette.

Coccus hesperidum Linn. The Soft Scale.

COCCOPHAGUS COGNATUS How.

Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

Codling Moth.

See Cydia.

Coleophora fletcherella Fernald. The Cigar Case Bearer.

MICRODUS LATICINCTUS Ash.

Braconid. Rpt. XXVII., Ont. Ent. Soc., 1896, p. 67. Fletcher, Port Hope, Ont.

Colias philodice Godt. The Clouded Sulphur.

MEGORISMUS NUBILIPENNIS Ashm.

Ichneumon. Rpt. Ent. Cen. Exp. Farm, Canada, 1887, p. 18. Fletcher, on larva, Ottawa, Ontario.

Conotrachelus nenuphar Herbst. Plum Curculia.

THERSILOCHUS CONOTRACHELI Ril.?

Ichneumon. Rpt. XXI. 1890, p. 67. Ont. Ent. Soc. Harrington, Ont.

Cottony Maple Scale.

See Pulvinaria.

Crioceris asparagi L. The Asparagus Beetle.

TETRASTICHUS ASPARAGI Cwfd.

Chalcid. Agricultural Gazette, Canada, November, 1915, p. 1055. Ross, on egg, Vineland, Ont.

Currant Sawfly.

See Pteronus.

Cutworm.

See Hadena, Mamestra, Noctua, Peridroma.

Cydia pomonella Linn. The Codling Moth.

PIMPLA PTERELAS (Say) Walsh.

Ichneumon. Rpt. XXXVII. Ent. Soc. Ont., 1906, p. 5. Brodie, Freeman, Ont.

EPHIALTES sp.

Ichneumon. Rpt. XXXVII. Ent. Soc. Ont., 1906, p. 5. Brodie, Prescott, Ont.

Diamond Back Moth.

See Plutella.

Dog-wood Sawfly.

See Harpiphorus.

Eriopeltis festucæ Fonse. The Grass Scale.

LEUCOPSIS BELULILA.

Dipterous. Rpt. XLI., Ent. Soc. Ont., 1910, p. 76. Jarvis, Nova Scotia.

Eulecanium caryæ Fitch.

CHILONEURUS ALBICORNIS How.

Chalcid. Rpt. XLI., Ent. Soc. Ont., 1910, p. 75. Eastham, Guelph, Ont.

EUCOMYS SCUTELLATA (Swed.) D. T.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

AGENIASPIS FUSCICOLLIS (Dalm) Thoms.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

Eulecanium cerasifex Fitch. The New York Plum Scale.

PACHYNEURON ALTISCOTA How.
Chalcid. Rpt. XXXVIII., Ont. Ent. Soc., 1907, p. 65. Jarvis, Ont.

EUNOTUS LIVIDUS Ashm.
Chalcid. Rpt. XXXVIII., Ont. Ent. Soc., 1907, p. 65. Jarvis, Ont.

CHILONEURUS ALBICORNIS How.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

EUCOMYS FUSCA (How.) D. T.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

COCCOPHAGUS LECANII Smith.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

COCCOPHAGUS FLAVOSCUTELLUM Ashm.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

COCCOPHAGUS COGNATUS How.
Chalcid. Rpt. XXXVIII., Ont. Ent. Soc., 1907, p. 65. Jarvis Ont.
Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

AGENIASPIS FUSCICOLLIS (Dalm.) Thoms.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

APHYCUS PULVINARIÆ How.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

APHYCUS JOHNSONI.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

APHYCUS FLAVICEPS.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Jarvis, Guelph, Ont.

BLASTOTHRIX LONGIPENNIS How.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

Eulecanium fitchii Sign. The Blackberry Soft Scale.

ENCYRTUS FUSCUS How.
APHYCUS ANNULIPES (Ashm) How. } (Chalcids.)
COCCOPHAGUS FLAVOSCUTELLUM Ashm.

EUTOCHUS XANTHOTHORAX Ash. (Proctotrupid.)
Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1901, p. 241. Fletcher. Trenton, Ont.

Eulecanium fletcheri Ckll.

COCCOPHAGUS LECANII Smith.
COCCOPHAGUS COGNATUS How.
COCCOPHAGUS FLETCHERI How.

Comys bicolor How.
Chiloneurus albicornis How.
Aphycus jarvisi How.
Aphycus pulvinariæ How.
Blastothrix longipennis How.
Chalcids. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

Euproctis chrysorrhoea L. The Brown Tail Moth.
Pentarthrum minutum Ril.
Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, 1911, p. 217. Hewitt, St. Stephen, New Brunswick.
Apanteles lacteicolor Vier.
Braconid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1914. p. 860. Hewitt, Bear River, Nova Scotia.
Compsilura concinnata Meig.
Tachinid. Rpt. XLIII., Ont. Ent. Soc., 1912, p. 57. Tothill, Fredericton, New Brunswick.
Phorocera leucaniæ Cog.
Tachinid. Rpt. XLIII., Ont. Ent. Soc., 1912, p. 58. Tothill, Charlotte County, New Brunswick.

Euthisanotia grata Fab. The Beautiful Wood Nymph.
Exorista leucania.
Tachinid. Rpt. I., Ont. Ent. Soc., 1870, p. 99. Saunders, Ont.

Fall Canker Worm.
See Alsophila pometaria.

Fall Webworm.
See Hyphantria.

Gelechia gallæasteriella Kell. The White Aster Gall Moth.
Bracon furtivus Fyles.
Braconid. Can. Ent. XXIV., 1892, p. 34. Fyles, South Quebec, Que.
Pimpla pterelas (Say) Walsh.
Ichneumon. Can. Ent. XXIV., 1892, p. 35. Fyles, South Quebec, Que.
Trychosis tunicula-rubra Fyles.
Ichneumon. Rpt. XXXIV., Ent. Soc. Ont., 1903, p. 73. Fyles, Levis, Que.

Grain Aphids.
See Aphis avenæ.

Grapta satyrus Edw. Polygonia satyrus Edw.
Ichneumon caliginosus Cress.
Ichneumon. Entomological Record, Ont. Ent. Soc., 1907, p. 16. Gibson. Ex pupa. Kaslo, B.C.; Ottawa, Ont.
Rpt. XXXVIII., Ont. Ent. Soc., 1907, p. 128. Fletcher. Ex pupa. Ottawa, Ont.

Grapevine Sphinx.
See Amphelophaga.

Grass Scale.
See Eriopeltis.

Hadena devastatrix Brace. Glassy Cutworm.
Bebecyntus bakeri How. Var.
Chalcid. Bull. 10, Ent. Branch, Dom. Can. Dept. Agri., 1915. Gibson, Ottawa, Ont.

Halisidota maculata Harr.

Ichneumon. Theronia melanocephala (Brulle) Prov.

Rpt. XXI., Ont. Ent. Soc., 1890, p. 69. Harrington, Ottawa, Ont.

Pimpla pedalis Cress.

Ichneumon. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1908, p. 209. Fletcher, Eastern Canada.

Harmologa.

See Tortrix.

Harpiphorus tarsatus (Say) Nort. The Dog-wood Sawfly.

Hemiteles mucronatus Prov.

Ichneumon. Rpt. XXX., Ont. Ent. Soc., 1899, p. 104. Fyles, Levis, Que.

Hemerocampa leucostigma S. and A. The White Marked Tussock Moth.

Pimpla inquisitoriella D.T. Recorded as Inquisitor.

Ichneumon. Rpt. XXVII., Ont. Ent. Soc., 1896, p. 53. Panton, Toronto, Ont.

Diglochis omnivora Walk.

Chalcid. Rpt. XXXVI., Ont. Ent. Soc., 1905, p. 19. Lyman, Montreal, Que.

Hessian Fly.

See Phytophaga.

Heterocampa manteo Dbl.

Ophion bilineatus Say.

Ichneumon. Rpt. XXXIV., Ont. Ent. Soc., 1903, p. 58. Gibson, Meach Lake, Que. On larva.

Hickory Leaf Roller.

See Ambesa Walsinghami Rag.

Hop Vine Borer.

See Hydroecia.

Hylotoma pectoralis Leach. The White Birch Sawfly.

Pimpla inquisitoriella D.T. (Recorded as Inquisitor.)

Ichneumon. Rpt. XXX., Ont. Ent. Soc., 1899, p. 104. Fyles, Levis, Que.

5th Annual Rpt. Quebec Society for Protection of Plants, 1912-1913, p. 30. Fyles, Quebec.

Hyphantria cunea Dru. Fall Webworm.

Limnerium validum Cress.

Limnerium pilosotum Cr.

Exochilum mundum Say.

Ichneumons. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1914, p. 861. Hewitt, New Brunswick.

Compsilura concinnata Meig.

Tachinid. Rpt. XLIII., Ont. Ent. Soc., 1912, p. 57. Tothill, on larva. Fredericton, New Brunswick.

Hydræcia immanis Guen. Hop Vine Borer.

Ichneumon jucundus Brulle.

Ichneumon. Rpt. Dom. Ent. Cen. Exp. Farm, 1892, p. 150. Fletcher, Bethel, Ont.

Iris Pod Weevil.

See Mononychus.

Isosoma tritici Fitch. The Wheat Joint Worm.

HOMOPORUS CHALCIDIPHAGUS Walsh.

EUPELMUS EPICASTE Walk.

Chalcid. Rpt. XXIX., Ont. Ent. Soc., 1898, p. 77. Fletcher, Verdun, Ont.

Kermes pubescens Bogue.

APHYCUS PULCHELLUS How.

BLASTOTHRIX LONGIPENNIS How.

Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

Larch Sawfly.

See Nematus.

Lecanium Scale (Soft Scale).

See Coccus.

Lepidosaphes ulmi Linn. The Oyster Shell Scale.

APHELINUS MYTILASPIDIS Baron.

Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1903, p. 188. Fletcher, generally distributed in South Western Ontario.

Rpt. Dominion Entomologist, 1887, p. 31, British Columbia.

Rpt. Dominion Entomologist, 1903, p. 188, universally distributed.

Rpt. Dom. Ent. Exp. Farm, Canada, 1887, p. 31. Fletcher, New Westminster, B.C.

Lyctus unipunctatus Herbert.—linearis. The Powder Post Beetle.

HECABALUS LYCTI Cress.

HECABALUS UTILIS Cress.

Braconid. Rpt. XXXII., Ont. Ent. Soc., 1901, p. 108. Fletcher, Ottawa, Ont.

Macrosiphum granaria Buckton. Grain Aphis.

APHIDIUS GRANARIAPHIS Cook.

Braconid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1898, p. 179. Fletcher, Ont.

Can. Ent. Vol. XXIV., 1890, p. 125.

LYSIPHLEBUS TRITICI Ashm.

Braconid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1908, p. 194. Fletcher, Ontario.

APHIDIUS AVENÆ Fitch.

Braconid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1903, p. 171. Fletcher, Ottawa, Ont.

ASAPHES VULGARIS Walk.

Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1903, p. 171. Fletcher, Ottawa, Ont.

LYGOCERUS NIGER How.

Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1903, p. 171. Fletcher, Ottawa, Ont.

ALLOTRIA TRITICI Fitch.

Cynipid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1903, p. 171. Fletcher, Ottawa, Ont.

Macrosiphum pisi Kalt. The Pea Aphis.

TRIOXYS (PRAON) CERASAPHIS Fitch.

Aphidius fletcheri Ash.

Braconid. Rpt. XXX., Ont. Ent. Soc., 1899, p. 107. Fletcher, Ottawa, Ont.

Rpt. Dom. Ent. Cen. Exp. Farm, 1899, p. 172. Fletcher, Ottawa, Ont.

Megorismus fletcheri Crawford.

Chalcid. Rpt. XL., Ont. Ent. Soc., 1909, p. 14. Gibson, Ottawa, Ont.

Malacosoma disstria Fab. The Forest Tent Caterpillar.

Apanteles longicornis Prov.

Braconid. Rpt. XXXIV., Ont. Ent. Soc., 1903, p. 73. Fyles, Levis, Que.

Pimpla conquisitor (Say) Ril.

Ichneumon. Rpt. XXI., Ont. Ent. Soc., 1890, p. 69. Harrington, Ottawa, Ont.

Pimpla pedalis Cress.

Ichneumon. Rpt. XXI., Ont. Ent. Soc., 1890, p. 69. Harrington, Ottawa, Ont.

Mamestra picta Harris. The Zebra Caterpillar.

Ophion purgatus Say.

Ichneumon. Can. Ent. XVI., 1884, p. 122. Caulfield, Montreal, Que.

Chaetostricha (Trichogramma) pretiosa D.T.

Chalcid. Rpt. XXVII., 1896, Ont. Ent. Soc., p. 64. Fletcher, Ottawa. Ont.

Rpt. Dom. Ent. Cen. Exp. Farm, 1892, p. 161. Fletcher, on egg, Ottawa, Ont.

Mamestra trifolii Rott. Clover Cutworm.

Ophion purgatus Say.

Ichneumon. Rpt. XIX., Ont. Ent. Soc., 1888. Fletcher, Ontario, on pupa.

Marumba modesta Harris.—Pachysphinx modesta Harr.

Winthemia quadripustulata Fab.

Tachinid. Entomological Record, Ont. Ent. Soc., 1903, p. 99. Gibson, St. John, New Brunswick.

Megachile brevis Say. Leaf Cutter Bee.

Leucospis affinis Say.

Chalcid. Rpt. XVII., Ont. Ent. Soc., 1886, p. 52. Guignard, Ottawa, Ontario, on larva.

Megachile centuncularis L. Leaf Cutter Bee.

Semiotellus cupreus Prov.

Chalcid. Rpt. XVII., Ont. Ent. Soc., 1886, p. 52. Guignard. Ottawa, Ont., on larva.

Meromyza americana Fitch. (Causing " Silver Top " in grass.)

Coelinius meromyzæ Forb.

Braconid. Rpt. XXII., Ont. Ent. Soc., 1891, p. 13. Bethune. Ont.

Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1887, p. 68. Fletcher. Ottawa, Ont.

Monarch Butterfly.

See Anosia.

Monohammus confusor. The Pine Borer.

Rhyssa persuasoria (L.) Grav.

Ichneumon. Faune. Ent. Canada. 1883. p. 448. Provancher. Quebec.

Monohammus scutellatus. The Pine Borer.

Rhyssa persuasoria (L.) Grav.

Ichneumon. Faune. Ent. Canada, 1883, p. 418. Provancher, Que.

Mononychus vulpeculus. The Iris Pod Weevil.

? Pimpla pterelas (Say) Walsh.

Ichneumon. Rpt. XXI., Ont. Ent. Soc., 1890, p. 69. Harrington, Ottawa, Ont.

? Pimpla inquisitoriella D.T. Recorded as Inquisitor Say.

Ichneumon. Rpt. XLI., Ont. Ent. Soc., 1910, p. 31. Fyles, Hull, Que.

Nematus erichsonii. The Larch Sawfly.

Coelopisthia nematicida Pack.

Chalcid. Bull. 10, 2nd Series, Div. of Ent., Dom. Can., Dept. Agr., Hewitt, on pupa, Ottawa, Ont.

Noctua c-nigrum Linn. The Spotted Cutworm.

Euplectrus frontalis How.

Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1900, p. 228. Fletcher, Ontario.

Notolophus antiqua Linn. The Rusty Tussock Moth.

Telenomus dalmanii (Ratz) Mayr.

Proctotrupid. Rpt. XLI., Ont. Ent. Soc., 1910, Ent. Record, p. 118. Gibson, ex egg, Little Bras d'Or, Cape Breton, N.S.

Oak Looper.

See Therina.

Orgyia sp.

Telenomus orgyiæ Fitch.

Proctotrupid. Bull. 45, U.S.N.A., p. 53. Ashmead, per Harrington, Ottawa, Ontario, on egg.

Ostræformis Scale.

See Aspidiotus.

Oyster Shell Bark Louse.

See Lepidosaphes.

Papilio eurymedon Boisd.

Trogus fletcheri Harrgt.

Ichneumon. Rpt. XXXVIII., Ont. Ent. Soc., 1907, p. 128, on pupa, Wellington, B.C. Taylor.

Trogus fulvipes Cress.

Ichneumon. Entomological Record, Ont. Ent. Soc., 1907, p. 16. Gibson (Cockle). Kaslo, B.C. Ex pupa.

Pamphila metacomet Harr.

Telenomus pamphilæ Ash.

Proctotrupid. Rpt. XXV., Ont. Ent. Soc., 1894, p. 4. Fletcher, Ottawa, Ont.

Papilio polyxenes Fab. The Celery Caterpillar.

Trogus vulpinus (Syn. Exesorius).

Ichneumon. Faune. Ent. Canada, 1883, p. 303. Provancher, Que.
Rpt. XXI., Ont. Ent. Soc., 1890, p. 66. Harrington, Ont.

Papilio troilus Linn.

Trogus fulvipes Cress.

Ichneumon. Rpt. XL., Ont. Ent. Soc., 1909, p. 82, on pupa. Fyles, Que.

Papilio turnus L.

Trogus fulvipes Cress.

Ichneumon. Rpt. XXXVIII., Ont. Ent. Soc., 1907, p. 128, on pupa. Digby, N.S. Aweme, Man. Fletcher.

Entomological Record, Ont. Ent. Soc., 1907, Gibson, Digby, N.S. Aweme, Man.

Trichogramma intermedium How.

Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1892, p. 160. Fletcher, on egg, Ottawa, Ont.

Peridroma saucia Hbn. The Variegated Cutworm.

Meteorus vulgaris Cress.

Braconid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1900, p. 226. Fletcher, Vancouver, B.C.

Phytophaga destructor Say. The Hessian Fly.

Merisus destructor (Say) Ril.

Chalcid. Rpt. II., Ont. Ent. Soc., 1871, p. 394. Bethune, Ont., on pupa.

Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1889, p. 63. Fletcher, Thornbury, Ont., and Prince Edward Island.

Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1899, p. 169. Fletcher, Portage la Prairie, Man.

Homoporus subapterus Ril.

Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1889, p. 63. Fletcher, Thornbury, Ont.

Platygaster sp. (? herricki) Pack.

Proctotrupid. Rpt. II., Ont. Ent. Soc., 1871, p. 394. Bethune, Ont., on egg.

Polygnotus hiemalis (Forb.) Ash.

Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1899, p. 169. Fletcher, Emerson, Man.

Tetrastichus productus Ril.

Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1899, p. 169. Fletcher, Prince Edward Island.

Entedon? metallicus (Nees) Walk.

Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1899, p. 169. Fletcher, Prince Edward Island.

Eupelmus allynii French.

Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1899, p. 169. Fletcher, Prince Edward Island.

Phorbia (Pegomyia) brassicæ Bouche. The Cabbage Root Maggot.*

Trybliographa anthomyiæ.

Cynipid, 5th Annual Rpt. Quebec Society for the Protection of Plants, 1913-1914, p. 41. Du Porte, Macdonald College, Que.

Aleochara anthomyiæ Sprague.

Staphilinid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1890, p. 164. Fletcher, Ottawa, Ont.

*(Note.—Parasites of this insect are under consideration in a bulletin on Root Maggots now in course of preparation in the Entomological Branch, Ottawa, by Gibson and Treherne, January, 1916.)

PACHYCREPOIDEUS DUBIUS Ashm.

Chalcid. Rpt. XLI., Ont. Ent. Soc. Ent. Record, 1910, p. 118. Gibson. ? Puparia, Ottawa, Ont.

Pigeon tremex.

See tremex.

Pine Borer.

See Monohammus.

Pine Leaf Scale.

See Chionaspis.

Plum Scale.

See Eulecanium.

Plum Curculio.

See Conotrachelus.

Plum Gouger.

See Coccotorus.

Plutella maculipennis Curt. The Diamond Back Moth.

LIMNERIUM PARVUM (Prov.) D. T.

Ichneumon. Rpt. XXX., Ont. Ent. Soc., 1899, p. 108. Fletcher, Ottawa, Ont.

Rept. Dom. Ent. Cen. Exp. Farm, Canada, 1890, p. 167. Fletcher. Generally distributed throughout Canada.

PHÆOGENES DISCUS Cress.

Ichneumon. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1890, p. 167. Fletcher, Indian Head, Sask.; Ottawa, Ont.

Polyphemus moth.

See Telea.

Polygonia interrogationis Fab.

PTEROMALUS VANESSÆ Harris.

Ichneumon. Rpt. III., Ont. Ent. Soc., 1872, p. 32. Bethune. Ontario, on pupa.

Pontia rapæ Linn. The Cabbage White.

PTEROMALUS PUPARUM (L) Swed.

Ichneumon. Can. Ent. Nov., 1871, Vol. III., No. 10. Lintner, introduction report.

Rpt. VI., Ont. Ent. Soc., 1875, p. 32. Saunders, Eastern Canada, on pupa.

Rpt. VII., Ont. Ent. Soc., 1876, p. 40. Saunders, London, Ont.

Rpt. VIII., Ont. Ent. Soc., 1877, p. 5. Saunders, review of distribution.

Powder Post Beetle.

See Lyctus.

Protoparce quinquemaculata How. The Tomato Sphinx.

APANTELES CONGREGATUS (Say) Prov.

Braconid. Rpt. XXIV., Ont. Ent. Soc., 1893, p. 27. Harrington, Ont.

Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1892, p. 161. Fletcher, generaally distributed over Western Ontario, ex pupa.

Pteronus ribesii Scop. The Imported Currant Worm.

HEMITELES NEMATIVORUS Walsh.

Ichneumon. Can. Ent. Vol. II., No. 2, Oct., 1869, p. 11. Walsh, Ont.

Rpt. II., Ont. Ent. Soc., 1871. Saunders (Bethune), Port Hope, Ont.

CHÆTOSTRICHA (TRICHOGRAMMA) sp. (near pretiosa) Ril.
Chalcid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1892, p. 159. Fletcher, on egg, Arnprior, Ont.

Pulvinaria innumerabilis Rath. The Cottony Maple Scale.
COCCOPHAGUS LECANII Smith.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.
COCCOPHAGUS FLAVOSCUTELLUM Ashm.
Chalcid. Rpt. XLI., Ont. Ent. Soc., 1910, p. 75. Eastham, Guelph, Ont.

Pyrameis cardui. The Painted Lady.
ICHNEUMON RUFIVENTRIS Brulle.
Ichneumon. Rpt. XI., Ont. Ent. Soc., 1881, p. 29. Huestis, St. John, N.B., on larva.

Raspberry aphis.
See Aphis.

Red Humped Apple Tree Caterpillar.
See Schizura.

Rose Scale.
See Aulacaspis.

Rusty Tussock Moth.
See Notolophus.

Samia cecropia Linn. The Cecropia Moth.
CRYPTUS NUNCIUS Say.
Ichneumon. Rpt. XXV., Ont. Ent. Soc., 1894, p. 55. Harrington, Ont., on larva.

San José Scale.
See Aspidiotus.

Schizura concinna S. & A. Red Humped Apple Tree Caterpillar.
OPHION PURGATUS Say.
Ichneumon. Rpt. Dom. Ent. Exp. Farm, Canada, 1887, p. 34. Fletcher, Ont.
LIMNERIUM GUIGNARDII (Prov.) D. T.
Ichneumon. Rpt. Dom. Ent. Exp. Farm, Canada, 1887, p. 34. Fletcher, Ottawa, Ont.
Also Nova Scotia, Rpt. Dom. Ent. 1906, p. 228.

Scolytus (Eccoptogaster) rugulosus Ratz. The Shot Hole Borer.
CHIROPACHYS COLON (L) Westw.
Chalcid. Rpt. XL., Ont. Ent. Soc., 1909, p. 18. Caesar, St. Catharines, Ont.

Scurfy Scale.
See Chionaspis.

Shot Hole Borer.
See Scolytus.

Syrphus ribesii L.
BASSUS ALBOSIGNATUS Grav. (Lœtatorius Fab.)
Ichneumon. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1899, p. 172. Fletcher, Ottawa, Ont.

Telea Polyphemus Cram. The Polyphemus Moth.
CRYPTUS NUNCIUS Say. (Syn. extrematis.)
Ichneumon. Faune. Ent. Canada, Hym. 1883, p. 340. Provancher, Que.

Rpt. XXI., Ont. Ent. Soc., p. 67. Harrington, Ont.

OPHION MACRURUS (L) Westw. (Syn. macrurum.)

Ichneumon. Faune. Ent. Canada, 1883, p. 350. Provancher, Que.

Rpt. III., Ont. Ent. Soc., 1872, p. 40. Reed, London, Ont.

Rpt. XXI., Ont. Ent. Soc., 1890, p. 67. Harrington, Ottawa, Ont.

Tent Caterpillar.

See Malacosoma.

Therina somniaria Hulst. Vancouver Island Oak Looper.

ICHNEUMON CESTUS Cress.

Ichneumon. Rpt. Dom. Ent. Cen. Exp. Farm, Canada. Fletcher, 1890, p. 177. Victoria, B.C.

PIMPLA ELLOPIÆ Harrington.

Ichneumon. Can. Ent. Vol. XXIV., 1892, p. 99. Harrington, Victoria, B.C., ex pupa.

Rpt. Dom. Ent. Cen. Exp. Farm, Canada. Fletcher, 1892, p. 160.

PIMPLA ONTARIO Cress.

Ichneumon. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1904, p. 245. Fletcher, Victoria, B.C.

PIMPLA SCRIPTIFRONS Cress.

Ichneumon. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1905, p. 194. Fletcher, Victoria, B.C.

TELENOMUS sp.

Proctotrupid. Rpt. Dom. Ent. Cen. Exp. Farm, Canada, 1892, p. 160. Fletcher, on egg, Victoria, B.C.

Tmetocera ocellana Schiff. The Bud Moth.

PIMPLA CONQUISITOR (Say) Ril.

Ichneumon. 7th Ann. Rpt. Quebec Society for Protection of Plants, 1914-1915, p. 76. Du Porte, Macdonald College, Que.

PENTARTHRON MINUTUM Ril. Syn. Trichogramma pretiosa Ril.

Chalcid. 7th Ann. Rpt. Quebec Society for Protection of Plants, 1914-1915. Du Porte, Macdonald College, Que., ex eggs.

BASSUS EARINOIDES Cress.

Ichneumon. 7th Ann. Rpt. Quebec Society for Protection of Plants, 1914-1915. Du Porte, Macdonald College, Que.

Tomato Sphinx.

See Protoparce.

Tortrix (Harmologa) fumiferana. The Spruce Bud-worm.

PENTARTHRON MINITUM.

Chalcid. Rpt. XLII., Ont. Ent. Soc., 1911, p. 26. Hewitt, on egg, Ottawa, Ont., Esquimalt, B.C., in Que.

APANTELES, sp.

Braconid. Rpt. XLII., 1911, p. 26. Hewitt, in Quebec and British Columbia.

APANTELES FUMIFERANÆ Viereck.

Braconid. Ent. Rec., 1912, p. 134, Ont. Ent. Soc. Quebec.

NASONIA TORTRICIS Brues.

Rpt. XLI., Ont. Ent. Soc., Gibson, 1910, p. 118, ex pupa, Baskatong, Que.

Tremex Columba Pigeon Tremex.

MEGARHYSSA LUNATOR (Fabr.) D. T.

Ichneumon. Faune. Ent. Canada, 1883, p. 446. Provancher, Que.

Can. Ent. 1882, p. 82. Harrington, Ottawa, Ont.

MEGARHYSSA ATRATA (Fabr.) D. T.
Ichneumon. Faune. Ent. Canada, 1883, p. 444. Provancher, Que. Can. Ent. 1882, p. 82. Harrington, Ottawa, Ont.

Trichotaphe levissella Fyles.
HEMITELES MUERONATUS Prov.
Ichneumon. Rpt. XXXIII., Ont. Ent. Soc., 1902, p. 28. Fyles, Que.
LAMPRONOTA MARGINATA Prov.
Ichneumon. Rpt. XXXVIII., Ont. Ent. Soc. Ent. Record, 1907, p. 128. Gibson (Fyles) Levis, Que.

Tussock Moth.
See Hemerocampa.

Vanessa antiopa Linn. Mourning Cloak.
PTEROMALUS PUPARUM (L) Swed.
Ichneumon. Rpt. XXI., Ont. Ent. Soc., 1890, p. 72. Harrington, Ottawa, Ont.

Willow Saw Fly.
See Cimbex.

Willow Scale.
See Chionaspis.

Wheat Joint Worm.
See Isosoma.

Zebra Caterpillar.
See Mamestra.

THE ENTOMOLOGICAL RECORD, 1915.

Arthur Gibson, Chief Assistant Entomologist, Department of Agriculture, Ottawa.

It is gratifying to be able to state that the collection and study of insects is gradually but surely increasing every year in the different provinces of Canada. This, I think, is largely owing to the fact that economic, or applied, entomology is more and more receiving its due recognition. The importance of local collections of insects to the economic entomologist is indeed of great value, providing, as they do, definite information as to distribution, etc. At Ottawa, as we have previously stated, due provision has been made for a national collection of the insects of Canada, and collectors generally could aid materially in building up this collection by forwarding donations of specimens.

During 1915 much material collected in previous years has been worked over by specialists, in addition to which large collections have been made during the past season in most of the provinces. Many of these are new records for Canada, while the capture of others in certain districts or provinces extend the known range of their distribution.

As in years past we have received invaluable assistance in the determination of many specimens from the recognized authorities in the United States and elsewhere. Our special thanks are due to Dr. L. O. Howard and his associates at Washington—Dr. Dyar, Dr. Banks, Messrs. Schwarz, Crawford, Busck, Rohwer, Gahan and Knab; Sir George F. Hampson, of the British Museum; Prof. H. F. Wickham, of Iowa City, Iowa; Mr. E. P. Van Duzee, of Berkeley, Cal.; Dr. Henry Skinner, of Philadelphia; Col. Thos. L. Casey, of Washington, D.C.; Mr. C. W. Johnson, of Boston, Mass.; Mr. Chas. Liebeck, of Philadelphia, Pa.; Prof. H. S. Hine, of Columbus, Ohio; Dr. J. M. Aldrich, of La Fayette, Ind.; Mr. Chas. W. Leng, of New York, N.Y.; Dr. W. G. Dietz, of Hazleton, Pa.; Dr. F. C. Fall, of Pasadena, Cal.; Mr. M. C. Van Duzee, of Buffalo, N.Y.; Mr. C. A. Frost, of South Framingham, Mass.; Dr. E. C. Van Dyke, of Berkeley, Cal.; Mr. J. R. de la Torre Bueno, of White Plains, N.Y.; Mr. F. H. Wolley-Dod, of Midnapore, Alta., and Dr. E. M. Walker, of Toronto, Ont.

Literature.

Among the books, memoirs, etc., which have appeared during 1915, and which are of interest to Canadian students, the following should be mentioned:

Bethune, Rev. Prof. C. J. S. Bibliography of Canadian Entomology for the year 1913; Ottawa, Trans. Royal Soc. of Canada, Third Series—1914, Vol. VIII, Section IV, 1914. In this contribution references are given to 151 papers; 42 of these relate to Economic Entomology, 18 to General Entomology, 18 to Lepidoptera, 21 to Diptera, etc.

Banks, Nathan. The Acarina or Mites; a review of the group for the use of economic entomologists: United States Department of Agriculture, office of the secretary, Report No. 108. Received December 28th, 1915. This is indeed a very useful contribution of 153 pages. In the introduction information is given on the structure, life-history, classification, etc. Then follows a lengthy discussion on the different families, and many keys are given. Notes on collecting, preserving and rearing mites are given on pages 141 and 142, and on pages 143-145 a list of works, useful in the study of American Acarina, is given.

BRAUN, ANNETTE FRANCES. Evolution of the color pattern in the Microlepidopterous Genus Lithocolletis: Journal of the Academy of Natural Sciences of Philadelphia, Vol. XVI, Second Series, Philadelphia, pp. 105-168, plates III and IV, 26 text figures. A separate of this article (issued February 12th, 1914) has recently been received. Under "Methods and Observations" the author discusses (a) Systematic Position and Characteristics of Lithocolletis, (b) Color Classes Represented and Structure of Scales, (c) Comparative Study of the Adult Markings, (d) Ontogenetic Development of the Color Pattern and (e) Phylogenetic Development of the Color Pattern. The two plates, in colors, at the end of the article well illustrate the various species of the genus. The paper is a most interesting one and undoubtedly of much value.

BRUES, CHARLES T., and MELANDER, A. L. Key to the Families of North American Insects: published by the authors; Boston, Mass., and Pullman, Wash., 1915, pp. 1-140. As stated by the authors this manual brings together a brief, yet complete, key to the families of American insects, unhampered by more than the explanations needed to make such a tabulation available to the general student. It has been prepared to meet the requirements not alone of college courses in systematic entomology, but also of agricultural high schools and of physicians, fruit inspectors, the modern farmer, the nature lover, or anyone who is concerned with the practical identification of insects. This very useful work will undoubtedly be widely received. 18 full-page plates, illustrating structural characters, etc., are included.

CASEY, THOS. L. Memoirs on the Coleoptera, VI; published by the New Era Printing Company, Lancaster, Pa.; issued November 27th, 1915, pp. 1-460. The contents of this the sixth memoir by this well-known coleopterist consists of: Part I, A Review of the American Species of Rutelinæ, Dynastinæ and Cetoniinæ, pp. 1-394; Part II, Studies in some Staphylinid Genera of North America, pp. 395-450. A large number of new species are described, seventeen of which are from Canada.

FRACKER, STANLEY BLACK. The Classification of Lepidopterous Larvæ, with ten plates: Illinois Biological Monographs, No. 1, Vol. II, July, 1915; published by the University of Illinois, under the auspices of the Graduate School, Urbana, Ill., pp. 1-169, (contribution No. 43, from the Entomological Laboratory of the University of Illinois). This contribution is divided into two sections, namely, Part one—The Homology of the Setæ, and Part two—Systematic Outline of Families and Genera. The work is a most interesting one. The author in Part One suggests the adoption of Greek letters in place of the Roman numerals now generally used to designate the different tubercles. In the second part, family and generic keys are given, based on larval characters. The plates at the end illustrate arrangement of setæ, etc. This contribution is indeed a valuable one and will doubtless receive much consideration from lepidopterists generally.

HAMPSON, SIR GEORGE F. (BART). Catalogue of the Lepidoptera Phalaenæ in the British Museum; Supplement, Vol. I, Catalogue of the Amatidæ and Arctiadæ, (Nolinæ and Lithosianæ). Received 19th January, 1915. Since the publication of the first two volumes of the "Catalogue of Moths" a large number of species in the families of which they treat have been described, and the newly published supplement brings the subject matter of Vols. I and II up to date. In the Family Amatidæ, 29 species are described as new, none of which, however, are from North America. In the Arctiadæ, descriptions of 122 new species appear—all exotic. Plates, in colours, numbered I to XLI accompany the volume.

HERRICK, GLENN W. Insects Injurious to the Household and Annoying to Man. New York, The Macmillan Company, pp. 1-470. This book which appeared late in 1914, was written particularly for the housekeeper and for those who desire information regarding household pests and practical methods of controlling them. The work is a valuable one and will certainly prove a handy volume of reference. It is profusely illustrated and is one of the Rural Science Series.

HOLLAND, W. J. The Butterfly Guide: a pocket manual for the ready identification of the common species found in the United States and Canada. Published by Doubleday, Page & Co., New York. This pocket guide is similar in form to the popular bird, flower and tree guides. It consists of 237 pages and is illustrated with 295 colored figures, representing 255 species and varieties. There are also five plates, in explanation of structure, venation, metamorphosis, and the apparatus required for collecting, rearing and mounting specimens. This convenient little manual should have a ready sale among nature lovers generally.

HOPKINS, A. D. Contributions Toward a Monograph of the Scolytid Beetles; Part II, Preliminary Classification of the Superfamily Scolytoidea. Tech. Series No. 17, United States Department of Agriculture, Bureau of Entomology; issued January 9th, 1915. The author states in the introduction that the object of this contribution is to discuss the taxonomy and present a preliminary classification of the families and subfamilies of the scolytid beetles of the world. The discussion and classification are based on a study of representatives of about 122 described and undescribed genera, and about 1,000 species of North America and other countries, in the collections of the United States National Museum and other institutions.

HOWARD, L. O., DYAR, H. G. and KNAB, F. The Mosquitoes of North and Central America and the West Indies—Vol. Three, Systematic Description, Part I; Washington, D.C. Published by the Carnegie Institution of Washington, pp. 1-523. This sumptuous volume of descriptive matter appeared in October, 1915. The species of the tribes Sabethini and Culicini are described. Most of these are southern in distribution. Several species are described as new. Canadian records of nine species are given. Short chapters precede the descriptive matter, namely: "Mosquitoes, Their Definition and Position in the Classification of Insects," "Statement of Some of the Characters used in the Tables," "Outline of the Geographical Area Covered" and "Historical Sketch of the Classification of Mosquitoes."

MALLOCH, JOHN R. The Chironomidæ, or Midges, of Illinois, with particular reference to the species occurring in the Illinois River; Bulletin of the Illinois State Laboratory of Natural History, Urbana, Ill., Article VI, Vol. X, May, 1915, pp. 275-538, plates XVII-XL. The opening chapters discuss "Methods of Collecting," "Methods of Rearing," "Methods of Preservation," "Synonymy Affecting Family Names" and "Biology and Taxonomy." Keys to the subfamilies follow, with a treatment of the Ceratopogoninæ, the Tanypinæ and the Chironominæ. The distribution of the Chironomidæ in the Illinois River is then stated and also a summary given of Illinois genera and species in comparison with those recorded for other states. Many species are described as new and a number of Canadian references given. The plates illustrate structural detail.

MORLEY, CLAUDE. A Revision of the Ichneumonidæ based on the collection in the British Museum (Natural History), Part IV, Tribes Joppides, Banchides and Alomyides: British Museum (Natural History), 1915, pp. 167. 1 plate, coloured. Part I appeared in 1912, Part II, in 1913, and Part III, in 1914. In Part IV, issued in March, 1915, 459 species are included, 40 of which are described as new. Records are given of a number of species from Canada which are in the British Museum, one of which is described as new.

PACKARD, The late ALPHEUS SPRING. Monograph of the Bombycine Moths of North America, Including their Transformations and Origin of the Larval Markings and Armature; Part III, Families Ceratocampidæ, Saturniidæ, Hemileucidæ and Brahmæidæ. Vol. XII, First Memoir, National Academy of Sciences, Washington, D.C., 516 pp., 4to, 113 plates, 34 of which depicting larvæ are colored. Edited by T. D. A. Cockerell. This, the third part of the late Dr. Packard's work on the Bombycine Moths, appeared in the first half of the year. It is indeed a most valuable contribution and one which will be welcomed by lepidopterists everywhere as the species described are not confined to North America but occur in various parts of the world. The successful issue of this sumptuous volume is largely due to Prof. Cockerell, who undertook to edit it.

RILEY, W. A., and JOHANNSEN, O. A. Handbook of Medical Entomology; Ithaca, N.Y., The Comstock Publishing Company, 1915, pp. 1-348. This handbook will be found of much value to those of our students who are interested in the study of medical entomology. It is an outgrowth of a course of lectures along the lines of insect transmission and dissemination of diseases of man, given by the senior author in the Department of Entomology of Cornell University, during the past six years. More especially is it an illustrated revision and elaboration of his "Notes on the Relation of Insects to Disease," published in January, 1912.

THOMPSON, MILLETT TAYLOR. An Illustrated Catalogue of American Insect Galls. Edited by E. P. Felt. Published and distributed by the Rhode Island Hospital Trust Company. Received, 26th June, 1915. This catalogue is divided into: Part I, Classification by Galls, and Part II, Classification by Genera. Both of these parts treat of the Cynipidæ. On pages 50 to 66 a "Supplemental List of American Gall-making Insects" is given. At the end of the volume are 21 plates, illustrating 247 different kinds of galls. These are from photographs and are splendid reproductions. This catalogue is an important contribution. It is to be regretted that only a portion of Dr. Thompson's investigation was completed at the time of his death.

WINN, A. F. and BEAULIEU, GERMAIN. A Preliminary List of the Insects of the Province of Quebec: Part II, Diptera. Published as a supplement to the 7th Report of the Quebec Society for the Protection of Plants; received 14th June, 1915. This publication of 159 pages is a welcome one and will undoubtedly be of much value to Canadian students of diptera. It is indeed a very creditable contribution. Under each genus the species known to occur in the Province of Quebec are listed, the definite localities and months of capture being recorded. A short introductory paragraph precedes each family.

COLLECTORS.

The following is a list of the names and addresses of collectors heard from during 1915:

Baird, Thos., High River, Alta.
Beaulieu, G., Ent. Branch, Dept. Agr., Ottawa.
Beaulne, J. I., Ent. Branch, Dept. Agr., Ottawa.
Bethune, Rev. Prof., O.A.C., Guelph.
Blackmore, E. H., Victoria, B.C.

Bowers, H. L., Oshawa, Ont.
Brimley, J. F., Wellington, Ont.
Brittain, W., Agric. College, Truro, N.S.
Bush, A. H., 1105 Broadway, Vancouver, B.C.
Caesar, L., O.A.C., Guelph, Ont.
Carr, F. S., Edmonton, Alta.
Chagnon, Gus., Box 521, Montreal.
Chagnon, W., St. John's, Que.
Chrystal, R. N., Ent. Branch, Dept. Agr., Ottawa.
Cockle, J. W., Kaslo, B.C.
Cosens, Dr A., Parkdale Collegiate Institute, Toronto.
Crew, R. J., 561 Carlaw Ave., Toronto.
Criddle, Evelyn, Aweme, Man.
Criddle, Norman, Aweme, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Dod. F. H. Wolley-, Midnapore, Alta.
Dunlop, James, Woodstock, Ont.
Emile, Rev. Bro., Longueuil, Que.
Evans, J. D., Trenton, Ont.
Fyles, Rev. Dr. T. W., 268 Frank St., Ottawa.
Germain, Rev. Bro., Three Rivers, Que.
Gibson, Arthur, Ent. Branch, Dept. Agric., Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Hanham, A. W., Duncan, B.C.
Harrington, W. H., P. O. Dept., Ottawa.
Hewitt, Dr. C. Gordon, Ent. Branch, Dept. Agric., Ottawa.
Hudson, A. F., Millarville, Alta.
Johnson, Geo. S., Moose Jaw, Sask.
Kitto, V., Inland Revenue, Dept. Interior, Ottawa.
Leavitt, A. G., St. John, N.B.
Macnamara, Chas., Arnprior, Ont.
McIntosh, W., St. John, N.B.
Mignault, Rev. J. B., Saint Lambert, Que.
Moore, G. A., 850 St. Hubert St., Montreal.
Perrin, Jos., McNab's Island, Halifax, N.S.
Petch, C. E., Hemmingford, Que.
Phair, A. W. H., Lillooet, B.C.
Ruhmann, Max M., Vernon, B.C.
Ross, W. A., Vineland Station, Ont.
Roy, Henri, Quebec, Que.
Sanders, G. E., Bridgetown, N.S.
Sanson, N. B., Banff, Alta.
Simpson, W., Dominion Observatory, Ottawa.
Simms, H. M., 192 Ontario East, Montreal.
Sladen, F. W. L., Experimental Farm, Ottawa.
Strickland, E. H., Experimental Station, Lethbridge, Alta.
Swaine, J. M., Ent. Branch, Dept. Agric., Ottawa.
Tams, W. H. T., Midnapore, Alta.
Taverner, P. A., Victoria Memorial Museum, Ottawa.
Tothill, J. D., Fredericton, N.B.

Treherne, R. C., Agassiz, B.C.
Venables, E. P., Vernon, B.C.
Walker, Dr. E. M., Univ. of Toronto, Toronto.
Wallis, J. B., 265 Langside St., Winnipeg, Man.
Whitehouse, F. C., Red Deer, Alta.
Willing, Prof. T. N., Univ. of Saskatchewan, Saskatoon, Sask.
Wilson, Tom, 1105 Broadway, Vancouver, B.C.
Winn, A. F., 32 Springfield Ave., Westmount, Que.
Young, C. H., Victoria Memorial Museum, Ottawa.

NOTES OF CAPTURES.

(Species preceded by an asterisk (*) described during 1915.)

Lepidoptera.

(Arranged according to Dyar's List of North American Lepidoptera, U.S. Nat. Museum Bull. No. 52.)

(Dyar's number.)

Papilionidæ.

16. *Papilio machaon* var. *aliaska* Scudd. Fort Chipewyan, Alberta, June 18, 1914, (F. Harper).

Sphingidæ.

730. *Smerinthus cerisyi* Kirby. Murray Bay, Que., July, (J. H. Holmes). Rare in Quebec Province. In Winn's list only two localities given—Cowansville and Montreal, (Gibson).

Saturniidæ.

766. *Pseudohazis hera* Harr. Recently I received a specimen of this species taken at Lillooet, B.C., (Phair). It is almost a perfect match to the specimen figured by Strecker on Plate XV of his Lepidoptera, Rhopaloceres and Heteroceres. Mr. Phair reported that he has only found the species where there is sage bush. Mr. Tom Wilson has also taken the insect at the same place. These are the first records I have for British Columbia, (Gibson).

Arctiidæ.

861. *Phragmatobia assimilans* Walk., var. *franconia* Slosson. Several at light, on Pine Creek, near Millarville, Alta., April 29, (Dod and Tams).

883. *Apantesis quenselii* Paykull. 141 Meridian, north of Mount Natazhat, July 1, 1913, (E. W. Nesham).

889. *Apantesis williamsii determinata* Neum. St. Agath, Que., June 25, 1910, (L. Gibb).

Noctuidæ.

996. *Apatela manitoba* Sm. Kaslo, B.C., (Cockle). First record from British Columbia.

1049. *Arsilonche henrici* Grt. Lethbridge, Alta., (Strickland). Rare in Alberta; the North American representative of European *albovenosa* (Dod).

Perigia albimacula B. & McD. Kaslo, B.C., (Cockle).

1145. *Hillia vigilans* Grt. Red Deer, Alta., Sept. 2, (Whitehouse and Tams).

1212. *Hadena passer* var. *incallida,* Walk. Lethbridge, Alta., (Strickland). This is the form with the ground colour pale ochreous. It has often passed in collections as *morna* Strk., (Dod).

1266. *Polia contacta* Walk. Kaslo, B.C., (Cockle).

1271. *Polia acutissima* Grt. Red Deer, Alta., Sept. 3, (Whitehouse and Tams). This is a prior name for *medialis* Grt. As it happens, the type of *acutissima* has the t.a. and the t.p. lines more deeply dentate than type *medialis.* The species has often been recorded from the West under the name of *confragosa* Morr., the correctness of which cannot at present be ascertained, (Dod).

1277. *Drycbota illocata* Walk. Red Deer, Alta., Sept. 4, (Whitehouse and Tams). New to Alberta, (Dod).

1297. *Heliotropha reniformis* Grt. Pine Creek, near Millarville, Alta., Aug. 27, (Tams). First record for this district, (Dod).

1324. *Oncocnemis hayesi* Grt. Kaslo, B.C., (Cockle).

Oncocnemis poliochroa Hamps. Kaslo, B.C., (Cockle).

1329. *Oncocnemis tenuifascia* Sm. Kaslo, B.C., (Cockle).

1331. *Oncocnemis levis* Grt. Lethbridge, Alta., (Strickland). Very rare in Canada, previously taken in the same locality by Mr. Wallis.

1339. *Oncocnemis riparia* Morr. Lethbridge, Alta., (Strickland).

Noctua dislocata Sm. Pine Creek, near Millarville, Alta., June 27, (Brill and Tams). Mr. Tams has prepared mounts of the genitalia of this and *calgary* and finds them very distinct. Those of *dislocata* are exactly like those of British *conflua,* whilst superficially *conflua* is much nearer to *calgary* than to *dislocata,* (Dod).

1483. *Noctua jucunda* Walk. St. John's, Que., (W. Chagnon). Only one record, "Meach Lake," in Winn's Quebec list. This latter is about 170 miles distant from St. John's, (Gibson).

1492. *Noctua patefacta* Sm. Lethbridge, Alta., (Strickland).

* *Rhizagrotis querula* Dod. Red Deer River, about 50 miles to the north-east of Gleichen, Alta., July 1, 3, 1915; July, 23, 24, 1907, (Hudson and Dod). Can. Ent. XLVII, 36. Recorded in 1906 and 1907 Ent. Records as *lagena.*

1535. *Feltia robustior* Sm. Lethbridge, Alta., (Strickland). First Alberta Record, (Dod).

1547. *Feltia vancouverensis* Grt. Pine Creek, near Millarville, Alta., June 24, (Tams). This species has rarely been met with before from east of the Rockies, one or two only having been recorded from Alberta. Mr. Strickland has found it not uncommon at Lethbridge. As a rule, there is less contrast between the light and dark shades than in Vancouver Island specimens, the dark shades being paler and less purplish and the ground colour decidedly darker, but occasional specimens from the two localities are almost exactly alike, (Dod).

Euxoa (*Rhizagrotis*) *perolivalis* Sm. Lethbridge, Alta., (Strickland). This species was referred to *Rhizagrotis* by Smith, by reason of the male antennæ being ciliate merely. The character does not appear to be quite constant, and one of the Lethbridge males has the antennæ more obviously serrate than any I had before seen, (Dod).

Euxoa pestula Sm. Lethbridge, Alta., (Strickland). This species is very close indeed to *pleuritica* Grt., and may be a dark form of it, (Dod).

Euxoa thanatologia var. *sordida* Sm. Lethbridge, Alta., (Strickland). Breeding results, in conjunction with a study of Kaslo, B.C., material and previous examination of type, has convinced me that *boretha* Sm. and *sordida* Sm. are both forms of one extraordinarily variable species previously described as *Porosagrotis thanatologia* by Dyar, but best referred to *Chorizagrotis* Smith, which Hampson treats as merely a section of *Euxoa*, (Dod).

1589. *Euxoa sponsa* Sm. Kaslo, B.C., (Cockle).

1590. *Euxoa choris* var. *cogitans* Sm. Lethbridge, Alta., (Strickland).

1593. *Euxoa hollemani* Grt. Maple Bay, Vancouver Island, B.C., Aug. 24, (Day).

1672. *Euxoa pallipennis* Sm. (Syn. *alcosta* Sm.). Lethbridge, Alta., Aug. 21, 1914, (Strickland). A new Canadian record, (Dod).

1689. *Euxoa holoberba* Sm. Kaslo, B.C., (Cockle).

1801. *Mamestra trifolii* Rott. Lethbridge, Alta., Aug. 20, 1914, (Strickland). A new Alberta record, all previous records being my *mutata*, which Hampson claims is a *Cardepia*, very close to *nova* Sm., (Dod).

1849. *Mamestra segregata* Sm. Bow River, at the mouth of Fish Creek, Alta., April 17-24, (Tams). Pine Creek, near Millarville, Alta., April 1, (Dod), and May 8 (Tams). *Segregata* was described from Laggan. *Gussata* Sm. described from here, appears to be a synonym of this, and *negussa* Sm., also described from here a variety without the blackish markings. The species is very variable, the forms easily intergrading, and an examination of male genitalia gives no evidence suggesting two species, (Dod).

2021. *Graphiphora uniformis* Sm. Lethbridge, Alta., (Strickland). The first Alberta record. This species has usually stood as *furfurata* or *peredia* in Manitoba collections. The two latter names refer to one species, very closely allied to *uniformis* (Dod).

2031. *Graphiphora præses* Grt. Kaslo, B.C., (Cockle). Not in Dyar's Kootenai list.

2048. *Stretchia muricina* Grt. Midnapore, Alta., April 12, 16, 28, May 12, (Dod and Tams). I have previously recorded the form occurring here as *plusiæformis*, but whilst I have not so far recognized a distinct species under that name, I consider it probable that all Alberta and British Columbia specimens which I have seen are *muricina*, (Dod).

2067. *Cleoceris populi* Strk. Lethbridge, Alta., (Strickland).

Xylina vivida Dyar. Kaslo, B.C., (Cockle). Not in the Kootenai list.

2079. *Xylina petulca* Grt. Kaslo, B.C., (Cockle). Not in the Kootenai list.

2093. *Xylina ferrealis* Grt. Kaslo, B.C., (Cockle). Not in the Kootenai list.

2095. *Xylina innominata* Sm. Red Deer, Alta., Aug. 30, and Sept. 4, (Whitehouse and Tams). New to Alberta (Dod).

2113. *Xylina capax* G. and R. Blackfalds, Alta., Aug. 17-24, (Whitehouse). New to Alberta, (Dod).

2121. *Calocampa curvimacula* Morr. Kaslo, B.C., (Cockle). Recorded in B.C. list from Vancouver Island.

* *Papaipema humuli* Bird. Cartwright, Man.; Can. Ent. XLVII, 112.

2175. *Papaipema harrisii* Grt. Midnapore, Alta., bred from larvæ found in flower and leaf stems of *Heracleum lanatum*, emerged Aug. 18—Sept. 1, (Dod and Tams). This is the No. 368 of my Alberta list, formerly recorded as *impecuniosa* on Smith's authority. It was a great surprise to discover some numbers of the larvæ feeding close to my house, after I had been on the look out for it for years (Dod).

2205. *Conservula anodonta* Gn. Bondville, Que., July 20, (Winn). Rare in Quebec Province; only two localities given in Winn's list—St. Margaret and Meach Lake, (Gibson).

Orthosia aggressa Sm. Lethbridge, Alta., (Strickland). The first Alberta record. Described from Colorado and Cartwright, Man. Very close to *puta* Grt. (Syn. *euroa* Grt. and *dusca* Sm.), for a large specimen of which it might easily be taken. Its distinction is not unquestionable, (Dod).

2244. *Scopelosoma devia* Grt. Kaslo, B.C., (Cockle). Not in Dyar's Kootenai list.

2262. *Ipimorpha subvexa* Grt. Lethbridge, Alta., (Strickland). The first Alberta record. Recorded in last year's Record from Moose Jaw, Sask., (Dod).

2288. *Nycterophæta luna* Morr. Lethbridge, Alta., (Strickland).

2289. *Copablepharon grandis* Morr. Lethbridge, Alta., (Strickland).

2307. *Rhodophora florida* Gn. Lethbridge, Alta., (Strickland). First Alberta record, (Dod).

Autographa sansoni Dod. Kaslo, B.C., (Cockle). New to B.C. list.

2529. *Autographa snowi* Hy. Edw. Pine Creek, near Millarville, Alta., July 21, (Tams).

2846. *Catocala pura* Hulst. Red Deer and Blackfalds, Alta., Aug. 17 to Sept. 6, (Tams and Whitehouse). The species is very closely allied to *unijuga*, which occurs with it, but *pura* is more variable. It seems probable that *semirelicta* Grt. is the same species, though I am in doubt as to what exact forms the two names apply. According to Smith's catalogue, Grote repeatedly referred Hulst's name to his *semirelicta*, whilst Hulst persisted that the latter was a variety of *briseis*. Pale specimens of the latter are not unlike some forms of *pura*, (Dod).

2851. *Catocala mariana* Hy. Edw. Peachland, B.C., Aug. 6, 10, 1912, (Wallis). Dr. McDunnough informs me that as *mariana* is preoccupied in Europe, *edwardsi* Kuz. will have to be used instead, (Gibson).

3006. *Erebus odora* L. Although this southern species has previously been recorded from Quebec Province (Metis, Quebec, Montreal and Meach Lake), it is of interest to record the capture of a specimen at Newport, Gaspe Co., Que., Aug. 15, by Mrs. G. Chapados. The specimen was donated to the collection of the Ent. Branch by the collector through Miss J. McInnes (Gibson).

3072. *Bomolocha toreuta* Grt. Agassiz, B.C., Aug. 1 (Treherne).

Notodontidæ.

3150. *Schizura semirufescens* Walk. Agassiz, B.C., Aug. 1-15, (Treherne).

Geometridæ.

3236. *Nyctobia nigroangulata* Strk. Red Deer, Alta., April 18, (Whitehouse).

* *Hydriomena speciosata* var. *ameliata* Swett. Victoria, B.C., July 7, 9, 1914. (Blackmore); Can. Ent. XLVII, 64.

3387. *Hydriomena nubilifasciata* var. *cupidata* Swett. Quamichan district, B.C., May 22, 1914, new to B.C. list. Identified by Mr. Swett, who stated that this is a rare variety and rather unexpected from British Columbia. He had only seen the variety from California, (Day).

* *Hydriomena grandis* var. *saawichata* Swett. Victoria, B.C., May 5 to June 20, 1914, (Blackmore); Can. Ent. XLVII, 157.

3393. *Hydriomena edenata* Swett. Mt. Tzouhalem, B.C., Apl. 5, (Hanham).

3401. *Hydriomena multiferata* Walk. Midnapore, Alta. (de Mille's Lumber Mill), July 13, (Brill and Tams).

* *Stammodes blackmorei* Swett. Victoria, B.C., July 2-27, 1913; July 3, 1914, (Blackmore); Can. Ent., XLVII, 155.

* *Petrophora defensaria* var. *mephistaria* Swett. Victoria, B.C., Jan. 9, 1909; Ladysmith, B.C., Feb. 3, 1906, (C. Livingston); Victoria, B.C., (Blackmore); Can. Ent. XLVII, 156.

3450. *Xanthorhoe abrasaria* H.-S. Midnapore, Alta. (de Mille's Lumber Mill), July 13, (Brill and Tams).

3605. *Orthofidonia exornata* Walk. Pine Creek, near Millarville, Alta., May 6, (Tams).

3784. *Alcis sulphuraria* Pack. Lethbridge, Alta., (Strickland). The only previous Alberta record was one taken at Midnapore and recorded in the 1914 Ent. Record, (Dod).

3804. *Spodolepis substriaria* Hulst. Pine Creek, near Millarville, Alta., April 29, (Dod).

3867. *Lycia cognataria* Gn. Quamichan Lake, B.C., April 2, (Hanham).

3963. *Euchlæna astylusaria* Walk. Pine Creek, near Millarville, Alta., May 31, (Tams).

3976. *Synaxis pallulata* Hulst. Quamichan Lake, B.C., Sept. 15, (Hanham).

4016. *Sabulodes lorata* Grt. Lethbridge, Alta., (Strickland); only one specimen previously recorded from Alberta, (Dod).

4026. *Sabulodes transversata* Dru. Lethbridge, Alta., (Strickland). New to Alberta, (Dod).

4040. *Leucobrephos brephoides* Walk. Klutlan Glacier, elev. 5,500 feet, (141 Meridian, north of Mt. Natazhat), May 2, 1913, (E. W. Nesham). Mr. Dod tells me that this insect was common in 1915 on Pine Creek, near Millarville, Alta., April 7-10, (Tams), flying in sunshine, (A. G.).

Tortricidæ.

5207. *Episimus argutanus* Clem. Aweme, Man., reared from *Rhus toxicodendron*, (N. Criddle).

5367. *Archips negundana* Dyar. Aweme, Man., July 8, 1914, (N. Criddle).

5396. *Tortrix pallorana* Rob. Aweme, Man., July 16, 1914, (N. Criddle).

Yponomeutidæ.

5491. *Trachoma falciferella* Walsm. Quamichan Lake, B.C., March 21, the second I have captured, (Hanham).

Gelechiidæ.

Recurvaria nanella Hbn. Toronto, Ont., reared from pear, (Cosens), Bridgetown, N.S., July 30, (Sanders).

* *Gnorimoschema gibsoniella* Busck. Aweme, Man., (N. Criddle); Proc. Ent. Soc. Wash. XVII, 82.

Elachistidæ.

* *Coleophora manitoba* Busck. Aweme, Man., (N. Criddle); Proc. Ent. Soc. Wash., XVII, 88.

6179. *Walshia amorphella* Clem. Aweme, Man., July 25, 1914, (N. Criddle).

Tineidæ.

* *Incurvaria itoniella* Busck. Kaslo, B.C., (Cockle); Proc. Ent. Soc. Wash., XVII, 92.

Coleoptera.

(Arranged according to Henshaw's list of Coleoptera of America, North of Mexico.)

Cicindelidæ.

18c. *Cicindela longilabris* var. *montana* Lec. Athabaska Landing, Alta., Aug. 11, (Strickland).

34. *Cicindela pusilla* Say. Estevan, Sask., June 20, (N. Criddle).

Carabidæ.

408. *Bembidium dubitans* Lec. Vernon, B.C., April 10, (Ruhmann).

416. *Bembidium mutatum* G. & H. Agassiz, B.C., (Treherne).

422. *Bembidium trechiforme* Lec. Agassiz, B.C., (Treherne).

* *Trechus borealis* Schaeffer. Labrador, Battle Harbor, (Engelhardt); Bay of St. George, Newfoundland, (Engelhardt). Jour. N.Y. Ent. Soc. XXIII, 47.

510. *Pterostichus brunneus* Dej. Armstrong, B. C., Sept. 12, (Ruhmann).

558. *Pterostichus scitulus* Lec. Vernon, B.C., July, 1914. (Ruhmann).

571. *Pterostichus corvinus* Dej. Winnipeg, Man., April 29, 1911, (Wallis).

578. *Pterostichus mutus* Say. Winnipeg, Man., June 10, 1910, (Wallis).

643. *Amara adstrictus* Putz. Miami, Man., Aug. 14, 1914, (Wallis).

749. *Calathus advena* Lec. Vernon, B.C., Aug. 1914, (Ruhmann).

750. *Calathus impunctatus* Say. Husavick, Man., Aug. 2, 1912, (Wallis).

776. *Calathus piceolus* Lec. Winnipeg, Man., May 3, 1911, (Wallis).

818. *Platynus cupreus* Dej. Agassiz, B.C., (Treherne).

1067. *Discoderus parallelus* Hald. Peachland, B.C., July 24, 1912, (Wallis).

1084. *Harpalus faunus* Say. Winnipeg, Man., June 18, 1911, (Wallis).

1087b. *Harpalus longior* Kirby. Winnipeg, Man., June 2, 1911, (Wallis).

1090. *Harpalus fulvilabris* Mann. Winnipeg, Man., June 1, 1912, (Wallis).

1096. *Harpalus ventralis* Lec. Treesbank, Man., July 26, 1910; Miami, Man., July 1, 1914, (Wallis).

1106. *Harpalus lewisii* Lec. Miami, Man., July 21, 1914, (Wallis).

Amphizoidæ.

1215. *Amphizoa insolens* Lec. Peachland, B.C., July 13, 1912. (Wallis).

Staphylinidæ.

2124. *Staphylinus badipes* Lec. St. Rose, Que., April 22, 1914. (Beaulne).
* *Philonthus pumilio* Casey. Aweme, Man., (N. Criddle): Memoirs on the Coleoptera, VI, 431, by Thos. L. Casey, issued Nov. 27. 1915.
* *Philonthus nematocerus* Casey. Metlakatla, B.C., (Keen): Memoirs on the Coleoptera, VI, 437, by Thos. L. Casey, issued Nov. 27, 1915.
* *Philonthus ottawensis* Casey. Ottawa, Ont., (Harrington): Memoirs on the Coleoptera, VI, 438, by Thos. L. Casey, issued Nov. 27, 1915.
* *Philonthus cephalicus* Casey. Aweme, Man., (N. Criddle); Memoirs on the Coleoptera, VI, 438, by Thos. L. Casey, issued Nov. 27. 1915.
* *Philonthus linearis* Casey. Metlakatla, B.C., (Keen); Memoirs on the Coleoptera, VI, 439, by Thos. L. Casey, issued Nov. 27, 1915.
* *Philonthus vulgatus* Casey. Ottawa; Memoirs on the Coleoptera. VI. 442, by Thos. L. Casey, issued Nov. 27, 1915.
* *Philonthus finitimus* Casey. Hull, Que., (Beaulne): Memoirs on the Coleoptera, VI, 443, by Thos. L. Casey, issued Nov. 27, 1915.
* *Megaquedius manitobensis* Casey. Aweme, Man., (N. Criddle); Memoirs on the Coleoptera, VI, 423, by Thos. L. Casey, issued Nov. 27, 1915.
* *Quediochrus quadriceps* Casey. Aweme, Man., (N. Criddle); Memoirs on the Coleoptera, VI, 421, by Thos. L. Casey, issued Nov. 27, 1915.
* *Microsaurus curtipennis* Casey. Aweme. Man., (N. Criddle); Memoirs on the Coleoptera, VI, 414, by Thos. L. Casey, issued Nov. 27, 1915.
* *Microsaurus breviceps* Casey. Stikine River, B.C., (Wickham); Memoirs on the Coleoptera, VI, 411, by Thos. L. Casey, issued Nov. 27, 1915.
* *Microsaurus criddlei* Casey. Aweme, Man., (N. Criddle); Memoirs on the the Coleoptera, VI, 410, by Thos. L. Casey, issued Nov. 27, 1915.
* *Microsaurus canadensis* Casey. Kazubazua, Que., (Beaulne); Memoirs on the Coleoptera, VI, 409, by Thos. L. Casey, issued Nov. 27, 1915.
* *Distichalius oculens* Casey. Inverness, B.C., (Keen); Memoirs on the Coleoptera, VI, 407, by Thos. L. Casey, issued Nov. 27, 1915.
* *Distichalius agnatus* Casey. Aweme, Man., (N. Criddle); Memoirs on the Coleoptera, VI, 406, by Thos. L. Casey, issued Nov. 27, 1915.
Orus punctatus Casey. Agassiz, B.C., (Treherne).
2501. *Hesperobium californicum* Lec. Agassiz, B.C., (Treherne).
2863. *Anthobium pothos* Mann. Ottawa, Ont., May, 13, (Germain).

Phalacridæ.

3007. *Olibrus nitidus* Melsh. Ottawa, Ont., May 31, (Germain).

Corylophidæ.

Orthoperus brunneus Casey. Ottawa, May, (Germain).

Coccinellidæ.

Anatis lecontei Casey. Lethbridge. Alta., July 27, (Strickland).
3089. *Pentilia marginata* Lec. Ottawa, Ont., June 17, (Germain).

Corydiidæ.

3281. *Deretaphrus oregonensis* Horn. Peachland, B.C., July 13, 1912, (Wallis).

Cucujidæ.

3348. *Dendrophagus glaber* Lec. Bird's Hill, Man., May 6, 1911, (Wallis).

Cryptophagidæ.

3363. *Paramecosoma serratum* Gyll. Ottawa, Ont., June 27, 1914, (Germain).
3443. *Trogoderma tarsale* Melsh. Ottawa, Ont., July 12, 1914, (Germain).

Histeridæ.

3495. *Hister furtivus* Lec. Millarville, Alta., April, May, 1914, (Tams).
3533. *Epierus regularis* Beauv. Ottawa, Ont., July 3, (Germain).
3552. *Paromalus æqualis* Say. Husavick, Man., June 22, 1912; under debris on lake beach, (N. Criddle and Wallis).
3586a. *Saprinus distinguendos* Mars. Winnipeg, Man., June 1, 1912, (Wallis).
3588. *Saprinus infaustus* Lec. Peachland, B.C., July 19, 1912, (Wallis). Dr. Fall when determining the specimen stated that probably this beetle is the one that Horn mentions in his Synopsis as possibly a form of *infaustus*.
3602. *Saprinus incertus* Lec. Peachland, B.C., July 22, 1912, (Wallis).
3610. *Saprinus fimbriatus* Lec. Peachland, B.C., July 22, 1912, (Wallis).

Elateridæ.

4115. *Cardiophorus amplicollis* Mots. Grand Forks, B.C., 1913, (Ruhmann).
4252. *Drasterius livens* Lec. Grand Forks, B.C., 1913, (Ruhmann).
4415. *Paranomus estriatus* Lec. Ottawa, Ont., June 25, (Germain).

Throscidæ.

4548. *Throscus invisus* Horn. Ottawa, Ont., June 17, (Germain).

Buprestidæ.

10,112. *Agrilus masculinus* Horn. Aweme, Man., June 5, (N. Criddle).

Lampyridæ.

4914. *Silas munita* Lec. Vernon, B.C., April 8, (Ruhmann).

Malachidæ.

5030. *Malachius ulkei* Horn. Aweme, Man., May 31, (N. Criddle).

Ptinidæ.

Ptinus villiger Reit. Winnipeg, Man., May 17, 1911, (Wallis).
10,149. *Xestobium elegans* Horn. Winnipeg, Man., May 23, 1911, (Wallis).
5265. *Oligomerus obtusus* Lec. Ottawa, Ont., June 25, (Germain).

Scarabæidæ.

5439. *Canthon perplexus* Lec. Macleod, Alta., June 30, 1902, (J. Fletcher).
5510. *Aphodius hamatus* Say. Quebec, Que., (Roy).

5629. *Trox scaber* L. Miami, Man., July 1, 1914, (Wallis).

5648. *Hoplia laticollis* Lec. Aweme, Man., July, 1903 to 1910, (Criddle Bros.). First Canadian record we have.

Serica intermixta Blatchley. Aweme, Man., May 26, 1910, (E. Criddle).

5686. *Serica anthracina* Lec. Vernon, B.C., April 8, (Ruhmann).

5705. *Diplotaxis obscura* Lec. Aweme, Man., April, May, (Criddle Bros.).

Lachnosterna grandis Smith. Halifax, N.S., July 18, (Perrin). It is also interesting to record the capture of a specimen on Sable Island. A single specimen was received at Ottawa with a small collection of lepidoptera. Sable Island is about 140 miles due east of Guysborough County in Nova Scotia.

* *Anomala* (subq. *Paranomala*) *canadensis* Casey. Ontario, Canada; Memoirs on the Coleoptera, VI, 33, by Thos. L. Casey, issued Nov. 27, 1915.

* *Cremastocheilus pocularis* Casey. Aweme, Man., (Criddle); Memoirs on the Coleoptera, VI, 33, by Thos. L. Casey, issued Nov. 27, 1913.

Cerambycidæ.

5973. *Nothorhina aspera* Lec. Peachland, B.C., July 12, 1912, (Wallis).

6201. *Neoclytus erythrocephalus* Fab. Miami, Man., July 2, 1914, (Wallis).

6252. *Anthophylax viridis* Lec. Halifax, N.S., Aug. 22, (Perrin).

6259. *Acmæops bivittata* Say. Miami, Man., July 3, (Wallis).

6304. *Leptura subhamata* Rand. Halifax, N.S., Aug. 21, (Perrin).

6332a. *Leptura erythroptera* Kirby. Halifax, N.S., Aug. 22, (Perrin).

Chrysomelidæ.

6531. *Donacia porosicollis* Lec. Onah, Man., May 24, 1912, in flowers of Marsh Marigold, (S. and E. Criddle and Wallis).

6535. *Donacia distincta* Lec. Ottawa, Ont., July, 1913, (Germain).

6538. *Donacia pubescens* Lec. Winnipeg, Man., June 22, 1912, (Wallis).

6539. *Donacia æqualis* Say. Ottawa, Ont., July, 1913, (Germain).

6541. *Donacia emarginata* Kirby. Ottawa, Ont., July, 1913, (Germain).

6545. *Donacia metallica* Ahr. Ottawa, Ont., July, 1913, (Germain).

6550. *Donacia atra* var. *childreni* Kirby. Winnipeg, Man., May 28, 1911, (Wallis). The same collector has also taken at Winnipeg the varieties *tibialis* (June 29) and *trivittata* (June 17).

10,337. *Syneta hamata* Horn. Vernon, B.C., April 9, (Ruhmann).

* *Pachybrachys relictus* Fall. Toronto, Ont.; Trans. Amer. Ent. Soc., XLI, 424.

* *Pachybrachys carborarius janus* Fall. Brandon, Man.; Trans. Amer. Ent. Soc., XLI, 462.

Pachybrachys elegans Blatchley. Winnipeg, Man., June 24, 1911, (Wallis).

Tymnes canellus var. *thoracica* Melsh. Winnipeg, Man., June 24, 1911, (Wallis).

6769. *Graphops marcassita* Cr. Winnipeg, Man., (Wallis): Ottawa, Ont., May 25, (Germain).

6809a. *Chrysomela spirææ* Say. Treesbank, Man., April 17, 1908, (Wallis).

6905. *Galerucella nymphææ* L. Fort Chipewyan, Alta., June 13, (F. Harper).

6920. *Hypolampis pilosa* Ill. Winnipeg Beach, Man., Aug. 25, 1910, (Wallis).

6974. *Haltica tombacina* Mann. Ottawa, Ont., May 25, (Germain).

Bruchidæ.

7135. *Bruchus aureolus* Horn. Aweme, Man., July 6, (N. Criddle).

Tenebrionidæ.

Eleodes letcheri var. *vandykei* Blaisd. Vernon, B.C., April 8, (Ruhmann).
7355. *Eleodes cordata* var *rotundipenne* Lec. Vernon, B.C., April 8, (Ruhmann).
7391. *Nyctobates pennsylvanica* DeG. Winnipeg, Man., May 5, 1911, (Wallis).
Arrhenoplita bicornis Oliv. Ottawa, Ont., May and June, (Germain).

Cistelidæ.

7631. *Androchirus erythropus* Kirby. Ottawa, Ont., July 21 (Germain).

Melandryidæ.

7653. *Melandrya striata* Say. Winnipeg, Man., June 19, 1912, (Wallis).
7655. *Emmesa labiata* Say. Quebec, Que., (Roy).
7658. *Xylita lævigata* Hellw. Ottawa, Ont., Aug., 1914, (Germain).
7663. *Scotochroa atra* Lec. Ottawa, Ont., July 18, 1914, (Germain).
7664. *Scotochroa basalis* Lec. Ottawa, Ont., June 12, (Germain).
7666. *Serropalpus barbatus* Schall. Winnipeg, Man., July, 1909, (Wallis).

Pythidæ.

7708. *Boros unicolor* Say. Winnipeg, Man., June 4, 1914, (Wallis).

Mordellidæ.

7804. *Mordellistena intermixta* Helm. Miami, Man., July 6, 1914, (Wallis).

Anthicidæ.

Stereopalpus vestitus Say. Ottawa, Ont., July 14, (German).

Pyrochroidæ.

7997. *Dendroides ephemeroides* Mann. Agassiz, B.C., June 20, (Treherne).

Otiorhynchidæ.

8261. *Panscopus erinaceus* Say. Ottawa, Ont., July 3, (Germain).
8285. *Otiorhynchus rugifrons* Gyll. Ottawa, Ont., July 1, (Germain).
8293. *Mylacus saccatus* Lec. Vernon, B.C., April 10, (Ruhmann).

Curculionidæ.

8673. *Orchestes pallicornis* Say. Ottawa, Ont., July 29, (Germain).
8688. *Proctorus decipiens* Lec. Ottawa, Ont., June 3, (Germain).
Cœliodes apicalis Dietz. Ottawa, Ont., June 29, (Germain).

Scolytidæ.

* *Pityogenes hopkinsi* Swaine. "In limbs of pine throughout eastern part of Canada and United States": Tech. Publication No. 2. N.Y. State College of Forestry, Vol. XVI, 7.

* *Ips perroti* Swaine. Isle Perrot, Que., 1912, (Swaine): Can. Ent., XLVII, 357.

* *Dryocætes sechelti* Swaine. Sechelt, B.C., Can. Ent., XLVII, 359.

* *Dryocætes piceæ* Hopk. "North Carolina to Canada, and westward to Michigan"; Rep. No. 99, U. S. Dep. Agr., Office of the Secretary, p. 51, issued March 10, 1915.

* *Dryocætes pseudotsugæ* Swaine. Inverness and Vancouver, B.C., Can. Ent., XLVII, 360.

* *Phlœosinus pini* Swaine. Riding Mts., Man., (Swaine); Can. Ent. XLVII, 362.

* *Hylastes ruber* Swaine. Golden, B.C., Creighton Valley, B.C., Can. Ent., XLVII, 367.

* *Conophthorus resinosæ* Hopk. "Ontario, Canada," (Harrington); Jour. Wash. Acad. Sci., Vol. V, 431.

* *Conophthorus monticolæ* Hopk. "Cowitche Lake, Canada," Jour. Wash. Acad. Sci., Vol. V, 432. The locality should be corrected to read "Cowitchan Lake, B.C."

Diptera.

(Arranged according to a catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI, No. 1, 444. The numbers refer to the pages in the catalogue.)

Large collections of these insects have been made in certain of the provinces during 1915. The appearance of Winn and Beaulieu's list of Quebec diptera will doubtless encourage collectors in that province to add to the list. Recently we had the pleasure, at Ottawa, of a visit from Prof. J. M. Aldrich, who came to study the collection of diptera in the collection of the Entomological Branch. Many species were determined by him, and the records of a number of these are undoubtedly new to Canada.

Tipulidæ.

* *Dicranomyia aquita* Dietz. Described in Can. Ent. XLVII, 331. The type localities there given, viz.: "Fort Resolution, Aug. 24, 1914; Island at mouth of Rocker River, Aug. 16, 1914, (F. Harper)" were tentative ones, I am informed by Mr. Harper, and should be corrected to read. "District of Mackenzie along the south shore of Great Slave Lake," (Gibson).

* *Limnobia gracilis* Dietz. Described in Can. Ent. XLVII, 329. The type locality there given, viz.: "Tsolinoi, about 5 miles north of Athabaska Lake, July 5, 1914, (F. Harper)," should be corrected to read, Tsal-wor Lake, Sask., about 8 miles from the north shore of Lake Athabaska at a point about midway of its length, (Gibson).

* *Gonomyia mathesoni* Alex. Truro, N.S., July 7-26, 1913, (R. Matheson): Ent. News, XXVI, 170.

* *Limnophila (Dactylolabis) hortensia* Alex. London Hill Mine, Bear Lake, B.C., July 29, 1903, (A. N. Caudell); Proc. Acad. Nat. Sciences, Philadelphia, LXVI, 591.

* *Phalacrocera neoxena* Alex. Nipigon, Ont., June 17, 1913, (Walker). Proc. Acad. Nat. Sciences, Philadelphia, LXVI, 603.

100. *Tipula angustipennis* Loew. Vernon, B.C., (Ruhmann); Athabaska River, between Grand Rapids and mouth of Little Buffalo River, Alta., May 24, 25, 1914, (F. Harper).
104. *Tipula serta* Loew. Soulier Lake, southern Mackenzie, July 18-22, 1914, (F. Harper).
104. *Tipula tessellata* Loew. Lake Athabaska, near mouth of Charlot River, northern Saskatchewan, June 29, 1914, (F. Harper).

Chironomidæ.

108. *Ceratopogon cockerelli* Coq. Banff, Alta., Aug. 29, 1910, (Sanson).

Culicidæ.

132. *Grabhamia curriei* Coq. Banff, Alta., June 26, 1909, (Sanson).

Cecidomyidæ.

* *Dasyneura torontoensis* Felt. Toronto, Ont., May 3, 1915, (Cosens); Jour. Econ. Ent. 8, 405.

Bibionidæ.

164. *Plecia heteroptera* Say. DeGrassi Point, Lake Simcoe, Ont., Aug. 26, 1914, (Walker).
166. *Bibio nervosus* Loew. Vernon, B.C., (Ruhmann).
166. *Bibio nigripilus* Loew. Ottawa, Ont., May and June, (Germain).
166. *Bibio obscurus* Loew. Banff, Alta., Sept. 29, 1911, (Sanson).
166. *Bibio xanthopus* Wied. Ottawa, Ont., June 18, (Germain).
167. *Dilophus serraticollis* Walk. Banff, Alta., Sept. 29, 1911, (Sanson).
167.* *Aspistes analis* Kirby. Banff, Alta., (Sanson.)
168. *Scatopse pygmæa* Loew. Ottawa, Ont., May 30, (Germain): Toronto, Ont., June 7, 1914, (Walker).

Simuliidæ.

169. *Simulium bracteatum* Coq. Ottawa, Ont., May 12, (Germain).
170. *Simulium vittatum* Zett. Ottawa, Ont., May 5, (Germain).

Stratiomyidæ.

179. *Sargus decorus* Say. Departure Bay, B.C., July 25, 1913, (Walker); Toronto, Ont., May 4, June 11, 1914, (Walker).
180. *Sargus viridis* Say. Spruce Brook, Nfd., July 29, 1914, (Walker).
182. *Stratiomyia discalis* Loew. Kelowna, B.C., June 2, 1914 (Ruhmann).
183. *Stratiomyia lativentris* Loew. Prince Albert, Sask., June 26, 1913, (Walker).
183. *Stratiomyia nymphis* Walk. Banff, Alta., Aug. 5, 1909, (Sanson).
184. *Stratiomyia normula* Loew. Prince Albert, Sask., June 29, 1913, (Walker).

Tabanidæ.

194. *Pangonia tranquilla* O. S. Halifax, N.S., Aug. 20, 22, (Perrin).
195. *Chrysops callidus* O. S. Toronto, Ont., June 30, 1914, (Walker).
195. *Chrysops celer* O. S. Prince Albert, Sask., June 23, 1912, (Walker); Spruce Brook, Nfd., July 27, 1914, (Walker).
196. *Chrysops carborarius* Walk. Toronto, Ont., June 7, 1914, (Walker).

196. *Chrysops frigidus* O. S. Spruce Brook, Nfd., July 29, 1914, (Walker).
197. *Chrysops montanus* O. S. Ottawa, Ont., May 20. (Germain).
197. *Chrysops niger* Macq. Spruce Brook, Nfd., July 27, 1914, (Walker); Toronto, Ont., June 13, 1914, (Walker).
197. *Chrysops plangens* Wied. MacNab's Island. Halifax, N.S., July 19, 1914, (Perrin).
201. *Tabanus astutus* O. S. MacNab's Island, Halifax, N.S., Aug. 16, 1914, (Perrin).
Tabanus centron Marten. Fort McMurray, Alta., May 29; Fort Chipewan, June 16-18, (F. Harper).
Tabanus fulvescens Walk. MacNab's Island, Halifax, N.S., Aug. 2, 1914, (Perrin).
208. *Tabanus stygius* Say. Pt. Pelee, Ont., July 19, 1913, (Taverner and Young).

Leptidæ.

Arthropeas magna Jns. Calgary, Alta., (J. Fletcher); Aweme, Man., June 20, 1903, (N. Criddle).
212. *Rhachicerus nitidus* Jns. Lake McGregor, Que., July 12, (Germain). New to Quebec Province.
214. *Triptotricha disparilis* Bergr. Agassiz, B.C., Aug., (Treherne).
214. *Leptis maculifer* Bigot. Vancouver. B.C., June, 1914, (Chrystal).
215. *Leptis plumbea* Say. Jordan, Ont., May 10, (Ross).
215. *Leptis scapularis* Loew. Bowmanville, Ont., July 10, 1913, (Ross); Lake McGregor, Que., July 12, (Germain).
216. *Chrysopila ornata* Say. Jordan, Ont., June 16, (Ross).
216. *Chrysopila proxima* Walk. Toronto, Ont., June 13, 1914, (Walker).
217. *Symphoromyia atripes* Bigot. Banff. Alta., (Sanson): Lake Louise, Alta., July 20, (Ruhmann).
217. *Symphoromyia hirta* Jns. Prince Albert, Sask., July 24. 28, 1907, (J. Fletcher).
* *Symphoromyia kincaidi* Aldrich. Victoria, B.C., Aug. 6, 1903, (Kincaid); Gabriola Island, B.C., May 30. 1908, B. Elliott, (Kincaid); Stickeen River Canyon, B.C., (Wickham); Proc. U. S. N. M. Vol. 49, 129.
* *Symphoromyia montana* Aldrich. Prince Albert, Sask., May 18. 1905, (Willing); Ungava Bay, (Turner); Farewell Creek, Sask., (C. W. J.); Proc. U. S. N. M. Vol. 49, 133.
217. *Symphoromyia plangens* Will. Elbert, B.C., June 19, 1914, (Chrystal).

Nemestrinidæ.

219. *Rhynchocephalus sackeni* Will. Vernon, B.C., June 23, 1902.

Bombyliidæ.

223. *Spogostylum pluto* Wied. De Grassi Point, Lake Simcoe, Ont., Aug. 14, 1895, (Walker).
230. *Anthrax fulviana* Say. De Grassi Point, Lake Simcoe, Ont., Aug. 28, 1914, (Walker).
230. *Anthrax fulviana* var. *nigricauda* Loew. Banff, Alta., July 25, 1910, (Sanson).
236. *Bombylius lancifer* O. S. Kelowna, B.C., June 2, 1914, (Ruhmann).

Therevidæ.

247. *Psilocephala munda* Loew. Banff, Alta., July 16, 1909, (Sanson).
248. *Thereva flavicincta* Loew. St. Johns, Que., Record from Stettiner Entomologische Zeitung, 1912, p. 261. New to Quebec list.

Mydaidæ.

251. *Mydas clavatus* Dru. Pt. Pelee, Ont., July 19, 1913, (Taverner and Young).

Asilidæ.

254. *Leptogaster badius* Loew. Jordan, Ont., June 29, (Ross).
Laphystia flavipes Coq. Aweme, Man., July 13, 1907, (J. Fletcher).
258. *Mycelaphus lobicornis* O. S. Invermere, B.C., June 30, 1914, (Sladen).
259. *Cyrtopogon dasyllis* Will. Banff, Alta., (Sanson).
260. *Cyrtopogon nebulo* O. S. Banff, Alta., March 6, 1911, (Sanson).
269. *Atomosia puella* Wied. Jordan, Ont., Jan. 29, (Ross).
271. *Dasyllus columbica* Walk. Banff, Alta., June 30, 1913, (Walker).
271. *Dasyllis thoracica* Fabr. De Grassi Point, Lake Simcoe, Ont., July 2, 1896, (Walker).
272. *Laphria pubescens* Will. Sudbury, Ont., June 7, 1913, (Walker).
273. *Laphria vultur* O. S. Kaslo, B.C., June, (Cockle).
281. *Tolmerus callidus* Will. Banff, Alta., July 11, 1911, (Sanson).
282. *Tolmerus notatus* Wied. De Grassi Point, Lake Simcoe, Ont., Aug. 23, 1914, (Walker).
282. *Asilus annulatus* Will. Toronto, Ont., Aug. 8, 1914, (Walker).
283. *Asilus orphne* Walk. Lake McGregor, Que., July 23, (Germain).
283. *Asilus paropus* Walk. Jordan, Ont., Aug. 6, 1914, (Ross).

Dolicopodidæ.

285. *Psilopodinus patibulatus* Say. Lake Louise, Alta., July 4, 1914, (Ruhmann).
289. *Chrysotus obliquus* Loew. Bridgetown, N.S., Aug. 29, 1912, (Sanders).
291. *Argyra albicans* Loew. Toronto, Ont., June 13, 1914, (Walker).
293. *Sympycnus lineatus* Loew. Brockville, Ont., Aug. 23, 1903, (W. Metcalfe).
296. *Medeterus veles* Loew. Aweme, Man., June 12, (N. Criddle).
* *Thrypticus comosus* Van Duzee. Toronto, Ont., July 4; Psyche, XXII, 86.
299. *Dolichopus bifractus* Loew. Aweme, Man., July 6, (N. Criddle); Dauphin, Man., June 22, 1913, (Walker).
300. *Dolichopus brevipennis* Meigen. Summerside, P.E.I., Aug. 21, 1914, (Walker).
301. *Dolichopus cuprinus* Wied. Dauphin, Man., June 22, 1913, (Walker).
301. *Dolichopus dakotensis* Ald. Dauphin, Man., June 22, 1913, (Walker).
301. *Dolichopus eudactylus* Loew. Jordan, Ont., June 12, (Ross).
304. *Dolichopus reflectus* Ald. Jordan, Ont., July 8, (Ross).
304. *Dolichopus renidescens* M. & B. Dauphin, Man., June 22, 1913, (Walker).
306. *Gymnopternus tristis* Loew. Vancouver, B.C., June 30, 1914, (Chrystal).

Empidæ.

311. *Drapetis medetera* Melan. Aweme, Man., Sept. 21, (N. Criddle).
311. *Platypalpus æqualis* Loew. Ottawa, Ont., June 18, (Germain).
312. *Platypalpus crassifemoris* Fitch. Aweme, Man., July 20, (N. Criddle).

313. *Tachydromia pusilla* Loew. Ottawa, Ont., May and June, (Germain).
318. *Syneches thoracicus* Say. Lake McGregor, Que., July 12, (Germain). New to Quebec Province.
319. *Leptopeza compta* Coq. Ottawa, Ont., July 16, (Germain).
319. *Ocydromia glabricula* Fallen. Aylmer, Que., June, (Germain). New to Quebec Province.
326. *Hilara tristis* Loew. Spruce Brook, Nfd., July 27, 1914, (Walker).
331. *Rhamphomyia irregularis* Loew. Ottawa, Ont., July 3, (Germain).
331. *Rhamphomyia lævigata* Loew. Ottawa, Ont., July 3, (Germain).
331. *Rhamphomyia longicauda* Loew. Toronto, Ont., July 12, 1914, (Walker).
332. *Rhamphomyia pulla* Loew. Toronto, Ont., May 31, 1914, (Walker).
Microsania imperfecta Loew. Aweme, Man., Sept. 18, (Criddle).

Phoridæ.

339. *Gymnophora arcuata* Meigen. Ottawa, Ont., July and August, (Germain).

Platypezidæ.

340. *Agathomyia notata* Loew. Ottawa, Ont., June 27, (Germain).

Pipunculidæ.

342. *Chalarus spurius* Fallen. Ottawa, Ont., July 20, (Germain).
Pipunculus appendiculatus Cr. Aweme, Man., July 6, (N. Criddle).
343. *Pipunculus albofasciatus* Hough. Ottawa, Ont., May and June, (Germain).
343. *Pipunculus cingulatus* Loew. Ottawa, Ont., May and June. (Germain).
Pipunculus confraternus Banks. Aweme, Man., July 23, (N. Criddle).
343. *Pipunculus flavomaculatus* Hough. Ottawa, Ont., May and June, (Germain).

Syrphidæ.

346. *Microdon tristis* Loew. Field, B.C., July 1, 1908, (J. C. Bradley); Vineland, Ont., June 4. (Ross and Curran).
348. *Chrysotoxum ventricosum* Loew. Revelstoke, B.C., July 8-13, 1905, (J. C. Bradley).
348. *Chrysogaster bellula* Will. Vineland, Ont., Aug. 18, 1914, (Ross and Curran).
349. *Chrysogaster stigmata* Will. Carbonate to Prairie Hills, Selkirk Mts., B.C., July 12-18., 1909, (Bradley).
349. *Pipiza albipilosa* Will. Ottawa, Ont., July 3, (Germain).
350. *Pipiza calcarata* Loew. Vineland, Ont., May and June, (Ross).
350. *Pipiza femoralis* Loew. Toronto, Ont., June 6, 1914. (Walker); Vineland, Ont., May and June, (Ross and Curran).
350. *Pipiza pistica* Will. Vineland, Ont., July 10, (Ross and Curran).
350. *Pipiza pisticoides* Will. Vineland, Ont., May 11, (Ross and Curran).
350. *Pipiza pulchella* Will. Ottawa, Ont., July 3, (Germain).
Eumerus strigatus Fall. Victoria, B.C., reared from Narcissus bulbs, April 7-9, 1910, (E. A. Wallace).
351. *Paragus angustifrons* Loew. Revelstoke, B.C., July 1, 1905, (J. C. Bradley).

351. *Paragus tibialis* Fall. Vineland, Ont., July 17-Aug. 6; also reared from larvæ feeding on *Aphis gossypii,* (Ross and Curran).
352. *Chilosia lasiophthalmus* Will. Carbonate to Prairie Hills, Selkirk Mts., B.C., July 12-18, 1908, (J. C. Bradley); Wellington, B.C., April 16, 1903, (R. V. Harvey).
353. *Chilosia tristis* Loew. Carbonate on Columbia River, July 7-12, 1908, (J. C. Bradley).
359. *Pyrophæna rosarum* Fabr. Ottawa, Ont., June 27, (Germain).
359. *Platychirus peltatus* Meigen. Carbonate to Prairie Hills, Selkirk Mts., July 12-18, 1908, (J. C. Bradley).
359. *Platychirus hyperboreus* Stæger. Vineland, Ont., (Ross and Curran), Bowmanville, Ont., (Ross).
360. *Melanostoma obscurum* Say. Vineland, Ont., May and June, (Ross and Curran).
362. *Leucozona lucorum* Linné. Metlakatla, B.C., (Keen).
362. *Didea fasciata* Macq. Vineland, Ont., May 10, (Ross and Curran).
362. *Didea fasciata* var. *fuscipes* Loew. Carbonate, B.C., July 7-12, 1908, (J. C. Bradley); Macnab's Island, Halifax, N.S., July 4, 1914, (Perrin).
363. *Didea laxa* O. S. Halifax, N.S., June 27, (Perrin).
364. *Syrphus amalopis* O. S. Banff, Alta., June 24, 1911, (Sanson).
365. *Syrphus geniculatus* Macq. Spruce Brook, Nfd., July 29, 1914, (Walker); Ground Hog Basin, Bend Country, Selkirk Mts., B.C., Aug. 4, 1905, (J. C. Bradley); Ottawa, Ont., May 3, (Germain).
366. *Syrphus grossulariæ* Meigen. Carbonate, Columbia River, B.C., July 7-12, 1908, (J. C. Bradley).
367. *Syrphus opinator* O. S. Ground Hog Basin, Selkirk Mts., Aug. 4, 1905, (J. C. Bradley).

Syrphus perplexus Osb. Toronto, Ont., May 30, 1909, (M. C. VanDuzee).

368. *Syrphus torvus* O. S. Spruce Brook, Nfd., July 27, 1914, (Walker).
368. *Syrphus umbellatarum* Fabr. Spruce Brook, Nfd., July 27, 1914, (Walker).
368. *Syrphus velutinus* Will. Ground Hog Basin, Big Bend Country, Selkirk Mts., B.C., July 24, 1905, (J. C. Bradley).
368. *Syrphus xanthostoma* Will. Vineland, Ont., May 17, (Ross and Curran).
371. *Xanthogramma polita* Say. Vineland, Ont., Sept. 8, (Ross and Curran).
373. *Sphærophoria scripta* L. Ottawa, Ont., April 20, (Germain). Mr. C. W. Johnson, when naming this specimen, stated: "This is the true *S. scripta*: although long recorded from America, I have not seen it before."
374. *Sphegina campanulata* Rob. Vineland, Ont., July 9, (Ross and Curran).
374. *Sphegina infuscata* Loew. Ground Hog Basin, Selkirk Mts., B.C., Aug. 4, 1905, July 24, 1908; Carbonate, Columbia River, B.C., July 7-12, 1908, (J. C. Bradley).
374. *Sphegina lobata* Loew. Ground Hog Basin, B.C., July 24, 1905, Aug. 4, 1905, (J. C. Bradley).
375. *Neoascia distincta* Will. Ottawa, Ont., May 13, (Germain).
375. *Neoascia globosa* Walk. Carbonate, B.C., July 7-12, 1908, (J. C. Bradley).
378. *Volucella esuriens mexicana* Macq. Victoria, B.C., April 15, 1905, (Hanham).
378. *Volucella fascialis* Will. Midnapore, Alta., June 15, (Tams); Invermere, B.C., June 30, 1914, (Sladen).

382. *Sericomyia chalcopyga* Loew. Spruce Brook, Nfd., June 29, 1914, (Walker).

383. *Arctophila flagrans* O. S. Rogers Pass, B.C., Aug. 1, 1908; Ground Hog Basin, B.C., July 22-Aug. 7, 1905, (J. C. Bradley); Vernon, B.C., (Ruhmann).

Eristalis arbustorum L. Ottawa, Ont., May 5, (Germain). St. John, N.B., (G. P. Engelhardt); Labrador, Battle Harbor, (G. P. Engelhardt). A European species. Jour. N.Y. Ent. Soc. XXIII, 143.

385. *Eristalis compactus* Walk. Halifax, N.S., July 11, (Perrin).

386. *Eristalis flavipes* Walk. Vineland, Ont., April 27, Sept. 16, (Ross and Curran).

386. *Eristalis hirtus* Loew. Agassiz, B.C., July, (Treherne).

386. *Eristalis inornatus* Loew. Mt. Cheam, B.C., July 22, (Treherne).

387. *Eristalis montanus* Will. Leduc, Alta., (J. Fletcher).

Eristalis nemorum, L. Vernon, B.C., Aug. 31, 1904, (R. V. Harvey); Kaslo, B.C., July 11; Revelstoke, B.C., July 14, (R. C. Osburn); Kaslo, B.C., May 7, 1910, (Cockle); Montreal, Que., Sept. 1, 1905, (Beaulieu). A European species—Jour. N.Y. Ent. Soc., XXIII, 144.

Eristalis rupium Fab. Atlin, B.C., (Anderson). A European species—Jour. N.Y. Ent. Soc., XXIII, 143.

393. *Helophilus hamatus* Loew. Aweme, Man., Aug. 25, (J. Fletcher); Vineland, Ont., Aug. 18, (Ross and Curran).

393. *Heliophilus lætus* Loew. Carlsbad Springs, Ont., June 1, 1903, (Gibson); Vineland, Ont., June 6, (Ross and Curran).

393. *Heliophilus latifrons* Loew. Vineland, Ont., Aug. 28 to mid-October, (Ross and Curran).

396. *Triodonta curvipes* Wied. Quebec, Que., (Roy). New to Quebec Province.

398. *Xylota angustiventris* Loew. Vineland, Ont., July 13, (Ross and Curran).

398. *Xylota anthreas* Walk. Vineland, Ont., June 14, July 2, (Ross and Curran.

398. *Xylota barbata* Loew. Kaslo, B.C., May 21, (Cockle).

398. *Xylota chalybea* Wied. Vineland, Ont., June 24, 29, (Ross and Curran).

398. *Xylota curvipes* Loew. Vineland, Ont., June 12, (Ross and Curran). Recorded from Ottawa.

399. *Xylota notha* Will. Vineland, Ont., June 24, (Ross and Curran).

Xylota segnis L. Macnab's Island, Halifax, N.S., July 4, 1914. (Perrin). A European species not heretofore reported from North America. See Verrall, British Flies, VIII, 598, for description and figure. (J. M. A.).

400. *Xylota vecors* O. S. Spruce Brook, Nfd., July 29, 1914, (Walker).

401. *Crioprora cyanella* O. S. Kaslo., B.C., (July 20, (Cockle).

402. *Criorhina intersistens* Walk. Ground Hog Basin, B.C., July 24, 1905, (J. C. Bradley).

403. *Criorhina scitula* Will. Ground Hog Basin, B.C., Aug. 4, 1905, (J. C. Bradley).

403. *Criorhina umbratilis* Will. Spruce Brook, Nfd., July 28, 1914, (Walker).

404. *Spilomyia fusca* Loew. Ottawa, Ont., Aug. 1, 1906, (J. Fletcher).

404. *Spilomyia interrupta* Will. Similkameen, B.C., Sept. 12, 1913, (Wilson).

404. *Sphecomyia brevicornis* O. S. Duncan, B.C., May 10, 1908, (Hanham).

Sphecomyia occidentalis Osb. Ground Hog Basin, B.C., July 22-Aug. 7, 1905, (J. C. Bradley). Only specimen known, I understand, except unique type.

405. *Temnostoma æqualis* Loew. Spruce Brook, Nfd., June 29, 1914. (Walker).

Conopidæ.

409. *Physocephala tibialis* Say. De Grassi Point, Lake Simcoe, Ont., July 11, 1895, (Walker).
412. *Oncomyia loraria* Loew. Ottawa, Ont., July 28, (Germain); Jordon, Ont., July 9, 1914, (Ross).
412. *Myopa clausa* Loew. Halifax, N.S., July 26, (Perrin).
412. *Myopa versiculosa* Say. Ottawa, Ont., May 20, 1915, (Germain).

Œstridæ.

419. *Cuterebra scutellaris* Brauer. Peachland, B.C., July, 1902, (A. H. Huston).

Tachinidæ.

423. *Phorantha occidentis* Walk. Aweme, Man., July 6, 13, (N. Criddle); Ottawa, Ont., June 3, (Germain).
424. *Alophora pulverea* Coq. Ottawa, Ont., June, (Germain).
433. *Hypostena flaveola* Coq. Simcoe, Ont., (Caesar).
434. *Hypostena floridensis* Tns. Ottawa, Ont., July 10, 1914. (Beaulieu).
442. *Besseria brevipennis* Loew. Lethbridge, Alta., June 26, 1914, (Strickland).
451. *Ocyptera carolinæ* Desv. De Grassi Point, Lake Simcoe, Ont., July 19, 1895; Toronto, Ont., June 13, 1895, (Walker).
451. *Ocyptera dosiades* Walk. Jordon, Ont., July 28, 1914, (Ross); Prince Albert, Sask.; June 23, 1913, (Walker).
453. *Gymnochæta alcedo* Loew. Vernon, B.C., (Ruhmann).
458. *Exorista nigripalpis* Tns. Pincher, Alta., July 18, 1913, (Strickland).
482. *Microphthalma disjuncta* Wied. Aweme, Man., July 10-21, (N. Criddle).
Trixosceles fumipennis Mall. Aweme, Man., July 23, (N. Criddle).
460. *Phorocera doryphoræ* Riley. Grimsby and Vineland, Ont., (Caesar).
Dichætoneura leucoptera Jns. Simcoe and Guelph, Ont., reared from *Archips cerasivorana*, July 22-Aug. 12, 1912, (Caesar).
484. *Peleteria ænea* Stæger. Pincher, Alta., July 18, 1913, (Strickland).
488. *Echinomyia dakotensis* Tns. Vernon, B.C., (Ruhmann).
* *Saskatchewania canadensis* Smith. Farewell Creek, Sask., June, Aug. and Sept., 1907; Can. Ent., XLVII, 153.

Sarcophagidæ.

510. *Sarcophaga assidua* Walk. Ottawa, Ont., Aug., 1915, (Germain).
511. *Sarcophaga cimbicis* Tns. Ottawa, Ont., Aug. 14, 1912, (Beaulne); Regina, Sask., June 12, 1903, (Willing); Guelph, Ont., (Sanders); Port Hope, May 30, 1907, (W. Metcalfe).
Sarcophaga hæmorrhoidalis Mg. Ottawa, Ont., Sept. 4, 1908, (H. Groh).
512. *Sarcophaga helicis* Tns. Ottawa, Ont., June 30, 1912, (Beaulne).
Agria affinis Fall. Victoria, B.C., reared from *Vanessa antiopa*, (J. R. Anderson).

Miltogrammidæ.

* *Arabiopsis cocklei* Tns. London Hill Mine, Bear Lake, B.C., July 21, 1903, (Cockle); Can. Ent. XLVII, 285.

Salmaciidæ.

* *Knabia hirsuta* Tns. Oxbow, Sask., April 30, May 13, 1907, (F. Knab); Can. Ent. XLVII, 287.

Larvævoridæ.

* *Okanagania hirta* Tns. Okanagan Falls, B.C., April 27, 1913, (E. M. Anderson); Can. Ent., XLVII, 290.

* *Panzeriopsis curriei* Tns. London Hill Mine, Bear Lake, B.C., July 21-29, 1913, (R. P. Currie); Can. Ent., XLVII, 291.

* *Rhachogaster kermodei* Tns. Penticton, B.C., July 4, 8, 1913, (E. M. Anderson); Can. Ent. XLVII, 291.

Minthoidæ.

* *Pseudodidyma pullula* Tns. Victoria, B.C., April 2, 1906, (E. M. Anderson); Can. Ent., XLVII, 288.

518. *Cynomyia cadaverina* Desv. Vernon, B.C., (Ruhmann).

527. *Mesembrina latreillei* Desv. Agassiz, B.C., July, 1915, (Treherne).

Hypodermodes solitaria Knab. Agassiz, B.C., Aug., (Treherne). Described in Can. Ent., Sept., 1910, from Alberta and Montana.

Anthomyidæ.

539. *Fannia serena* Fall. Ottawa, Ont., June 27, (Germain).

547. *Limnophora diaphana* Wied. Ottawa, Ont., June 3, (Germain).

550. *Anthomyia pluvialis* L. Ottawa, Ont., May 13, (Germain).

552. *Hylemyia lipsia* Walk. Ottawa, Ont., May 3, (Germain).

553. *Eustalomyia vittipes* Zett. Ottawa, Ont., July 14, (Germain).

557. *Phorbia latipennis* Zett. Lake Athabaska, near mouth of Charlot River, Northern Saskatchewan, June 29, 1914, (F. Harper).

558. *Pegomyia calyptrata* Zett. Ottawa, Ont., May 13, (Germain).

563. *Schœnomyza dorsalis* Loew. Aweme, Man., Sept. 18-21, (N. Criddle).

Scatophagidæ.

565. *Cordylura adusta* Loew. Ottawa, Ont., April 27, (Germain).

566. *Cordylura volucricaput* Walk. Ottawa, Ont., June 18, (Germain).

566. *Parallelomma varipes* Walk. De Grassi Point, Lake Simcoe, Ont., July 10, 1895, (Walker).

567. *Hydromyza confluens* Loew. Ottawa, Ont., June 15, (Germain).

Heteroneuridæ.

Clusia czernyi Jns. Ottawa, Ont., July 12, (Germain).

Helomyzidæ.

572. *Helomyza longipennis* Loew. Spruce Brook, Nfd.. July 28, 1914, (Walker).

572. *Anorostoma marginata* Loew. Ottawa, Ont., June 27, (Germain).

572. *Scoliocentra helvola* Loew. Ottawa, Ont.. July 14, (Germain).

Sciomyzidæ.

578. *Sciomyza pubera* Loew. Ottawa, Ont., July 14, (Germain).
578. *Neuroctena anilis* Fall. Ottawa, Ont., June 3, (Germain).
580. *Tetanocera valida* Loew. De Grassi Point, Lake Simcoe, Ont., Aug. 26, 1914, (Walker).
581. *Sepedon fuscipennis* Loew. Spruce Brook, Nfd., July 29, 1914, (Walker).
581. *Sepedon pusillus* Loew. De Grassi Point, Lake Simcoe, Ont., Aug. 26, 1914, (Walker).

Sapromyzidæ.

Lonchæa laticornis Mg. Banff, Alta., Aug. 29, 1911, (Sanson).
582. *Lonchæa rufitarsis* Macq. Toronto, Ont., May 13, 1914, (Walker).
582. *Palloptera jucunda* Loew. Inverness, B.C., July, 1910, (J. H. Keen).
582. *Palloptera superba* Loew. Ottawa, Ont., June 21, 1904, (W. Metcalfe).
585. *Sapromyza decora* Loew. Ottawa, Ont., Aug. 11, 1909, (W. Metcalfe).
587. *Sapromyza vulgaris* Fitch. Ottawa, Ont., June, (Germain); Aweme, Man., July 13, (N. Criddle).

Ortalidæ.

587. *Pyrgota chagnoni* Jns. Ottawa, Ont., May 16, (Germain).
589. *Rivellia flavimanus* Loew. Toronto, Ont., May 30, 1896; June 6, 1914. (Walker).
589. *Rivellia viridulans* Desv. Toronto, Ont., June 19, 1895; Dauphin, Man., June 22, 1913, (Walker).
592. *Tephronota narytia* Walk. Aweme, Man., July 23, (N. Criddle).
597. *Chætopsis massyla* Walk. Aweme, Man., Sept. 7, (N. Criddle).

Trypetidæ.

603. *Acidia fratria* Loew. Toronto, Ont., June 8, 1914, (Walker).
604. *Spilographa electa* Say. Smith's Cove, N.S., July 15, 1914, (Gibson).
604. *Spilographa setosa* Doane. Reared from hips of *Rosa nutkana* collected at Cowichan Lake, B.C., Sept. 18, 1906, by J. Fletcher; emerged at Ottawa, Ont., June 25, 1907, (Gibson).
605. *Trypeta occidentalis* Snow. Larvæ destroying seeds of *Cirsium drummondii* at Elphinstone, Man., collected by W. A. Burman; adults reared, (Gibson).
Rhagoletis fausta O. S. Victoria B.C., June 19, 1907, (R. M. Palmer).
607. *Rhagoletis rubicola* Doane. Aweme, Man., July 3, (J. Fletcher and N. Criddle).
611. *Tephritis albiceps* Loew. Ottawa, Ont., July 1, 1914, (Beaulne).
611. *Tephrites clathrata* Loew. Aweme, Man., Sept. 18, (N. Criddle).
613. *Urellia aldrichii* Doane. Aweme, Man., Oct. 4, (N. Criddle).

Micropezidæ.

616. *Calobata alesia* Walk. Ottawa, Ont., June 27, (Germain).
616. *Calobata antennipes* Say. Toronto, Ont., June 13, 1895, (Walker).
617. *Calobata univitta* Walk. Ottawa, Ont., June 15, (Germain); Toronto, Ont., June 11, 1914, (Walker).

Psilidæ.

621. *Loxocera collaris* Loew. Ottawa, Ont., June 20, (Germain).

Ephydridæ.

623. *Dichæta caudata* Fall. Ottawa, Ont., June 3, (Germain).
623. *Notiphila bella* Loew. Ottawa, Ont., May 27, (Germain).
623. *Notiphila carinata* Loew. Toronto, Ont., June 13, 1914, (Walker).
Psilopa compta Mg. Aweme, Man., Oct. 14, (N. Criddle).
627. *Hydrellia obscuriceps* Loew. Brockville, Ont., Sept. 20, 1903, (W. Metcalfe); Ottawa, Ont., Aug. 28, 1908, (J. Fletcher).
627. *Philygria opposita* Loew. Ottawa, Ont., July 28, (Germain); Aweme, Man., July 23, (N. Criddle).
628. *Ochthera mantis* DeG. Lake McGregor, Que., July 12, (Germain). New to Quebec Province.
628. *Pelina truncatula* Loew. Aweme, Man., Oct. 17, (N. Criddle).
629. *Parydra bituberculata* Loew. Ottawa, Ont., July 3, (Germain); Ottawa, July 21, Aug. 6, 1914, (Beaulieu); Toronto, Ont., June 13, 1914, (Walker).
629. *Ephydra atrovirens* Loew. Ottawa, Ont., June, July, (Germain).
630. *Scatella oscitans* Walk. Aweme, Man., Oct. 14, (N. Criddle).
630. *Scatella stagnalis* Fall. Bridgetown, N.S., Aug. 29, 1912, (Sanders); Port Hope, Ont., May 24, 1897, (Metcalfe); Aweme, Man., Sept. 7, Oct. 14, 17, (N. Criddle).

Oscinidæ.

Meromyza flavipalpis Mall. Aweme, Man., July 20, (N. Criddle).
Meromyza marginata Beck. Beaver River, Alta., Aug. 20, (Strickland).
632. *Anthracophaga maculosa* Loew. Montreal, Que. Record from Becker's Mon. of Chloropidæ IV, 1912, p. 44.
632. *Anthracophaga eucera* Loew. Brockville, Ont., Aug. 23, 1903, (Metcalfe); Bridgetown, N.S., Aug. 29, (Sanders).
Chlorops seminigra Becker. Type locality, Montreal. Que. Described in Becker's Monograph of Chloropidæ, IV, 66, 1912.
633. *Diplotoxa microcera* Loew. Aweme, Man., July 2, (N. Criddle).
633. *Diplotoxa versicolor* Loew. Aweme, Man., June 25, (N. Criddle).
Chlorops stigmata Becker. Type locality, Vancouver Island, B.C., (Livingston). Described in Becker's Monograph of Chloropidæ, IV, 60, 1912.
Chlorops integra Becker. Aweme, Man., July 20, Aug. 8, (N. Criddle).
Chlorops rufescens Coq. Ottawa, Ont., July 4, (Beaulne).
Chloropisca clypeata Mall. Regina, Sask., June 18, 1904, (J. Fletcher); Ottawa, Ont., June 24, 1904, (W. Metcalfe).
633. *Chloropisca obscuricornis* Loew. Aweme, Man., July 23, (N. Criddle).
Chloropisca obtusa Mall. Ottawa, Ont., July 17, 1904, (W. Metcalfe).
634. *Chloropisca variceps* Loew. Athabaska, Alta., Edmonton, Alta., Aug. 10, (Strickland); Prince Albert, Sask., July 28, 1907, (J. Fletcher).
635. *Eurina exilis* Coq. De Grassi Point, Lake Simcoe, Ont., Aug. 26, 1914, (Walker).
635. *Hippelates flavipes* Loew. Aweme, Man., Sept. 16, (N. Criddle).
Hippelates pallipes Loew. Aweme, Man., June 12, (N. Criddle).

636. *Elachiptera costata* Loew. Ottawa, Ont., May 27, 1905; Chelsea, Que., May 27, 1905; Carlsbad Springs, Ont., June 26, (W. Metcalfe).
638. *Elachiptera decipiens* Loew. Aweme, Man., Oct. 17, (N. Criddle).
636. *Elachiptera longula* Loew. Aweme, Man., July 6, (N. Criddle).
Mosillus subsultans Fab. Aweme, Man., Aug., Sept., (N. Criddle).
637. *Siphonella oscinina* Fall. Brockville, Ont., Sept. 13, 1903, (W. Metcalfe).
Siphonella parva Ad. Aweme, Man., June 12, (N. Criddle); Ottawa, Aug. 26, 1908, (Fletcher).
638. *Oscinis dorsata* Loew. Aweme, Man., June 6, July 23, Aug. 6, Sept. 7, (N. Criddle).
Oscinis marginalis Mall. Aweme, Man., Aug. 6, (N. Criddle).
Oscinis melanchulica Beck. Aweme, Man., July 23, (N. Criddle).
639. *Oscinis trigramma* Loew. Aweme, Man., Sept. 7, 21, Oct. 10., (N. Criddle).
639. *Oscinis umbrosa* Loew. Aweme, Man., July 13, 23, (N. Criddle).

Drosophilidæ.

641. *Drosophila amœna* Loew. Brockville, Ont., Aug. 12, 1903, (Metcalfe); Ottawa, Ont., June 2, 1878, (Fletcher).

Agromyzidæ.

Phytomyza acuticornis Loew. Aweme, Man., July 13, (N. Criddle).
Phytomyza flava Fall. Aweme, Man., Oct. 12, (N. Criddle).
Cerodonta femoralis Mg. Aweme, Man., Oct. 9-17, (N. Criddle).
647. *Agromyza angulata* Loew. Aweme, Man., Aug. 6, (N. Criddle).
Agromyza coquilletti Mall. Aweme, Man., June 25, (N. Criddle).
Agromyza genualis Mel. Aweme, Man., Oct. 9, (N. Criddle).
648. *Agromyza jucunda* Van der Wulp. Aweme, Man., Oct. 10, (N. Criddle).
Agromyza immaculata Coq. Brockville, Ont., Oct. 25, 1903, (W. Metcalfe); Aweme, Man., Oct. 14, (N. Criddle).
Agromyza laterella Zett. Brockville, Ont., Sept. 13, 1903, (W. Metcalfe).
648. *Agromyza marginata* Loew. Ottawa, Ont., Sept. 1, 1908, (Fletcher); Aylmer, Que., Oct. 20, 1905, (W. Metcalfe). New to Quebec Province.
Agromyza nasuta Mel. Aweme, Man., July 6, (N. Criddle); Montreal, Que., July 11, 1914, (Winn); Port Hope, Ont., May 24, 1897, (W. Metcalfe); Ottawa, Ont., Aug. 26, 1908, (J. Fletcher).
Agromyza scutellata Fall. Aweme, Man., July 20; June 25, (N. Criddle).
649. *Agromyza terminalis* Coq. Dauphin, Man., June 22, 1913, (Walker).
649. *Agromyza vireus* Loew. Ottawa, Ont., Aug. 17, 1907, (J. Fletcher); Brockville, Ont., Aug. 23, 1903, (W. Metcalfe).
Meoneura vagans Fall. Aweme, Man., July 23, (N. Criddle).
649. *Desmometopa latipes* Mg. Aweme, Man., July 6, (N. Criddle).
649. *Desmometopa m-nigrum* Zett. Brockville, Ont., Sept. 20, 1903, (W. Metcalfe).
Desmometopa sordida Fall. Ottawa, Ont., June 1, 1900, (Gibson).
651. *Milichia arcuata* Loew. Ridgeway, Ont., July 23, 1910, (Walker).
Pseudodinia pruinosa Mel. Aweme, Man., Aug. 6, (N. Criddle).
652. *Ochthiphila elegans* Panz. Carlsbad Springs, Ont., June 26, 1904, (W. Metcalfe).
652. *Ochthiphila polystigma* Mg. Aweme, Man., Aug. 6, (N. Criddle).

Hymenoptera.

During the year 1915, many specimens in this order were collected in the various provinces in Canada, and some of the interesting captures are here recorded. Species collected in former years have been definitely determined, and some of these, too, we are now able to include. The records of these give further information on their distribution within the Dominion.

Tenthredinidæ.

Strongylogastroidea aprilis Say. Toronto, Ont., June 13, 1895, (Walker).
Parasiobla rufocinctus Nort. Toronto, Ont., June 13, 1895, (Walker).
Dolerus aprilis Nort. Toronto, Ont., June 19, 1907; May 5, 1914, (Walker).
Dolerus cohæsus MacG. Ottawa, Ont., July, 1914, (Germain); Spruce Brook, Nfd., July 27, 1914, (Walker).
Dolerus stugnus MacG. Ottawa, Ont., July, 1914, (Germain).
Dolerus unicolor Beauv. Toronto, Ont., April 19, 1895, (Walker).
Loderus apricus (Nort). Ottawa, Ont., July, 1914, (Germain); Toronto, Ont., June 13, 1914, (Walker).
Tenthredo basilaris Say. De Grassi Point, Lake Simcoe, Ont., Aug. 22, 1914, (Walker).
Macrophya trisyllaba Nort. Toronto, Ont., May 24, 1889, (E. M. Morris); Spruce Brook, Nfd., July 27, 1914, (Walker); Pictou, N.S., July 22, 1914, (Walker).
Cimbex laportei Lep. Dauphin, Man., June 23, 1913, (Walker).
Cimbex 10-maculata Urban. Prince Albert, Sask., June 26, 1913, (Walker).
Gymnonychus appendiculatus Hart. Ottawa, Ont., June 13, 1914, (Germain).
* *Euura cosensii* Rohwer. Toronto, Ont., (Cosens). Proc. U. S. N. M., Vol. 49, 213.
Amauronematus semirufus (Kirby). Ottawa, Ont., Aug. 3, 1913, (Germain).
Pachynematus extensicornis Nort. Ottawa, Ont., Aug. 7, 1914, (Germain); De Grassi Pt., Lake Simcoe, Ont., Aug. 23, 1914, (Walker).
Pristiphora bivittata Nort. Ottawa, Ont., May 22, 1914, (Germain).
Monophadnoides concessus MacG. Ottawa, Ont., Aug. 25, 1914, (Germain).

Cynipidæ.

Callirhytis gemmarius Ash. On island near Hamill's Point, Lake Joseph, Muskoka, Ont., (Cosens). First Canadian record (W. B.).
Andricus clavula O. S. On island near Hamill's Point, Lake Joseph, Muskoka, Ont., (Cosens). First Canadian record (W. B.).
Andricus piger Bass. On island near Hamill's Point, Lake Joseph, Muskoka, Ont., (Cosens). First Canadian record (W. B.).
Andricus ventricosus Bass. On island near Hamill's Point, Lake Joseph, Muskoka, Ont., (Cosens). First Canadian record (W. B.).
* *Diastrophus fragariæ* Beut. Toronto, Ont., (Cosens). Can. Ent., XLVII, 353.

Braconidæ.

Meteorus loxostege Vier. Iron Springs, Alta., May 18, 1914, (Strickland).
Sigalphus bicolor Cr. Grimsby Ont., June 20, 1914, (Walker).
Spathius canadensis Ashm. Toronto, Ont., May 26, 1895, (Walker).

Ichneumonidæ.

Crematus retiniæ Cr. Toronto, Ont., June 13, 1914, (Walker).
Campoplex expertus Cr. Toronto, Ont., June 7-11, 1914, (Walker).
Campoplex vitticollis Nort. Toronto, Ont., June 11, 1914, (Walker).
Thyreodon morio Fab. De Grassi Point, Lake Simcoe, Ont., Aug. 16, 1914, (Walker).
Exochus pallipes Cr. Toronto, Ont., July 12, 1914, (Walker).
Spanotecnus concolor Cr. Toronto, Ont., June 13, 1914, (Walker).
Spanotecnus discolor Cr. St. Catharines, Ont., June 21, 1914, (Walker).
Odontomerus mellipes Say. Toronto, Ont., (Walker).
Megarhyssa nortoni Cr. Pictou, N.S., July 22, 1914, (Walker).
Rhyssa persuasoria Linn. Quebec, Que., (Roy).
Rhyssa albomaculata Cr. Spruce Brook, Nfd., July 29, 1914, (Walker); Edmonton, Alta., (Carr).
* *Pseudorhyssa sternata* Merrill. Toronto, Ont., Aug. 20, 1892. Trans. Amer. Ent. Soc., XLI, 150.
Lissonota superba Prov. Edmonton, Alta., May 22, 1911, (Carr).
Arenetra canadensis Cr. Macleod, Alta., July, 1913, (Strickland).
Lampronota parva Cr. Toronto, Ont., April 19, 1895, (Walker).
Arotes vicinus Cr. Morris Island, Muskoka, Ont., July 30, 1888 (E. M. Morris).
Coleocentrus occidentalis Cr. Departure Bay, B.C., July 5, 1913, (Walker).
Cryptus robustus Cr. De Grassi Point, Lake Simcoe, Ont., Aug. 16, 1914, (Walker).
Ichneumon bimembris Prov. Prince Albert. Sask., (Walker).
Ichneumon canadensis Cr. Spruce Brook, Nfd., July 29, 1914, (Walker); Departure Bay, B.C., July 6, 1913, (Walker).
Ichneumon comes Cr. Morris Island, Muskoka, Ont., July 8, 1888, (E. M. Morris).
Ichneumon cincticornis Cr. Edmonton, Alta., Nov. 10, 1910, (Carr); Prince Albert, Sask., June 26, 1913, (Walker); Toronto, Ont., Aug 8, 1914, (Walker).
Ichneumon cæruleus Cr. Muskoka, Ont., July 30, 1888, (E. M. Morris).
Ichneumon devinctor Say. Edmonton, Alta., April 23, 1910, (Carr).
Ichneumon funestus Cr. Toronto, Ont., Aug. 8, 1914, (Walker).
Ichneumon feralis Cr. Spruce Brook, Nfd., July 27, 1914, (Walker); Edmonton, Alta., (Carr).
Ichneumon flavicornis Cr. Departure Bay, B.C., July 4, 1913, (Walker).
Ichneumon galenus Cr. Toronto, Ont., Aug. 8, 1914, (Walker).
Ichneumon grandis Br. Departure Bay, B.C., July 29, 1913, (Walker).
Ichneumon orpheus Cr. De Grassi Point, Lake Simcoe, Ont., Aug. 16, 1914, (Walker).
Ichneumon pervagus Cr. Morris Island, Muskoka, Ont., (E. M. Morris).
Ichneumon putus Cr. Edmonton, Alta., (Carr).
Ichneumon seminiger Cr. Toronto, Ont., April 12, 1895, (Walker).

Ichneumon suadus Cr. Lake Simcoe, Ont., (Walker).

Ichneumon sublatus Cr. Hamilton, Ont., June 20, 1914, (Walker).

* *Coelichneumon barnstoni* Morley. Hudson Bay, 1884, (Geo. Barnston); Revision of the Ichneumonidæ in the British Museum, Part IV, p. 130.

Amblyteles montanus Cr. Sault Ste. Marie, Ont., June 10, (E. M. Morris).

Amblyteles quebecensis Prov. Departure Bay, B.C., July 7, 1913, (Walker).

Amblyteles stadaconensis Prov. De Grassi Point, Lake Simcoe, (Walker).

Amblyteles subrufus Cr. Sault Ste. Marie, Ont., June 7, 1889, (E. M. Morris).

Amblyteles suturalis Cr. Lethbridge, Alta., July 23, 1914, (Strickland).

Amblyteles tetricus Prov. Toronto, Ont., (Walker).

Trogus fulvipes Cr. Okanagan Landing, B.C., Aug. 16, 1913, (Walker).

Trogus obsidianator Br. De Grassi Point, Lake Simcoe, Ont., Aug. 6, 1895, (Walker).

* *Xenoschensis gracilis* Cushman. Banff, Alta. Proc. Ent. Soc. Wash., XVII, 141.

* *Xenoschensis slossonæ* Cushman. Spruce Brook, Nfd., July 24, 1914, (Walker); Proc. Ent. Soc. Wash., XVII, 140.

Eulophidæ.

Tetrastichus asparagi Cwfd. Vineland, Ont., (Ross).

Formicidæ.

Lasius niger L. var *sitkaensis* Pergande. Treesbank, Man., Sept. 23, (Hewitt).

* *Formica fusca* L. var *algida* Wheeler. Kenora, Ont., (J. C. Bradley); Saguenay River, Que., (Geo. Englehardt); Digby, N.S., (J. Russell); also from Newfoundland and Labrador; Psyche, XXII, 205.

Formica neogagates Em., subsp. *vetula* Wheeler. Banff, Alta., Sept. 16, (Hewitt).

Formica rufa L. subsp. *aggeranus* Wheeler. Banff, Alta., Sept. 16, (Hewitt).

Formica ulkei Em. Treesbank, Man., Sept. 23, (Hewitt).

* *Aphænogaster subterranea borealis* Wheeler. Lardo, Kootenay Lake, B.C., (J. C. Bradley); Bull. Amer. Mus. Nat. Hist., XXXIV, 413.

Psammocharidæ.

* *Ageniella cupidella* Banks. Ridgeway, Ont., Can., July 9, (Van Duzee); Can. Ent., XLVII, 400.

Apidæ.

Osmia armaticeps Cr. Invermere, B.C., female, June 30, 1914, (Sladen); Okanagan Landing, B.C., April 23, 1914, (Wilson).

Osmia quadridentata Cr. Hull, Que., April 25, (Sladen); Toronto, Ont., April 19, 1896, (W. Brodie).

Osmia bucephala Cr. Banff, Alta., May 21, (Sladen); Toronto, Ont., May 6, 1894, (W. Brodie).

Osmia cœrulescens Linn. Ottawa, Ont., May and June, (Sladen); Toronto, Ont., June and July, (W. Brodie). Mr. Sladen considers *purpurea* Cr. to be the same insect known in England as *cœrulescens*.

Osmia lignaria Say. Ottawa, Ont., male, April 5, 23, (Sladen); Golden, Invermere and Sydney, B.C.; Banff, Alta., (Sladen).

Osmia coloradensis Cr. Spulamacheen, B.C., female, Aug., (Wilson); Shawnigan, B.C., July; Revelstoke, B.C., May; Invermere, B.C., May, (Sladen).

Bombus fervidus Fabr. Vernon, B.C., (Venables).

Bombus moderatus Cr. Banff, Alta., (Sanson); Banff, Alta., on *Arctostaphylos uva-ursi,* May 21, (Sladen).

Psithyrus latitarsus Morrill. Aweme, Man., Sept. 16, (N. Criddle).

Hemiptera-Heteroptera.

(Arranged according to Banks' Catalogue; Amer. Ent. Soc., 1910; the numbers refer to the pages in the catalogue.)

Saldidæ.

12. *Salda humilis* Say. Ottawa, Ont., May and June, 1913 and 1914, (Germain).

12. *Salda littoralis* Linn. Ottawa, Ont., May and June, 1913 and 1914, (Germain).

Reduviidæ.

16. *Zelus luridus* Stal. Bondville, Que., (Moore).

Nabidæ.

22. *Reduviolus propinquns* Reut. Bondville, Que., (Moore).

Capsidæ.

30. *Plagiognathus politus* Uhler. Ottawa, Ont., June 27, 1914, (Germain).

37. *Dicyphus vestitus* Uhler. Ottawa, Ont., July 30, 1914, (Germain).

40. *Resthenia insitiva* Say. Aylmer, Que., Aug. 1914, (Germain).

41. *Miris vicina* Prov. Ottawa, Ont., Aug. 23, (Germain).

44. *Horcias marginalis* Reut. Ottawa, Ont., July 20, 1914, (Germain).

46. *Lygus viticollis* Reut. Ottawa, Ont., May 27, 1914, (Germain).

47. *Phytocoris lasiomerus* Reut. Ottawa, Ont., June, 1914, (Germain).

49. *Stenotus binotatus* Fabr. Ottawa, Ont., Aug. 3, 1914, (Germain).

49. *Pœciloscytus basalis* Reut. Ottawa, Ont., Aug., 1914, (Germain).

Tingitidæ.

56. *Galeatus peckhami* Ashm. Ottawa, Ont., Aug. 1914, (Germain).

Lygæidæ.

58. *Ischnodemus falicus* Say. Ottawa, Ont., July 23, 1914, (Germain).

59. *Crophius disconotus* Say. Ottawa, Ont., July 3, 1914, (Germain).

Pentatomidæ.

86. *Menecles insertus* Say. Quebec, Que., (Roy).

Orthoptera.

Some interesting records of these insects have been received. Considerable collecting in the order has recently been accomplished and our knowledge of the distribution of many of the species considerably widened.

Mantidæ.

Mantis religiosa L. This species known as the European Praying Mantis, and recorded in last year's Entomological Record, has evidently established itself in the Province of Ontario. This year it was again found near Picton, in Hallowell Township, on Oct. 1, (Brimley).

Acridiidæ.

Acrydium obscurum Hanc. Aweme, Man., May 28, Sept. 16, 1915, (Criddle).

Chlöealtis conspersa Harr. Athabaska Landing, Alta., Aug. 11, 1915, (Strickland). Previously reported from Banff, by Walker.

Orphulella speciosa Scudd. Aweme, Man., Aug. 7-17, (E. and N. Criddle).

Chortophaga viridifasciata DeG. Treesbank, Man., June 11, (E. Criddle).

Arphia frigida Scudd. Fort Chipewyan, Alta., June 14, 15, 1914; Fort McMurray, Alta., May 29, 1914, Hill Island Lake, Southern Mackenzie. July 13, 1914, (F. Harper).

Hippiscus tuberculatus Beauv. Fort Chipewyan, Alta., June 15, 1914, (F. Harper).

Trimerotropis monticola Sauss. Aweme, Man., Sept. 16, 1914. (N. Criddle).

Circotettix verruculatus Kirby. Athabaska Landing, Alta., Aug. 11. (Strickland); Island in Tsu Lake, Southern Mackenzie, Aug. 6, 1914; Fort Resolution, Mackenzie, Aug. 24, (F. Harper).

Melanoplus bivittatus Dodge. Athabaska Landing, Alta., Aug. 12, 1915, (Strickland).

Melanoplus bruneri Scudd. Athabaska Landing, Halcourt and Water Hole, Alta., Aug. 11, 12, (Strickland).

Melanoplus fasciatus Walk. Athabaska Landing, Alta., Aug. 11, (Strickland); Fort Resolution, Mackenzie, Aug. 24, 1914, (F. Harper).

Locustidæ.

Scudderia pistillata Brun. Rosedale, Alta., (Miss E. Moodie); St. Louis, Sask., July 25, 1898, (E. Coubeaux); new to Saskatchewan.

Conocephalus fasciatus DeG. Peachland, B.C., Aug. 6, (Wallis).

Udeopsylla nigra Scudd. Oxbow, Sask., July 31, 1897, (W. Noble).

Gryllidæ.

Nemobius fasciatus DeG. Near Souris, P.E.I., Aug. 27, 1915, (A. G. Huntsman).

Œcanthus niveus DeG. Penticton, B.C., Aug. 1908, (Mrs. Fowler).

Œcanthus nigricornis quardipunctatus Beut. Peachland, B.C., Aug. 2-12, (Wallis).

Neuropteroid Insects (Except Odonata).

(Arranged according to a catalogue of the Neuropteroid Insects (except Odonata) of the United States, by Nathan Banks; American Entomological Society. 1907. The numbers refer to the pages of the catalogue.)

Corrodentia.

Psocidæ.

7. *Pterodela pedicularis* L. Spruce Brook, Nfd., July 29, 1914, (Walker).
9. *Psocus campestris* Aaron. Toronto, June 30, 1914, (Walker).
9. *Psocus hageni* Bks. Algonquin Park, Ont., Aug. 17, 1903, (Walker).

Archiptera.

Perlidæ.

10. *Pteronarcys regalis* Newm. Athabaska River, between Grand Rapids and mouth of Little Buffalo River, Alberta, May 24, 25, (F. Harper).
10. *Pteronarcella badia* Hag. Coldwater, B.C., July, 1914, (Wilson).
11. *Isogenus frontalis* Newm. Hymers, Ont., June 19, 1908. (Dawson); Athabaska River, between Grand Rapids and Fort McMurray, Alta., May 28, 1914, (F. Harper); Tazin River, near Tha-inka Lake, Northern Saskatchewan, July 11, (F. Harper).
13. *Isoperla bilineata* Say. Ottawa, Ont., Aug. 13, 1909, (H. Groh); Ottawa, Ont., June 11, 1913, (Beaulne).
13. *Isoperla ebria* Hag. Bartlett Bay, off Glacier Bay, Alaska, June 19, 1907, (D. H. Nelles).
14. *Tæniopteryx frigida* Hag. Hull, Que., May 22, 1904, (W. Metcalfe).
15. *Arsapnia decepta* Banks. Wellington, B.C., March 9, 1907, (G. W. Taylor).

Ephemeridæ.

16. *Ephemera simulans* Walk. Tazin River and Hill Island Lake, Southern Mackenzie, July 14, 1914, (F. Harper).
* *Callibætis semicostata* Banks. Stony Mt., Man., Sept. 16, (Wallis); Proc. Acad. Nat. Sciences, Philadelphia, LXVI, 614.

Neuroptera.

Sialidæ.

22. *Sialis infumata* Newm. Casselman, Ont., May 22, 1904, (J. Fletcher); La Seine River, Rainy River District, Ont., June 30, (W. McInnes).

Trichoptera.

Limnephilidæ.

35. *Neuronia semifasciata* Say. Tsal-wor Lake, about 8 miles north of Lake Athabaska, Northern Saskatchewan, July 5, 1914, (F. Harper).
36. *Glyphotælius hostilis* Hag. Spruce Brook, Nfd., July 29, 1914, (Walker).
Limnephilus bifidus. Lake Athabaska, near mouth of Charlot River, Northern Saskatchewan, June 29, 1914, (F. Harper).
36. *Limnephilus indivisus* Walk. Hamilton, Ont., June 20, 1914, (Walker).
36. *Limnephilus nebulosus* Kirby. Fort Chipewyan, Alta., June 16-18, 1914, (F. Harper).

37. *Anabolia bimaculata* Walk. St. Lawrence River, between Montreal and Quebec (on steamer), July 15-16, 1914, (Walker).
Anabolia nigricula Banks. Fort Resolution, Mackenzie, Aug. 24, 1914, (F. Harper).
38. *Halepsyche indistinctus* Walk. Spruce Brook, Nfd., July 27, 1914, (Walker).
38. *Pycnopsyche guttifer* Walk. De Grassi Pt., Ont., Sept. 22, 1914, (Walker).
39. *Platyphylax designata* Walk. Tazin River, near Tha-inka Lake, Northern Saskatchewan, July 11, 1914, (F. Harper).
40. *Chilostigma difficilis* Walk. Toronto, Nov. 22, 1913, (Walker).

Sericostomatidæ.

42. *Brachycentrus similis* Banks. Athabaska River, above mouth of House River, Alta., May 22, 1914, (F. Harper).

Leptoceridæ.

46. *Leptocella exquisita* Walk. St. Lawrence River near Quebec (on steamer), July 16, 1914, (Walker).
46. *Mystacides sepulchralis* Walk. Sydney, N.S., July 24, 1914; Spruce Brook, Nfd., July 27, 1914, (Walker).
46. *Setodes grandis* Bks. Toronto, June 30, 1914, (Walker).

Hydropsychidæ.

47. *Hydropsyche scalaris* Hag. St. Lawrence River near Quebec (on steamer), July 16, 1914, (Walker).
48. *Nyctiophylax vestitus* Hag. Spruce Brook, Nfd., July 27, 1914, (Walker).

Odonata.

(Arranged according to Muttkowski's Catalogue of the Odonata of North America. The numbers refer to the pages.)

Coenagrionidæ.

39. *Lestes uncatus* Kirby. Red Deer, Alta., 1915 (Whitehouse). New to Alberta.
48. *Argia moesta putrida* Hag. St. John's, Que., July 11, 1914, (Chagnon).
54. *Enallagma antennatum* Say. St. John's, Que., July 11, 1914, (Chagnon). New to Quebec.
56. *Enallagma carunculatum* Morse. St. John's, Que., July 11, 1914, (Chagnon).
59. *Enallagma ebrium* Hag. St. John's, Que., June 24, 1914, (Chagnon).
59. *Enallagma exsulans* Hag. St. John's, Que., July 11, 1914, (Chagnon). New to Quebec.
85. *Ophiogomphus rupinsulensis* Walsh. St. John's Que., June 22, 1914, (Chagnon).
94. *Gomphus intricatus* Hag. Saskatoon, Sask., July 28, 1910, (Willing). First Canadian record. (Determined by P. P. Calvert.)
114. *Aeshna sitchensis* Hag. Red Deer, Alta., 1915 (Whitehouse).
114. *Aeshna umbrosa* Walk. Red Deer, Alta., 1915, (Whitehouse). New to Alberta.

Siphonaptera.

* *Ceratophyllus ignotus recula* J. and R. Okanagan Landing, B.C., July, 1913, off *Putorius arizonensis,* (J. A. Munro); Okanagan Falls, B.C., April, 1913, off *Thomomys talpoides,* (C. Grant); Kelowna, B.C., Dec. 1910, off *Mustela* sp. (A. Tate); Ectoparasites, 1, 58.

* *Ceratophyllus ignotus albertensis* J. and R. Blackfalds, Alta., collected off *Geomys* sp., *Mustela* sp., and *Lynx canadensis,* (A. D. Gregson); Ectoparasites, 1, 56.

* *Megarthroglossus sicamus* J. and R. Eagle River, Sicamous, B.C., found on *Canis latrans,* Sept. 1903, (G. F. Dippie); Ectoparasites, 1, 50.

* *Megarthroglossus procus* J. and R. Chilliwack, B.C., collected on *Spilogale,* Sept. 1899, and on *Peromyscus,* Dec. 1899, (Allan Brooks); Ectoparasites, 1, 47.

* *Catallagia decipiens* Rothschild. Horse Creek, Upper Columbia Valley, B.C., Oct. 13, 1913, off *Peromyscus,* (G. F. Dippie); Blackfalds, Alta., (A. J. Gregson); Red Deer, Alta., April 25, 1901, off *Evotomys saturatus,* (G. F. Dippie); British Columbia, off *Neotoma cinerea* (W. Wenmann); Ectoparasites, 1, 43.

* *Neopsylla inopina* Rothschild. Calgary, Alta., found on *Spermophilus richardsoni,* April 11, 1907, (C. Garrett); Calgary, Alta., on *Putorius longicaudatus* and *Evotomys saturatus,* (G. F. Dippie); Ectoparasites, 1, 30.

* *Doratopsylla curvata* Rothschild. Blackfalds, Alta., off Kangaroo Mouse and Shrew Mouse, (A. D. Gregson); Ectoparasites, 1, 25.

Araneida.

(Arranged according to Banks' Catalogue of Nearctic Spiders, U. S. N. M., Bulletin 72. The numbers refer to the pages in the catalogue.)

During 1915, collections of spiders have been made in some of the provinces, and also in Labrador, but many of the species have not, as yet, been determined. In 1914, Mr. J. H. Emerton collected in Alberta, and through Mr. N. B. Sanson, of Banff, some of the records are included here. Mr. Sanson has also made collections for several years and recently Mr. Emerton has named these.

Drassidæ.

10. *Drassus coloradensis* Em. Banff, Alta., July 4, 1914, (Sanson).

10. *Drassus neglectus* Keys. Natashkwan, South Labrador, July, (C. W. (Townsend).

Clubionidæ.

* *Clubiona obtusa* Em. Banff, Aug., 1914, (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 153.

Agelenidæ.

15. *Cryphœca montanata* Em. Banff, Alta., Aug. 15, 1914, (J. H. Emerton).

15. *Hahnia agilis* Keys. Old Romaine, South Labrador, July, (C. W. Townsend).

Theridiidæ.

20. *Theridium sexpunctatum* Em. Lake Louise, Alta., Aug. 1914, (J. H. Emerton).
21. *Steatoda borealis* Hentz. Banff, Alta., Aug. 15, 1914, (J. H. Emerton); South Labrador, July, (C. W. Townsend).
26. *Hypselistes florens* Camb. Colpoy's Bay, Ont., Ompah, Ont., (A. B. Klugh).
- * *Lophocarenum dentipalpis* Em. Goat Mountain, Jasper, Alberta, (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 149.
- * *Lophocarenum erectum* Em. Tackakaw Falls, Yoho Valley, B.C., (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 150.
- * *Gongylidium tuberosum* Em. Battle Harbor, Labrador, (C. W. Leng); Trans. Conn. Acad. Sci., Vol. 20, 150.
- * *Gongylidium canaliculatum* Em. Prince Albert, Sask., (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 151.
- * *Tmetis reticulatus* Em. Lake Louise, Laggan, Alta., (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 148.
- * *Tmetis obtusus* Em. Lake Louise, Laggan, Alta.; Jasper, Alta., (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 149.

Linyphiidæ.

33. *Linyphia nearctica* Banks. Blanc Sablon, South Labrador, July, (C. W. (Townsend).
33. *Linyphia phrygiana* Koch. Banff, Alta., Aug. 15, 1914, (J. H. Emerton); South Labrador, July, (C. W. Townsend).
- * *Bathyphantes arborea* Em. Banff, Alta.; Laggan, Alta.; Yoho Valley, B.C., (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 150.
- * *Bathyphantes occidentalis* Em. Vancouver, B.C., (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 151.
- * *Microneta pinnata* Em. Prince Albert, Sask., (J. H. Emerton); Trans. Conn. Acad. Sc., Vol. 20, 152.
- * *Microneta flava* Em. Lake Louise, Laggan, Alta., (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 152.

Epeiridæ.

- * *Singa campestris* Em. Kenora, Ont.; Edmonton, Alta., (J. H. Emerton); Trans. Conn. Acad. Sci., Vol. 20, 153.

41. *Epeira carbonaria* Koch. Laggan, Alta., Aug. 12, 1914, (J. H. Emerton).
41. *Epeira marmorea* Clerck. Banff, Alta., Aug. 27, 1914, (Sanson).

Thomisidæ.

48. *Xysticus ferrugineus* Em. Banff, Alta., July, 1913, (Sanson).
48. *Xysticus triangulosus* Em. Banff, Alta., July, 1913, (Sanson).
49. *Coriarachne brunneipes* Banks. Banff, Alta., Aug., 1914, (Sanson).
51. *Thanatus coloradensis* Keys. Banff, Alta., June, 1912, (Sanson).
52. *Philodromus inquisitor* Thor. Banff, Alta., (Sanson).

Lycosidæ.

55. *Lycosa albohastata* Em. Banff, Alta., (Sanson); Mecatina, South Labrador, July, (C. W. Townsend).
55. *Lycosa beani* Em. Banff, Alta., Sept. 7, 1913, (Sanson).
56. *Lycosa fumosa* Em. Banff, Alta., Sept. 7, 1913, (Sanson).
57. *Lycosa quinaria* Em. Old Romaine, Southern Labrador, July, (C. W. Townsend).
59. *Pardosa gracialis* Thor. Laggan, Alta., Aug. 1914, (J. H. Emerton).
* *Pardosa albiceps* Em. Spray River, near Banff, Alta., (Sanson); Trans. Conn. Acad. Sci., Vol. 20, 153. Type locality with description, given in error as "Spray River, B.C."
59. *Pardosa grœnlandica* Thor. Banff, Alta., June 25, 1912; Sept. 7, 1913, (Sanson); Old Romain and Natashkwan River, South Labrador, (C. W. Townsend).
59. *Pardosa glacialis* Thor. Blanc Sablon, South Labrador, July; Natashkwan River, South Labrador, July, (C. W. Townsend).
60. *Pardosa luteola* Em. Banff, Alta., Aug. 8, 1914, (Sanson); Old Romaine, South Labrador, July, (C. W. Townsend).
60. *Pardosa tachypoda* Thor. Banff, Alta., July 4, 1914, (Sanson).

Attidæ.

66. *Dendryphantes flavipedes* Peck. Banff, Alta., (Sanson).
* *Pellenes sansoni* Em. Spray River, near Banff, Alta., (Sanson); Trans. Conn. Acad. Sci., Vol. 20, p. 154.

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ANNUAL REPORTS

OF THE

DAIRYMEN'S ASSOCIATIONS

OF THE

PROVINCE OF ONTARIO

1915

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:

Printed by A. T. WILGRESS, Printer to the King's Most Excellent Majesty

1916

Printed by
WILLIAM BRIGGS
Corner Queen and John Streets
Toronto

To His Honour Sir John Strathearn Hendrie, C.V.O., a Lieutenant-Colonel in the Militia of Canada, etc., etc., etc.

Lieutenant-Governor of the Province of Ontario.

May it Please Your Honour:

The undersigned beg to present for the consideration of Your Honour the Report of the Dairymen's Association of Eastern Ontario for 1915 and the Report of the Dairymen's Association of Western Ontario for 1915.

Respectfully submitted.

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1916.

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DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO

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Frontenac	Jos. McGrath, Mt. Chesney.
Lennox & Addington	N. M. Empey, Napanee.
Prince Edward	T. G. Wright, Picton.
S. Hastings	John Kerr, Belleville.
N. Hastings	T. H. Thompson, Madoc.

G. G. Publow, Chief Dairy Instructor, Kingston.
L. A. Zufelt, Superintendent, Eastern Dairy School, Kingston.
Auditors: J. J. Payne, Brinston; Morden Bird, Stirling.
Representative to the Canadian National Exhibition: Henry Glendinning, Manilla.

FINANCIAL STATEMENT FOR 1915.

Receipts.

Jan. 7—Cash on hand from previous year	$582 54
Received from prosecutions	498 50
Peterboro grant	150 00
Peterboro County grant	150 00
Members' fees	115 00
Receipts, programme advertising	230 00
Legislative grant	1,250 00
Interest, Molsons Bank	18 81
	$2,994 85

Expenditures.

Peterboro pay sheet, Directors, other expenses	$349 65
Toronto pay sheet, executive committee	185 20
Lecturers' expenses	385 10
Advertising and printing	411 52
District meeting expenses	143 25
Rural Publishing Co., subs. to "Farm and Dairy"	85 40
Stationery, stamps, telephone, express	66 77
Officers' salaries	600 00
Official stenographer	90 00
Prosecutors' expenses	329 90
Balance on hand	348 06
	$2,994 85

DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO

OFFICERS FOR 1916.

President—James Bristow, St. Thomas, Ont.
First Vice-President—R. W. Stratton, Guelph, Ont.
Second Vice-President—W. A. Bothwell, Hickson, Ont.
Third Vice-President—J. MacHoover, Burgessville, Ont.
Secretary-Treasurer—Frank Herns, London, Ont.

Directors:

J. N. Paget, Canboro.
T. Ballantyne, Stratford.
J. H. Scott, Exeter.
James Donaldson, Atwood.
Geo. E. Booth, Ingersoll.
Robt. Snell, Norwich.

Auditors: J. A. Nelles, London; J. C. Hegler, K.C., Ingersoll.

Representatives:

Canadian National Exhibition, Toronto: Frank Herns, London; Robt. Johnston, Woodstock.

Western Fair, London: F. Herns, London; Jno. Brodie. Mapleton.

FINANCIAL STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1915.

Receipts.

Cash on hand from previous year	$439 86
Members' fees, 283 at $1.00	283 00
Legislative grant	1,500 00
Money received from prosecutions	485 00
Donations for special prizes	50 00
Sale of dairy exhibits	2,084 95
Advertising in Convention programme	155 00
	$4,997 81

Expenditures.

Cash paid for prizes: cheese and butter, $367.00; Special Canadian Salt Co., $50.00	$367 00
Expenses for Convention	119 00
Stenographer's salary, $338.00; Directors' expenses, $141.25	479 25
Postage and stationery, $153.90; printing, $191.88; advertising, $160.04	505 82
Judges' fees and expenses	45 60
Prosecutor's salary, $168.75; expenses, $77.25	246 00
Periodicals for members	196 73
Cost of reporting	60 00
Purchase of dairy exhibit	2,087 55
Office expenses, light, cleaning and sundries	136 40
Office rent, $120; office furniture, $14.00	134 00
Telegrams and telephone, $45.60; express and cold storage charges, $28.28	73 88
Half fine paid to factories	242 50
Auditor's fees	13 00
Refund to members	1 00
Purchase of demonstration butter	18 62
Total	$4,726 35
Balance	271 46
	$4,997 81

Dairymen's Association of Eastern Ontario

The Thirty-ninth Annual Convention of the Dairymen's Association of Eastern Ontario, was held in the Town Hall, Renfrew, on the 5th and 6th of January, 1916.

JAMES A. SANDERSON, Oxford Station, President of the Association, occupied the Chair.

PRESIDENT'S ADDRESS.

It gives me much pleasure, as President of the Eastern Ontario Dairymen's Association to welcome you to the thirty-ninth annual convention of this Association, and to congratulate the members on the privilege of meeting in Renfrew, whose citizens are so justly proud of their town, one of the rapid growing and most progressive of Eastern Ontario, and having the distinction of being the creamery town of our Province. As I have some knowledge of the calibre of your citizens and the keen alert business ability of your rural population, I venture the assertion, that in the near future you will be one of the leading dairy producing districts of Eastern Ontario. My earnest desire is that our meeting in your midst may be a factor in inspiring you with the possibilities along this line.

Nineteen hundred and fifteen has surely been a record year in all branches of the dairy industry; this is especially true of the cheese business, and the results should be convincing proof that the dairy industry is one, if not the greatest, factor in the wealth production of our fair Dominion. I am pleased to tell you that a keener interest than ever before has been taken by all concerned in the industry, in everything that tends to increase and improve the business; such as the districts, dairy meetings, the herd improvement work, the work of District Representatives, and the annual factory meetings.

On behalf of the Association I take pleasure in tendering the thanks of the dairymen to the Departments of Agriculture, both Provincial and Federal, for the splendid assistance being rendered to these different lines of Educational work.

I am glad to know that our chief dairy instructor, Mr. G. G. Publow, through the local instructors of Eastern Ontario, has conducted some comparative experiments this season between sound well-cooled milk and ordinary milk. The results, when published, should be an incentive to dairymen to make it their personal business to see that every pound of milk produced is handled in such a manner that it will give the best possible results.

Reference was here made to the slight decrease in output of butter in Eastern Ontario, while the price was from 2c. to 3c. a pound higher. In cheese both quantity and price were most satisfactory, the net increase in value for the season being about $3,000,000.

In conclusion I wish to congratulate the dairymen on the success of their efforts for greater production and on the patriotism shown by dairymen throughout Ontario in their splendid response to the different patriotic funds for the comforts of the sick and wounded at the front and for the assistance of those depending on them at home, and I make an earnest appeal to you to not only maintain the production reached in 1915, but use your best efforts to make 1916 show a greater increase, remembering in doing this you are doing your bit to help yourself, your country, and the British Empire, of which you form no mean part.

COMMITTEES.

Nominating Committee.—R. G. Leggett, Newboro, Ont.; Neil Fraser, Vankleek Hill; J. B. Ferguson, Renfrew; W. H. Olmstead, Bearbrooke; T. H. Thompson, Madoc; T. A. Thompson, Almonte.

Resolutions Committee.—G. A. Gillespie, Peterboro; J. A. Campbell, Ormond; William Brown, Dickenson's Landing; Joseph McGrath, Mount Chesney; T. J. Wright, Picton; Henry Glendinning, Manilla.

CARE AND FEEDING OF THE DAIRY COW.

Henry Glendinning, Manilla.

In presenting a subject of this kind, we have to confine ourselves to a few leading points.

The Cow.

The dairy farmer, as a rule, confines himself to one of the well-known recognized dairy breeds. It is not necessary that the cows should be registered animals of their respective breeds, but the dairyman should use a pure-bred sire of whatever breed he may have chosen to build up a herd.

It is easier and more economical to handle one breed than two or three, as the farmer can concentrate his mind on that one breed and his money in procuring a first-class sire. See that the sire is descended on both sides from parents of good milkers and high test in butter fat. Dairymen should, as far as possible, raise their own cows. With the creamery this is easily done, as there is always an abundance of fresh skimmed milk. The young calf should be fed the whole new milk from the mother for a week. After that a little skimmed milk can be added, and the skimmed milk gradually increased, so that at the end of three weeks the new milk can be cut off altogether.

It is a good plan to add a little ground flax seed to the skimmed milk to supply the natural fat that has been taken from the milk in the form of cream. In advising ground flax, I wish to impress upon my hearers that I do not mean oil cake, as the most of the oil has been taken from the flax in the process of making the oil cake. Oil cake and skimmed milk have a good deal in common in their composition as feed stuffs. With skimmed milk the green grasses and clovers in the summer, plenty of shade, makes calf raising an easy matter. For winter feeding substitute the grasses by using alfalfa or clover hay, corn, silage and roots. If alfalfa cannot be had, substitute ground oats to take its place.

It is advisable to have young heifers to drop their first calf at about thirty months of age. If they freshen earlier, in the course of a few generations it has a tendency to weaken the offspring and make them smaller and less robust.

Early summer conditions are the ideal ones for successful dairying. The cows are allowed to wander in the fields at their own sweet will, bathed in sunshine, expanding their lungs with pure air, abundance of succulent and palatable grass and pure spring water. Unfortunately these conditions do not continue throughout the summer. Supplementary feed has to be supplied to help out the pasture. The best of these supplementary feeds, I consider to be alfalfa, which can be fed either green or as hay. It contains a high percentage of all of the nutriments for milk production. Corn silage made the previous season and in a narrow, deep silo, with the addition of such feeds as wheat bran, ground oats, cottonseed meal, or oil cake, is good. Later in the season, green peas and oats, and green corn are found excellent.

For winter feed, roots, silage, alfalfa and red clover hay stand out prominently as roughage, supplemented with wheat bran, ground oats, cottonseed meal and oil cake. If an abundance of alfalfa hay is to be had there will not be much need of the more expensive meals.

Stable Ventilation.

Farm animals could live several days without food or water, but not many minutes without air. Fresh air is the most essential element in the maintenance of life. It is the most easily obtained of all life sustaining elements, but it is frequently used as if it was a very scarce commodity from the small quantities that are sometimes allowed to enter the stables.

The demand from the cities and towns for milk and cream during the winter has given winter dairying a great impetus. Clean, sanitary milk can only be obtained from healthy cows, good food, pure water and well ventilated stables. The stables should be well lighted by large windows. I prefer the windows extending from the ceiling well down towards the floor, the sash to be made in one solid piece and stationary at the bottom, but arranged to drop inward at the top. This permits the windows to be partly opened on warm days without any draught striking the cows. During cold weather the windows should be kept closed and the air conducted from near the ground, outside, up a flue and discharged into the stable near the ceiling. The foul air should be removed from the stable from near the floor, as that is where the deadly gas settles after being thrown off by the animals lungs. This can be accomplished by having a tight board flue made to carry the foul air up from the stable floor and extending above the ridge of the barn. When all of the doors and windows are closed there will be a constant current of fresh air entering from the side entrances and the current of foul air passing up the central flue out at the top of the barn. A trap door should be put in the foul air flue near the ceiling to be opened when the weather gets warm, so as to carry off quickly the overheated air of the stable. By keeping the opening in the flue near the ceiling closed during cold weather, it prevents the escape of the warm air in the body of the stable and carries off the cool, foul air from the floor. A common error is made by supposing that warm air is foul air and that cold air is pure. The reverse is apt to be the case in our stables.

Water.

The importance of water will be more clearly understood when we consider that an average cow, as she stands, consists of about 50 per cent. of water, her milk about 87 per cent. and her blood about 90 per cent., and that all of the food is carried through the system by the action of water. The water should be pure and free from any contamination, and constantly in front of the cows in the stable where they may drink at will. If allowed to drink whenever she pleases she will never drink enough at one time to chill her. A cow that gives a large flow of milk must of necessity drink a large quantity of water. A storage tank should be provided so that the drinking troughs can be supplied automatically by gravitation but held in check by a valve.

Cement Floors and Mangers.

Cement floors and mangers are best from a sanitary and economic standpoint. The stables should be white-washed every fall, which will add much to their light and sanitary condition. The manure should be removed from gutters twice daily, and the cows curried and brushed every day.

Feeding.

The feed of the dairy cow is always an interesting subject to the dairy farmer. It is an easy matter for the theoretical feeder, who has now cows, to solve. He can choose his silage, hay, grains and other concentrated foods, and say that so many pounds of each will make a perfectly balanced ration. The practical farmer who endeavors to raise all of the feed for his cows on his own farm has many things to contend with that prevents him carrying out his plans; such as, a failure to get a catch of clover, corn or roots, owing to drought, destruction by insects, wind or weather. Some of these conditions present themselves to the farmers nearly every season in some form or other. The farmer must forever nurture hope. If he has had failure this year he should persevere next season along some well laid out plan. Every farmer should attempt to raise as much of the feed required for his cows as possible. There are two crops that I strongly advocate. These are corn for silage and alfalfa for hay. These two foods in abundance for winter feed puts the dairyman in a very advantageous position. In giving special prominence to these two feeds, I do not minimize the importance of such feeds as roots, red clover hay and a number of others that might be mentioned. The reason I give prominence to these two is that they can be raised cheaply in large quantities and they contain all of the nutrients required for milk production. On nearly every farm in Ontario corn can be grown successfully. Alfalfa has had a more chequered career. There have been many failures but I am strongly of the opinion that nearly every failure can be traced to some cause, which, in the most of cases, can be remedied.

One of the principal causes of failure in our alfalfa crops is the sowing of seed of a variety that is not suited to this northern climate. If Ontario grown seed, known as the Ontario Variegated variety, is sown and properly handled, we would hear less of failures in alfalfa growing. Much alfalfa seed is sold as northern grown seed. There is none of the Ontario variegated variety sold as northern grown. Let the farmer ponder over these words northern grown, and ask himself the question "What does Northern Grown mean?" Where there is not plenty of alfalfa or red clover, it will be necessary to feed liberally of such feeds as wheat bran, oil meal, cottonseed meal or brewers' grains.

Discussion.

Q.—How many ventilation pipes would be required in a stable 40 x 60?

A.—That would depend on the number of horses and cattle that you had in the stable. If such a stable were full of cattle, I should say you should have at least four intakes from the outside and two outtakes from below. I think that a smaller pipe that goes straight up will give better results than two pipes if there is a bend in them; the bend seems to check the draught.

Q.—Is it necessary to have the pipes go straight to the roof?

A.—They should go outside.

Q.—Can you take the pipe out at the gable end?

A.—Yes, they can be taken out at the end. Don't run them out sideways, because if it is turned to the north, then when you have a north wind it prevents a suction by striking against the pipe, you must have the pipe straight up so that the wind will blow over the top.

Q.—Could not the pipe go up through the roof anywhere?

A.—I prefer having it on the ridge. If the pipe is on one side of the barn and not higher than the ridge, then if the wind is blowing in a certain direction it will not draw properly.

Mr. Grisdale: I know that if you carry the pipe through the roof at any point and have it above the peak it will be quite satisfactory.

A.—Yes, it is perfactly satisfactory if you carry it above the peak, but very few do that. Where it merely sticks up six inches above the roof and not above the peak it is not satisfactory.

Mr. J. R. Dargavel, M.L.A.: I have two outlets one on each side of the stable and they come together at the peak of the roof. I have a large cupola, 6 ft. x 8 ft. and 8 ft. high on the peak. There is a door on each side of the cupola, the full size of the cupola. There is a rod between these two doors, when the wind blows from the west it closes the west door and opens the east door and vice versa.

A.—I have had that on one of my buildings for twenty years, but there is one point that I do not like about it. We have iron rods to open the doors and we have never yet been able to get one that will last very long; they break from the constant jar.

Mr. Dargavel: I use wooden rods with iron ends. The jar will not affect the wooden rod in the same way that it will affect the iron.

Q.—What do you think of painting the walls of the stable?

A.—It would be a very good way, because then you could wash them down.

Q.—Would it not be better than whitewash?

A.—I do not know that there is anything more sanitary than white-wash.

Q.—The trouble with whitewash is that after you have applied it once or twice it will continually peel off. We find it expensive to keep on whitewashing. We find that the paint will last two or three years, and in the end it is cheaper than whitewashing.

G. A. Gillespie, M.L.A.: What quantity of variegated alfalfa seed could you buy last year?

A.—I secured all I required, but it was very scarce. This year was so wet that I did not produce much seed. Haldimand County is the principal place where that seed is grown, and I do not think they had any seed this year. There is no doubt we can grow alfalfa seed if we get the right kind of a season. There are a good many things that we do not yet understand about growing alfalfa seed in Ontario.

Mr. John Forrester: You described the raising of the dairy calf and feeding the cow, but you did not say one word about salt. I am afraid that a great many farmers leave the salt in the bags, and do not use it as they should.

A.—It is very important that the cow should be fed salt.

Q.—What system have you for cleaning out the stable?

A.—We have a track and bucket and it is run out into the yard.

Q.—What is the proper age at which to breed a dairy cow?

A.—So as to have them come in at the age of thirty months.

Q.—Do you let your cows out during the winter?

A.—No, they are never let out; they are put in in the fall and remain there till the spring.

Prof. Grisdale: What do you think of mixing salt with the feed?

A.—That is how we do it in the winter time.

SOME COW TESTING POSSIBILITIES.

Chas. F. Whitley, Ottawa.

As your secretary has been kind enough to ask me for a few observations on the work of cow testing as carried on under the Dairy Branch at Ottawa, may I simply outline one or two ways in which it is daily proving itself of inestimable value to the dairymen of Canada.

Cow testing is recommended because it is a rational method of quickly building up a thoroughly profitable herd. It is almost possible to say that the sun has set on the day of the 3,000 pound cow: we are beginning to celebrate the dawn of a new era wherein each cow kept by the ordinary factory patron makes a good profit. Men at the high noon of prosperity as dairymen are those who, having disregarded the siren voices of the poor average cows, have come under the magnetic attraction of the record-selected, large-profit cow.

You are well aware that the aim of all cow testing is increased efficiency of all cows kept. If not efficient, why keep them? The pillar of strength on every dairy farm being always built on the foundation stone of dairy records, including as the next three courses, plenty of good feed, the pure-bred dairy sire of good dairy ancestry, then good judgment, bears as its crowning keystone, invariably, the profitable herd. That stone of good judgment is necessarily laid with the cement mortar of such measure of business efficiency that determines not only the annual profit on each individual in the herd, but knows that all feed is suitable, is both secured and used economically; remembering, for example, that for every pound of protein, as is contained in every twenty-eight pounds of milk, the cow has to get somewhere two pounds of protein in her daily bread, her owner's efficiency will know whether that necessary protein costs him 12, 8 or 6 cents per pound. Such efficiency is possible for all dairymen.

This leads to certainty in dairy operations. Have not some of our patient dairymen "guessed" at things just a little too long? Development through cow testing is permanent, not incidental, and surely true wisdom lies in the discernment of the essential, the lasting. It can never be hard-boiled egotism for any man to say "I've got a good herd, my figures prove it." Cow testing is certainly with us to stay.

Evidently, therefore, we may expect a realization of our dream of increasingly high yields of milk and fat from our ordinary cows. Why not, indeed? There is a trinity of ruin in poor crops, poor cows, and poor conceptions of possibilities. Let us kill the vulture sense and sight for those dead things that can only annul progress. Spurning the old pathway our cow testing members are stepping into a new track, the primrose way to happiness, exulting in yields of 7,360 lbs. milk and 254 lbs. fat from two year old grades; 11,000 and 15,000 lbs. milk, 400 and 500 lbs. fat in the year from more mature cows.

COMPARATIVE YIELDS.

One Herd of Nine Cows, Eastern Ontario.

Cow No.	Age.	Pounds of Milk.	Pounds of Fat.
1	6	6,834	255
2	6	4,164	147
3	10	6,255	238
4	6	4,362	161
5	4	7,736	281
6	3	6,590	227
7	3	5,170	209
8	5	7,200	258
9	9	6,642	247

Average per cow: Income, $67.38; feed, $40.00; net profit, $27.38. All cows fed the same, feed weighed by owner.

These figures of a herd of nine grades in Ontario are of interest from one or two points of view.

When the average yield per cow as kept in his own herd record book by the owner is seen to be 6,105 lbs. milk, 3.6 test and 224 lbs. fat it may be considered a fairly good herd. With fat valued at 30 cents per lb. the average income is $67.38, leaving, with feed valued at forty dollars, a net profit from each cow of $27.38.

The lowest yield is from a six-year-old, giving 4,164 lbs. milk containing 147 lbs. fat, returning a profit of only four dollars. Another six-year-old is a close second to this record. A three-year-old is well up above the average, a four-year-old heads the list with a yield of 7,736 lbs. milk and 281 lbs. fat. This means a profit of forty-four dollars, or eleven times as much profit as is made by the six-year-old. Notice the two extremes, one cow giving actually 3,572 lbs. milk more than the other.

When there is seen to be a difference in income of over forty dollars between two cows receiving the same care and attention, is it not self-evident that individual, not average, merit and efficiency must be considered?

No good dairyman wants to be inveigled into running to cover behind the sheltering average which never discriminates good from poor, nor does his ambition for good yields deserve to be dampened by a miserable 2,700 lbs. milk trickling in one full lactation period from a so-called dairy cow.

Each owner can decide if it is advisable to dispose of all cows that with the third or fourth calf do not come within 500 or 1,000 lbs. of the herd average.

These higher yields mean lower cost, because the expense side of the account does not increase in proportion. When dairymen are found to be reducing the feed cost of milk and fat, even when the feed given is both more liberal in quantity and actually costs more hard cash, simply because that feed is handed to cows known to be efficient, then we begin to glimpse the possibilities of cow testing if its common sense principles are more generally applied.

Logically, then, larger incomes are within reach. Our records enable us to submit such figures as these: 73 cows last season earned $4,310.59, but 69 cows close by earned $6,694.35. That is, they brought in an extra amount of spot cash to the extent of $2,383.76. Here we have one sample, a clean cut indication of what can be duplicated in hundreds of localities.

This leads us to notice how the net profit, the real acid test of business, can also be considerably increased. Other professions tell us plainly there are rigid, narrowing laws, clearly defined. The singer, the instrumentalist, have to be exact, no flat or sharp notes must intrude; the artist cannot have one shade of color out of place: the river without banks or squeeze of mountains spreads to a useless swamp. So our cows may be educated by the professional dairyman into the business attitude of increased profit. I find in the statements forwarded to the office by dairy farmers who keep careful feed records, which we supply free, that at one factory 50 cows made a profit above feed cost of $615.93. At the next factory is a group of 43 cows that cleared a profit of $1,540.36. Does your herd average about three cents profit per day, or more than nine? In district after district in Ontario and the east I find single cows making less than one cent. per day profit, while other cows, with a feed cost of over forty dollars, are making fifteen times that profit.

Another indication of the master key usefulness of cow testing is its ability to build every dairy farm into a Gibraltar, impregnable against the ravages of its fertility by hungry stock. Such men as from their dull fires of keeping "just cows" shake out the ashes of discontent, the clinkers of indifference, stoke up with the hard coal of well fed, selected cows, soon find their real dairy enthusiasm well ablaze, and radiating prosperity to every distant corner lot of the farm. Instead of six or seven cows kept per hundred acres, they find it pays to carry eleven or thirteen, instead of 200 pounds of milk from every cultivated acre, they obtain 800 or 1,400 pounds.

Our records also show that more and more is being appreciated the value of the pure-bred dairy sire from a good family. Picking up records of herd after herd, and group after group of grade cows headed by a pure-bred sire, I find that the heavy balance in his favor is from 1,500 frequently up to as high as an extra 3,000 pounds of milk per cow. These figures are of immense import to our farming community, they suggest again that our cow testing members might well add to their co-operative purchases of feed stuffs the further co-operation of the very best pure-bred sire to be found.

Some Sample Increases in 3 Years Cow Testing, Both in Number of Cows and Yields of Milk.

Herd.	Last Year.		Three years ago.		Increase per Cow.	Percentage Increase.	
	No. of Cows.	Average lbs. Milk.	No. of Cows.	Average lbs. Milk.	Lbs. Milk.	Lbs. Milk.	No. of Cows.
						%	%
A	9	7,225	5	6,287	938	14	80
B	14	7,574	8	5,894	1,680	28	75
C	8	6,404	5	4,704	1,700	36	60
D	11	7,255	8	5,266	1,989	38	37
E	7	4,844	2	2,811	2,033	72	350
F	16	7,259	12	4,572	2,687	58	33
G	8	10,935	5	7,689	3,246	42	60
Average..	73	7,392	45	5,405	1,987	36	62

Total Yields, 296,459 lbs. Milk—More. 122% Increase.

Your attention is particularly invited to the fact that cow testing makes for better and bigger things as evidenced by these seven Ontario herds, samples of very many others.

After three years of application of this simple tally system, cow testing, we see these herds increasing in the yield of milk per cow from 2,800 lbs. to 4,800 lbs., from 4,500 to 7,200, from 7,600 to 10,900 lbs. Here are gains of from 14 to 72 per cent.

This is not all. Achievement is made a starting point for further endeavour: as cow testing clinches the proof of its special utility in securing more milk it opens new avenues, it proves that the good old standby the dairy cow is worth keeping. Hence these men of enterprise add to their possessions, thereby bringing not sorrow, but the double distilled joy of larger herds of selected excellence and uniformity. The man with 5 cows three years ago now keeps 9, each one better; the owner of 8 now has 14.

As these figures show, the general average increase is 1,987 lbs. of milk per cow, or 36 per cent.: while in place of 45 cows these men now own 73, or 62 per cent. more. So much better is the general average of the cows kept that the total milk yield is increased by 296,459 pounds, one hundred and twenty-two per cent.

May I submit that better proof, not simply of possibilities, but the actualities of cow testing could not reasonably be demanded.

These seven or eight points hastily sketched indicate clearly that cow testing is not simply a mere matter of occasionally sharpening a lead pencil to puncture the toy balloon of a few low average yields; the outlook is far broader, higher ambitions are fostered. Milk records, but the initial letter in the alphabet of herd improvement can spell out strong sentences bubbling over with encouragement for all. They become for the herd owner both eye and ear, helping him to see, to hear, to discern clearly those things easily within his grasp which make for immediate improvement and lasting success. If men but "follow the impetus," if there can be a definite registry of one's relationship to this timely movement, if with couched lance our dairymen will charge into the lists against those poor, those sinister-barred antique cows, if we all grip these wider problems of advanced dairying with intensity and tenacity, we shall, with loyal and useful service to country and generation, work a revolution through cow testing possibilities.

Senator Derbyshire expressed appreciation of the address delivered by Mr. Whitley and asked the delegates to apply direct to the Department of Agriculture for further particulars.

WHAT KIND OF FEED TO GROW AND HOW TO GROW IT.

J. H. Grisdale, Director Dominion Experimental Farms, Ottawa.

This morning, Mr. Glendinning entertained us at some length on the care, breeding and management of the dairy cow. Mr. Whitley has just given us some valuable suggestions as to what we should do to increase the production of the individual cow, and I have thought in view of these two addresses, that I could not do better than deal with the sinews of war. We who are carrying on war, know that there is a tremendous amount of supplies needed, and you who are producing milk know that it is not only cows and men that are needed but a very considerable amount of feed, and I propose to discuss with you this afternoon "What kind of feed to grow and how to grow it." If we are to make a success of dairying we must depend on what we can grow on our own farms. The dairyman who depends largely on what he buys, or upon what accidentally comes along is not going to make a success.

One reason why so many of our dairymen fail to make a striking success of the business is that they fail to begin the business in a right way. They fail to make the best use of the land on which they are working. There is room for improvement in the herds and in their management, but I believe there is even greater room for improvement in the management of our farms. We, to-day, as farmers, are not getting anything like proper returns from our acres. This year has been an exception from one end of Canada to the other and we are rolling in wealth of farm products. It has never before been equalled in the history of this country. Within the last month and a half I have been from the Pacific to the Atlantic, and never before have I seen anything like the crops that have been secured. ' The yields of all kinds of farm products is beyond anything that has ever happened before in this country.

Let me give you a few figures to think over: In Saskatchewan, a common yield for wheat was 50 bushels per acre. I saw one field that gave 75 bushels per acre of Number One Northern Wheat. 100 bushels per acre was very common for oats, and some were as high as 150, and that extended right through the Western Provinces. In Manitoba it was almost as good. While we have not been quite as generously dealt with in Ontario in the way of grain crops, our forage crops have been most excellent. Why cannot we have every year some good crops? I ask you to ask yourselves that question. The reason we cannot have them every year is because we do not handle our land properly. There is absolutely no reason why the crops in this country should not be on an average fifty per cent. better than they are, taking them one year after another. The reason they are not fifty per cent. better is because there is too great a percentage of men who are willing to take what comes along and who handle the land with as little labor as possible, and who devote very little attention to the cultivation of their land. We have got to change all that and we have to put into our business of producing crops, a little more care and intelligence and thought and a little bit more labor. Many farmers put enough work on their land, but they do not do it in the right way. There is on the programme for this afternoon an address by Mr. Leitch on "Farm Management." I think that is one of the most important lines of improvement that can be undertaken by the farmers at this present time. We are too willing to handle our farms as our fathers did, and we are too willing to let the farm crops be produced in the same way and with the same lack of orderly methods that our grandfathers had. That was all right in the old days. I won't say it was absolutely all right, but it was not too bad because the land at that time was simply overflowing with fertility, but now conditions have changed, and in many places the soil is depleted of much of its fertility, and in other places the land is infested with weeds and show the effect of long cropping. That has to be changed, and what I am going to talk to you about to-day is the kinds of crops to grow and how they should be grown in order to get the greatest yield.

Practically all who are here are engaged in the dairy industry. The farmer must consider the crops best suited for the business that he is in. Every last one of us has found that the most important characteristic of a good feed for a dairy cow is that characteristic which will make her like it. We must have in the feed something that lends palatability to it—something that will make the cow consume a lot of it. If you feed a cow 100 pounds of feed, she will produce so much milk; if you feed her 150 pounds, that same cow will produce you so much more. Feed her 100 pounds of feed that she likes and she will give you more milk than if you feed her 100 pounds of feed that she just eats. Hence the production of food that has that characteristic of palatability or that is acceptable to the cow is doubly important, because in the first place it will make the cow produce more milk for the amount consumed, and in the second place, it will make her consume more food and produce that much more milk. If we get a feed that a cow likes, she will produce the milk more cheaply. While it is important to make a cow give a large yield, 8,000 or 15,000 pounds, it is just as important to produce that milk in such a way that it will cost us less than what we get for it. Producing 10,000 pounds of milk at a cost of $100 is not very profitable to the farmer, but if he can produce 10,000 pounds for $80, or better still for $50, then there is a chance of making some profit. Therefore, it is necessary to consider the cost of the article that we feed to the cow. We have not very many succulent feeds available in this country; we have corn ensilage, turnips and mangels. Corn ensilage is easily the most acceptable both to the farmer and to the cow. Perhaps I should not say the most acceptable to the cow, but equally as acceptable as either of the other two, and it is more acceptable to the farmer because it can be handled more readily and economically and profitably. Therefore, corn should be one of the principal products of the dairy farm in Eastern Ontario. I am glad to say that my observation leads me to feel sure that it is already one of the principal crops in this part of Ontario, in fact in the whole of Ontario, and it is getting to be the most important crop in the Province of Quebec. I think the farmers all over Canada are quite conscious of the value of the corn crop, therefore, I do not need to emphasize it any further. I will merely say that we should grow far more than we do.

To give you an idea of how I live up to what I am preaching, I want to tell you that this year we put up about 1,200 tons of ensilage. We grew about 85 acres, harvested it and put it into the silo.

Corn alone is not sufficient, and in order to balance things up, we must give some dry food, because it is not proper to give a cow nothing but succulent food; that would only disgust her and disorganize her digestive system and put her in bad shape for producing milk. Mr. Glendinning this morning emphasized very strongly the value and importance of producing alfalfa. I have not a word to say against alfalfa; in fact, we never sow an acre of hay on the Experimental Farms, into which alfalfa does not enter as one of the grasses. Alfalfa is not absolutely necessary; it is a crop which requires special preparation. It will grow satisfactorily only on certain areas. I would like to see every farm with a field set apart on which alfalfa is grown practically all the time, but I would like to see the rest of the farm handled in another way. There is a crop which, so far as food value is concerned, is almost equal in value, and a crop that we all know how to handle—that is red clover or alsike. Clover is almost as rich in food as alfalfa, and it is easily made into hay, and easy to feed, and is a surer crop in this district. Alfalfa is excellent; red clover is excellent, and almost as valuable, and can be grown much more easily.

In addition to a succulent food and a highly nitrogenous food, such as clover, we need something in the way of a cereal and straw. There is not a crop that does better in Eastern Ontario than oats; barley and wheat also do well, but the Banner Oat is the best crop of all to grow. If you add to that a certain amount of land given over to pasture made of the right kind of grass, then you have a complete production of food for the dairy cow—a succulent crop for the winter, grasses for the summer and clover or alfalfa for the hay, and oats or barley for the grain, and some straw. These four crops are the essential things for success in

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dairying. If you eliminate one of them you cannot hope to make a success of dairying in Eastern Ontario. I say that advisedly, and after experimenting on this land for the last seventeen years.

It is seventeen years since I appeared for the first time before this Convention, and my observations lead me to be fully sure that the farmers of Eastern Ontario are not growing these crops to the best advantage. Some of you are. I can pick out here and there in this district men who are growing these crops in the very best way, but the great majority are not doing this. There are possibilities in the way of increasing our crops that are almost incredible to a man who has not tried them, and who has not worked these things out. It has been found all over Canada that certain crops do better after certain others. For instance, the man who would grow in the first place a crop of corn, finds he gets his best results when he sows that corn on a clover sod or an old pasture sod. That sod plowed with a moderately shallow furrow and manure applied on the surface, and the whole thing well packed and disk-harrowed, and the corn sown right after the operations I have just mentioned have been properly performed is practically certain to give you a good crop. I have been growing corn for thirty-five years in this Ottawa Valley, and I have never seen corn, grown under the conditions I have described, turn out a failure. I have never seen a corn crop failure in thirty-five years in this Ottawa Valley. Do not make a mistake and think corn will grow and be a good crop on land that is prepared in any old way and after any other crop. If you want the best crop of corn you must grow it on a sod and on a spring plowed sod preferably. Put your manure on the surface and work the sod until there is no possibility of your running a stick, or your finger, or a sharp knife between the sod and the soil below the furrow. You should work the land so thoroughly that you cannot tell just where one begins and the other ends.

Q.—How deep do you plow?

A.—About four inches; we sometimes plow less than that, but as a rule about four inches.

When you have the land in the shape I have described, then you should sow the corn right away and sow the right varieties. The varieties we have found the most satisfactory for the Ottawa Valley are Wisconsin No. 7, White Cap Yellow Dent, and Golden Glow. If you want a very large variety Leaming is good. Sow the corn in rows, unless your land is very dirty. Sow it in drills three feet to three and a half feet apart, and that will give you the best results both in the weight of yield and the quality.

There is considerable debate as to what is really the best, a large tonnage of succulent feed rather than a lot of dry matter, or a smaller tonnage of succulent feed very high in dry matter. There is an uncertainty in the minds of experimenters as to whether it is better to grow fifteen tons of corn that is well eared and fairly well matured, or to grow twenty tons of corn with very few ears and very green. I am not in a position to say which is the best. We have tried it over and over again and we have made up our minds half a dozen times, and then something turns up and we say we are not sure about it yet.

Senator Derbyshire: You have made up your mind that the smallest yield is the best.

Prof. Grisdale: Yes, but I am not sure of it to-day. At Guelph next week they are going to have a debate on that very point. Professor Day and Professor Harcourt are going to take that question up at the Experimental Union. "Hoard's Dairyman" has been preaching on that line for some time, and they are not yet sure. They have been studying the matter out in Wisconsin and Minnesota, and they say to-day the big crop is the better one. I have always thought I was better pleased with a small crop of good corn. If you feel that you do not know which to do, let me advise you to go ahead and put it three and a half feet apart and sow moderately early and you will be safe. Personally, I think fifteen tons of good corn is better than twenty tons of poor corn.

Q.—Does the absence of ears always indicate immaturity?

A.—No, the absence of ears does not necessarily indicate immaturity. It is claimed that the stalk and leaves may include such dry matter that they will be about as nutritious as the ear. That is a question we have to consider.

Mr. Glendinning: I think your Experimental Stations ought to take up that question.

Prof. Grisdale: We are working at it. We have been working at it for twenty-seven years, and we are not sure yet. I thought we were sure many years ago, but every now and again a new agitation comes up and something is brought to light which throws doubt on the question.

Mr. Glendinning: Do you find that stalks that have no ears contain a higher percentage of protein than the stalks that have produced ears?

Prof. Grisdale: Yes, I think so.

Mr. Glendinning: More digestible protein?

Prof. Grisdale: I would not like to say that. We can all grow corn, and we can all grow first-class corn, if it is grown in the way I have indicated. If you will grow the varieties I have mentioned you do not need to hesitate for a moment, and you will have a feed well worth putting into your silo, but do not put it in the kind of silo I saw coming along on the train, that was 300 yards wide and 400 yards long, spread all over a field. Erect a silo close to the barn, of wood, brick, stone, or cement, and have it good and high so that the silage will be well packed down.

Q.—Which is the best kind of silo, one made of cement, brick or stone?

A.—I like the wood best myself. We have wood, cement, and tile silos, but I like the wood best, and we have been using a wooden one for twenty-six years.

Q.—Is that twenty-six-year-old wooden silo in good repair.

A.—It was until it burned down the other day.

Q.—You do not recommend sowing the corn in hills?

A.—No, I have never recommended sowing corn in hills; sow it in rows because it is easier sown. We can sow twenty-five acres a day and it can be cultivated much more rapidly and cheaply by putting on a two-row cultivator.

Q.—Do you sow three rows of corn at a time?

A.—Yes.

Q.—How do you manage with your double cultivator?

A.—We only cultivate two rows at a time.

Mr. Glenndinning: I have never had a hired man who could sow straight enough so that we could use the two-row cultivator.

Prof. Grisdale: We have a man that can run a half mile row of corn so straight that you could shoot down it with a rifle and never touch a piece of corn. That is very important, and do not make any mistake on that point because a little neglect at the time of sowing will cause a great deal of trouble afterwards. If you go along with the cultivator and touch the corn here and there, you will do a lot of harm. Sowing in rows is an advantage for cultivating and for harvesting.

You can make a cleaner job of the harvesting if it is sown in rows, because if it is in hills it does not harvest nearly as well.

Q.—Will you get as much corn from an acre?

A.—No, I do not think you do when it is in hill, and I like it better in rows.

After you have this crop of corn harvested, do not consider that crop alone. A good farmer will consider what he is going to grow for the next year, and the year after on that same land. No man can live unto himself without considering what is going to follow. If you prepare the land properly for a crop of corn, it will be in good shape for the two crops that are to come after the corn, and there is the whole secret of success in crop production. Grow three crops each year; that is, get your land ready for the next two crops. Your corn should be absolutely free from weeds. When a corn crop comes off a field, and a stranger looking at the field asks "What did you grow there?" that is not proper conditions. You have taken off the corn and you have left your field in such shape that it is spoiled for the next crop and the crop after. You must leave that field so that there will not be any question about anything else but corn, and so that it will be in an ideal condition for the grain crop the next year. Do not disturb that soil any more than you can help. If you are going to plough it, plough it with a very shallow furrow. We have tried that in every way we can possibly think of, and we have found that good results are secured by just running a shallow furrow, and if you want the stubble out of sight, just plough with a shallow furrow and work it down. Do that shallow ploughing in the fall, and you will have it ready for the grain the next year. Sow oats, barley or wheat, and after it sow the grass, because one year of grain is all that any land can stand in this Eastern country or any other part of Canada. Sow grass and clover seed. For the last twelve years we have sown with very great satisfaction a mixture of six pounds of red clover, two pounds of alsike, six pounds of alfalfa, and six pounds of timothy. That sounds like a heavy seeding, but it is worth while, because you there have a mixture that is almost impossible to beat, and you will get a yield that cannot be beaten for getting the land into shape for the next crop. A mixture of alfalfa, red clover, alsike and timothy is ideal for either hay or pasture. We got from two to three crops of hay last year. The last crop gave us about a ton, the second crop about a ton and a half. The first crop was not as good as usual, but it was about two tons. We like to get three and a half or four tons to the acre of first crop, but last year was a bad one for hay in the spring. That crop is left for one or two years.

If we are following the second best rotation, it is pasture the second year or cut for a crop of hay and pasture the latter part of the season, and then we come back to our corn.

For a three year rotation, corn, grain and hay is the rotation that will give you the biggest returns and be the most profitable per acre. Where there is broken land that has to be pastured, the three year rotation is the best. If you cannot follow the three year rotation, you can follow the four year rotation, corn, grain, hay and pasture. But do not extend the rotation beyond four years. I do not suppose there is more than one or two per cent. of the farmers in Canada who are following a proper rotation. I have travelled this country from one end to the other, and almost invariably where I found men following a proper rotation, they were making a success, and you never see them with a bad crop. They may have a slight failure some years, but nearly always they have a good crop. That sounds like strong language, but we have our own experience of seventeen years that I have been following this rotation, and it is not only on one little farm at Ottawa, but we have twenty experimental farms throughout Canada. Last year we had this rotation on twenty-five different private farms or illustration stations, and next year we hope to have that rotation followed on fifty farms. We are going to bring this matter before the farmers of Canada. We are absolutely convinced of the importance and of the necessity of following a good rotation in crop production, in order to get out of this country the greatest possible amount of crop and the most that our soil and climatic conditions can produce. A proper rotation means a continuous fertility and greater crops every year. For the dairy farmer, it is an absolute necessity because it will give him power to keep on his farm from 20 to 50 per cent. more cattle than as a rule he can keep at the present time, and it will maintain the fertility of his soil and rid his farm of weeds.

I was talking to a young man in this audience who told me he had left the old homestead and had taken the adjoining farm, but he said it was absolutely infested with weeds. Why? Because his predecessor had grown grain after grain, until the land became so dirty that he had to sell it and let this young man get in. This young man is wise and he is starting on a rotation. He is following the four year rotation, and I say that if he follows that rotation for eight years he will be producing at the end of that time, double the crop he was producing at first. If you can show a man right near his home what will happen if you do a certain thing, then he will do it, and I want every farmer here to make his farm a centre of progress along these lines. The possibilities are simply marvelous and even if you are doing pretty well at the present time, if you are not following a rotation, you will do better by following a three or four year rotation. I am not going to say that a rotation is a cure-all, but a good rotation will do marvels.

I took hold of a farm that was not producing enough to feed one cow on ten acres, and in six years, following that four year rotation, I made it produce enough to feed one cow on two acres. I took another farm and doubled the crops in six years by following a satisfactory rotation, and did not buy a pound of manure; but we doubled the production of that farm and doubled its crop carrying capabilities in eight years. That was on an experimental farm that had been handled properly for ten years before that. They were carrying at that time about eighty head of cattle and in eight years we had 125 head of cattle, and we were not buying a pound of anything except meal, the same as we were buying before, and you can do the same thing on your own farms.

On our farm at Ottawa we were carrying about 160 head of cattle, 30 horses and 50 sheep. We have 150 sheep at the present time: 100 of them are feeders, and we have a great number of pigs, and we are not buying anything more than we were twenty years ago. We have about 210 acres in the farm. That shows you what can be done by a proper cultivation. When we drive a horse to its limit, it is ready to drop at the end of the run, but if you drive land to its limit, it is ready to produce more than ever before, and that is one of the great beauties in crop production—the harder you make the land produce, the harder it is willing to produce, the more cheaply it will produce and the more profitably it will produce. We, as dairymen, have the best chance in the world to build our farms up, because there is nothing like dairy cattle to produce manure, and if you have manure you can produce good crops, and that means more cattle, more manure and more crops. I remember Prof. Dean saying, "More cows, more crops, more manure," and I do not know that I can end up much better than by saying that we can guarantee to this eastern part of Canada such an area of prosperity as has never before been seen on this whole great Dominion if every farmer would set to work and make the land produce all it can produce by introducing a good rotation.

We hope some of you at least will introduce a good rotation. If you are not sure about what will be best send to us for information. We have tons of literature on the subject, and we have concise instruction as to how to handle the thing in every detail, and we will be very glad to send it to you. We are sending out now not only bulletins of all kinds, but a periodical called "Seasonable Hints," and if you are not getting it, send us your name and it will be forwarded to you.

Mr. G. A. Gillespie, M.L.A.: If you were not sowing corn, what rotation would you follow—I mean, on the back fields, where you cannot grow corn, what would you suggest to grow there?

Prof. Grisdale: Do you mean it is too far back to haul corn to the silo? If that is the case, peas is the nearest and best thing to take its place, but peas are not entirely satisfactory.

Q.—Did you ever have any experience with sweet clover?

A.—Yes, sweet clover is a good feed, but it is a dangerous thing to grow in Eastern Ontario, for the reason that it is apt to overrun the fields. It is not quite as acceptable to cattle as other clovers, and I do not know that it is any better than common clover. I have no serious objection to it, except if you are not careful it is apt to spread.

The Chairman: There are some lands that are not very good, the soil is not strong enough to produce crops. Would you recommend sowing sweet clover on land of that kind.

Prof. Grisdale: It will grow there all right and would be a good crop under such conditions.

Q.—How do you cut sweet clover?

A.—You must cut it before it begins to get woody. The proper time to cut it is when it is about three feet high and when the stems are not so hard that you cannot crush them. They get hard and woody after a time.

Q.—How many pounds of sweet clover seed would you sow to the acre?

A.—I would sow about ten to twelve pounds. We have never grown it on our fields.

Q.—Do you let the corn lie on the ground after you cut it?

A.—Not unless we cannot help it. If it is very wet we sometimes do. To let it lie twenty-four hours is very satisfactory because it handles a little better, but I do not approve of letting it lie any longer than necessary. If you have a strong force of men working your cutting box, it is not safe to keep too close up to your harvest, otherwise you will be stuck, because something might go wrong with the harvest, but if you let the corn lie too long, especially in the latter part of the season, you are apt to have an unsatisfactory fermentation. This year the ensilage in some places turned sweet, and that was the result of letting it lie too long. One man told me his engine broke down, and he let the corn lie on the ground for two weeks and it moulded.

Q.—How would it do to leave the corn in stooks?

A.—I do not see any advantage. Cut your corn fine.

Q.—What would you call fine?

A.—If you set your box to cut half an inch or less, it will be pretty fine. If you can cut it a quarter of an inch, it would be better still.

Q.—Do you use the harrow on the corn before it is up?

A.—If the weather is rather cold, we use the harrow both before the corn comes up and after.

Mr. Glendinning: There is just one point on which Prof. Grisdale may have left a wrong impression; he told you he had a wide drill and he could sow three drills of corn at the same time. We have a drill of that kind and it is all right, and Mr. Grisdale is all right because he has the right kind of man to drive that drill, but I have never been able to get a man to do what his man has been doing, and there are a great many farmers who have drills of that kind and they are in the same fix. We use three horses on our cultivator.

Prof. Grisdale: We have good horses and we only use two.

Mr. Glendinning: You can do better work with three horses because there are two tongues to the drill, and you can drive straighter with three horses than two. These three-row drills are all right if you have a good man to drive them, but that kind of a man is very hard to get.

A Member: It would be all right near a local option town.

Prof. Grisdale: It is very important to get the rows straight. Of course if you cannot sow three rows straight, you had better sow two and get them straight.

Q.—In what season of the year do you apply manure?

A.—We apply it when it is made as far as we can. We spread it on the fields and plow it in in the spring. If we have some plowing done, we spread it on the surface. I would rather spread it on the surface right after the plowing, but that would make too much work at a busy season of the year.

Q.—Don't you find it a disadvantage to spread it on the top of the snow?

A.—No.

Q.—I pile it?

A.—We do not unless the snow is so deep that we cannot get around. We put in a couple of sticks to show where we stopped spreading the manure so that if it gets covered with snow we know where to go on.

Q.—Do you advocate plowing a heavy clay land in the spring?

A.—Yes, after you have your seeding done and are ready to plow for corn, there is a good growth of vegetation, and it will be in a nice shape for plowing.

Q.—Our land is heavy, sticky clay?

A.—We have that same condition. If you have some land of that kind and some of ordinary loam, and if you feel that you would like to do some plowing in the fall, plow the clay, because the clay will give better results from fall plowing than the light land.

In Quebec, along the St. Lawrence River, there is a strip about twenty miles wide that is as level as this floor, and it is all clay, and there are a number of men there who do practically all their plowing in the fall, and they get most excellent results. We have tried it both ways, and we find we can get just as good results by plowing in the spring.

Q.—At what time do you put your corn in the silo?

A.—We like to get it in before the frost comes if we can, and we like to get it in in the milk stage.

Q.—If it was not quite ready?

A.—If I was ready to put it in and the corn was not quite ready, I would go ahead and cut. The frost does not hurt it very much. It does do some harm, but I would not let the frost be my master in a case of that kind.

Q.—After you plow your sod, do you roll it?

A.—Yes, plow and roll it, the same day if possible.

Q.—Do you ever have any corn frozen off in the spring?

A.—I had it frozen off once on the eighth of June, but that was many years ago and it grew up, and I had a good crop. I was hoeing corn more than thirty-five years ago.

Q.—How many pounds of corn do you sow to the acre?

A.—It depends a little on the kind of corn.

Q.—If you are sowing $3\frac{1}{2}$ feet apart and a Dent corn?

A.—I would say sow 22 or 23 pounds, and less of Longfellow.

Q.—What is your experience of mixing a Dent corn with a Flint?

A.—I would rather sow them separately. If you have so many pounds of each, sow 20 rows of one and 20 rows of the other. We do not use a weeder; we use a harrow; we had some old weeders but we abandoned them.

Mr. Glendinning recommended strongly the grading up of a herd and grading continuously on one line. That, of course, is a well known truism, but I want to bring to your attention the tremendous increase in value, not only in the selling value but in the milk-producing value that can be quickly reached along that line. A certain work along this line was introduced about fourteen years ago by a man who brought a good Holstein bull from the O. A. C., and he bought a herd of grades that cost him, fourteen years ago, $25 a cow. The first year they gave less than 250 pounds of milk apiece. After the bull got old, he secured another just as good. After ten years he was compelled to sell the farm, and the grade cattle resulting from these crosses were sold at auction and brought over $90 a cow. The last year he ran the herd, instead of producing between 2,000 and 2,500 pounds of milk apiece, they were producing something over 8,000 pounds of milk, and one of the cows that was four years old at the time of the auction sale, which was five years ago, brought $100, and she was sold again a week ago yesterday and she brought $175. That is a result of the grading up of one herd. In all the time he was grading, he purchased three bulls, and the stock sold at over three times its original cost, and one of them sold as high as $175. At the same sale, there were sold eight pure-bred cattle, and the highest price paid was $185, and they were good ones, and the good grade brought $175, so that shows that buyers are quite willing to pay the price when they get the goods. It also shows that you can get the goods if you go at it in the right way. The first bull cost $50 and the second one $40. They were bought when they were calves, of course.

Q.—What qualifications would you look for in a male?

A.—I like a good healthy one and fairly near the breed type. I am not such a faddist on the breed type as some are. I think production rather than fashion is the important point, and I would get a cow that gave a good lot of milk under natural conditions. You can go to some breeders and they will tell you, "There is a cow that gave 30 pounds of butter in seven days," and that is right, she did, but that does not mean she is an extra good cow because that cow is beautifully fixed up and handled in order to give that production. Probably under other conditions she would have given only 14 or 15 pounds. I like to buy from a cow that has given 15,000 or 20,000 pounds of milk in the year without any pampering.

I bought a calf about a year and a half ago that was very satisfactory. I was at a banquet in Toronto, and the man who sat beside me said he had a cow last year that gave 25,000 pounds of milk in the year and that she calved the other day. I congratulated him on the cow, and he said she gave him a bull calf. I said to him, "What do you think it is worth?" and he said, "I suppose $125," and I said, "All right, it is mine," He was nonplussed and he said, "Well, I did not want to sell it," and I said, "You said it was for sale," and he said, "Well, all right, I am game; I will stick to it." I have that bull at Ottawa to-day, and I would not take $525 for him. That is the kind of bull that I think is going to be of some value. I could have sold it two or three times since then for over $500. He knew the value of a good bull, but his cow was not in the record of performance, and he thought, therefore, he could not make much of a sale; but that is the kind of cow I am after—the cow that will give 25,000 pounds under any average conditions. This cow was never milked more than twice a day.

Q.—Do you often find cows that give 25 or 30 pounds of butter a week without extra care?

A.—Not without extra care. I can show you a cow that is giving about 30,000 pounds of milk a year, but if I could treat my children like that cow is treated they would be wonderful.

ADDRESSES OF WELCOME.

Mr. Rochester, Mayor-Elect of Renfrew, delivered an address of welcome to the delegates of the Convention, and expressed the town's appreciation that the Convention was being held in Renfrew. The speaker pointed out the many advantages his town offered the manufacturer, stated that they had one of the largest creameries found in Ontario, and expressed the wish that the dairymen of Eastern Ontario would again visit Renfrew in Convention.

Mr. A. A. Wright, Post Master, Renfrew, addressed the meeting at some length, reviewing the dairy industry of Ontario. He showed what an important place Canadian cheese had on the British market, and welcomed the delegates to Renfrew.

Senator Derbyshire (Chairman): There is no doubt that Renfrew has made wonderful progess in the last few years. In 1895 we had Lord and Lady Aberdeen open the Creamery at Renfrew. At that time it was the largest creamery in Canada, and I felt very proud of it. The first time I came here to see about putting up that creamery I saw Mr. Wright behind an old dash churn. The butter that was made in those days was not the best, to say the least about it, and it sold for 12 and 15 cents per pound. Now it is selling as high as 35 and 40 cents per pound.

COMMUNITY BUILDING AND COMMUNITY BUILDERS.

A. MacLaren, Ontario Agricultural College, Guelph.

Mr. MacLaren reviewed at some length the needs of rural communities, chief of which were the lack of wholesome recreation for both old and young, and the lack of a "community spirit," which was absolutely necessary before the social conditions of a district could be improved. The speaker showed the necessity of fixing the boundaries of a "community," of making a "survey" of its needs, and expressed his willingness to assist any community with this "survey" should they so desire. The community should be built up around some central organization, such as a church, and it was pointed out that all should co-operate in an attempt to raise the standard of the district in every respect. A "community," so organized, could do much to improve its educational, social and industrial conditions.

A full report of Mr. MacLaren's address can be seen in the Report of the Women's Institutes, 1915, Part I.

NEW POSSIBILITIES IN DAIRYING.

WILFRID SADLER, B.S.A., MACDONALD COLLEGE, QUE.

I appreciate the honour of being asked by the Secretary of this Association to deliver an address at your annual convention. It is unfortunate for you that Dr. Harrison, my principal and professor, found it impossible to come, for it is too much to hope that the mantle of Elijah can be worn with the necessary distinction and éclat by his humble follower Elisha.

About twelve months ago I was asked to prepare a paper for *The Journal of the British Dairy Farmers' Association* on "Dairying in Canada." Thanks to the courtesy of Mr. Ruddick, and thanks to the addresses and papers of the first Commissioner for Dairying, Dr. Robertson, I was provided with a fund of literature which, with my own local knowledge, I endeavoured to interpret in such a way as would convey something of value to the reader in the Old Country. I found that from this Dominion the exports of cheese have declined, in round numbers, from 196,000,000 lbs. in 1901 to 155,000,000 lbs. in 1913, a decrease of 21 per cent.; and that the exports of butter during the same period have fallen from 16,000,000 lbs. to 823,000 lbs. per annum, a decrease of 95 per cent. Coincident with this, the total production of milk was 6,900,000,000 lbs. in 1901; while in 1911 the annual production had reached a total of 9,900,000,000 lbs., an increase of 50 per cent. During the decade 1901 to 1911 the total population of Canada had increased from 5,350,000 to 7,200,000; the urban population from 2,000,000 to 3,300,000, an increase of 62 per cent., while that of the rural population has been from 3,260,000 to 3,900,000, or 20 per cent. In brief, the position is this: within approximately the same period, the exports of cheese and butter have enormously declined, the production of milk has decidedly increased; and, while the total population has increased, the urban has grown at a much greater rate than has the rural. Being interpreted, this means an increasing home consumption of butter, cheese and milk, with a body of consumers increasing out of all proportion to the body of producers. This is a very pressing problem in economics; but in general these conditions are such as to stimulate, as they most certainly necessitate, greater exertions on the part of all those concerned in the production of dairy products, not only as to the quantity of such products but also the quality, the variety, and the efficiency with which the greatest economic advantage is taken of every succeeding national phase. I am convinced that the present is a period of metamorphosis, and, adapting a recent observation of Mr. Ruddick, one in which the changing economic conditions make it impossible to use statistics of exports to judge of the progress or decline in the dairying industry. The rapid development of a home consumption requires the putting into practice of the greatest initiative on the part of producers. Just so long as the export trade was such as to ensure success to the Canadian dairymen, there did not appear to be any paramount necessity for his departing from the well tried practice of the making of Cheddar cheese. It was, and is, a cheese eminently fitted for export purposes, capable of holding its own in the markets of Britain; palatable, nutritious and well able to furnish an adequate return for the outlay incurred by the maker. But the times are changing, and we, like the times, must change; if progress is to be maintained we must be prepared to adapt ourselves. The consumption of whole milk as such is a phase of the dairying industry which is developing by leaps and bounds. But, to you as Cheesemakers and Buttermakers, I do not propose to speak of the rapidly growing trade in new milk for consumption, much as I would like to do so. I want to remind you of that which you yourselves already feel; that not only is the increasing population calling for milk, but a vast and profitable field is being opened, inviting the efforts of all those concerned in the manufacture of dairy products. You have established your reputation as makers of Cheddar cheese; but are you sure that the busy professional and the business man, the artisan, and those who dine in the seclusion of their own homes, are you sure that these buy and consume any appreciable quantity of the cheese we have named. Are you sure that you are making it possible for yourselves to derive the fullest advantage from changing conditions? The consuming public is increasing; and we are told on the highest authority that at the conclusion of peace we shall have an influx of immigrants. Would it not be well to take time by the forelock, and, in addition to supporting most loyally the patriotism and production principles enunciated by our leading agriculturists, to prepare and make ready for the near approaching future. Do not be content to produce as hitherto, and trust that the public is satisfied. The subject for study as never before is the study of the public taste and the market demand. Why not begin to enquire as to what the public wants? Until comparatively recent times your public has been on the other side of the Atlantic ocean. That public wanted Cheddar cheese. Cheddar cheese you sent. To-day your public is increasingly concentrating at your own doors. Why not ask *that* public what it wants? I cannot give you figures, but the home consumption of cheese is far below what it ought to be. Do not on any account allow the making of Cheddar to become a matter of history, but what the public wants is something else in addition, or something different.

This in general, Mr. Chairman, is the view I wish to put before you of the "New Possibilities in Dairying."

Those of you who in the quiet of your own homes ever indulge in the pursuit of the art of the playing of cards know that the game, whatever it may be, is played according to Hoyle. If you will, however, consult the Oracle Hoyle, you will find that in his preface he requests that he be favoured with particulars as to any new games, or any new ways of playing old games. I simply wish to discuss with you some new methods of playing an old game.

You have listened to a few observations on the question of cheese, and presently we will return to the subject. Firstly, however, I wish to deal with the subject of "Clotted cream," Devonshire clotted cream, the cream of 2,000 years, the cream of which Devon and Cornwall are justly proud, the cream of which the bard has so well sung:—

> "Nothing on earth or in poet's dream
> Is so rich and rare as your Devonshire cream."

In clotted cream we have a delicacy and at the same time a product full of commercial possibilities, and pre-eminently suited to the palate of the epicurean diner. Those who have tasted clotted cream will never forget it; those who have not, once they do, will be added to the band of enthusiasts. The butter fat in this form is well emulsified, and is easily digested. By the medical profession it is recommended as an excellent fatty food, and is often prescribed as an alternative to cod liver oil. Some few years ago I undertook for the English Board of Agriculture an investigation into the methods adopted by the makers of clotted cream, and subsequently conducted a series of experiments as a result of and based upon the enquiry pursued. Ever since coming to Canada I have been impressed with the great opportunities here existing for the establishment of a new industry, one, I am sure, which would be a sound financial undertaking for the dairyman, and one which would be welcomed by the consumer. In the Niagara peninsula, in the city of Ottawa, in Toronto and elsewhere, a constant supply of a first-class clotted cream would, especially during the fruit season, rapidly create its own demand; would increase the interest of the consumer in the products of the dairy; and would be an industry returning an adequate profit to the farmer or dairyman who undertakes to pioneer and substantiate the production. In this country it would be quite feasible to prepare the cream on the farm, or at the creamery or factory. In the latter case the supply of steam which is already of necessity installed would simplify very considerably the initial expense entailed in equipment. In the main, the equipment consists of a long copper or galvanized tank, some three or four feet from the floor. This tank, about 3 ft. wide and 1 foot deep, is to accommodate water and is fitted with steam connections whereby the water may be heated. The tank is fitted with a cover hollowed in such a way as will admit of pans being supported and at the same time surrounded by the water. These pans used for the milk are preferably made of aluminium or block tin. They are 20—24 inches in diameter at the top, 12—14 inches diameter at the bottom and are 3 inches deep. It may be more convenient and economise steam if the tank used for the heating is subdivided in such a manner that each pan is in its own container. A cool room is required, fitted with latticed metal shelves, small strainers resembling a culinary strainer, palette knives and perforated metal skimmers, complete the essential apparatus. It will be seen that the whole of the equipment is such that a local tinsmith or hardware manufacturer, if competent, can install without much difficulty; and apart from the room set aside for cooling purposes, the amount of floor space required is not large. Having the necessary equipment, the prime essential, as in all dairy processes, if success is to be insured, is a bacteriologically clean milk. The milk on being received is poured into the pans, using for each pan from 6 to 8 quarts. The pans are set aside in the cool room and left for 10—12 hours for the cream to rise. When operations are to begin the steam is turned on and the water in the tank heated to a temperature of about 200°F. The pans of milk are placed in the tank, the greatest care being observed in order that the layer of cream shall not be disturbed. The steam heating continues, and the contents of the pans reach a temperature of 180—190°F.; this operation usually taking about 20—30 minutes. When the heating or "scalding" is completed, the layer of cream in the pan is crinkled, and appears as a blanket or "head" of cream on the surface of the milk, from ¼ to ½ inch thick. The pans are now removed, placed on the shelves in the cooling room and allowed to remain for 20—24 hours. We now have the "clotted cream." It is lifted with the skimmer and placed in the perforated strainer. This part of the proceeding calls for considerable skill, for excessive stirring and mixing of the cream is liable to destroy the texture—a highly important consideration. The cream is ready for sale at once, and for marketing purposes is packed into small earthenware jars or wood pulp cups similar to those in vogue as receptacles for cream. Clotted cream is sold by the pound, and when produced under good conditions can be perfectly sweet and typical after at least 48 hours in transit, using no preservative whatever. This does not represent the time the cream may be kept. It has been pasteurized in the process and will keep a number of days under good conditions. I have found in using Shorthorn milk that the average weight obtained from many trials was 10.39 ozs. of clotted cream from 15 lbs. of milk; or 1 lb. of clotted cream from 23 lbs. of milk. The price at which the cream finds market varies, but in general one might say that it compares favourably with the price obtainable for whole milk shipped to the city for consumption. In addition to this, the scald milk—the residual milk after the cream has been lifted—is a product of considerable food value and may with advantage be used for human consumption; where this is done, a price is often obtained equivalent to ½—2/3 the prevailing price for whole milk. For cooking purposes this scald milk is desirable for the amount of butterfat present is frequently as high as 1 per cent. In the experiments to which I have referred an average butterfat content of ¾ of one per cent. (0.75 per cent.) was found. Further, the process involved in the preparation of the cream serves to pasteurise both the cream and the residual milk, and this ensures the latter being a perfectly safe as well as an excellent food for the rearing of young calves. The unique flavour of clotted cream is no doubt due in some degree to the scalding process; but I have reason for believing that both the flavour and the keeping properties of the cream are largely problems of a bacteriological nature. In the work with which I am dealing the average percentage of butter fat in the cream was 62.6; 50 per cent. higher than the average in rich raw cream. Regarding the qualities required in a typical sample of clotted cream, it must be granular in texture, firmer than the thickest of cream obtained from the separator, but not so firm as freshly made cream cheese; the colour should be golden. Too much moisture indicates an excess of scald milk incorporated and a consequent impairing of the keeping qualiities. The cream must have a so-called "nutty" taste and be decidedly pleasing to the palate. Many adaptations of the method to meet local conditions may be suggested and will suggest themselves.

I now come to a brief discussion of the "modicum" of cheese. I have spoken of the changing economic conditions; I have spoken of the necessity of a study of the public taste and market demand; I have spoken of the public which is increasingly concentrating at your own doors; I have spoken of the comparatively small consumption of the standard Cheddar cheese. How can you best take advantage of these changing conditions? How can the position be improved? Largely I feel sure it is to be done by the market meeting the consumers half way, and providing them with a small cheese suitable for an everage family, and yet having qualities equal to the best Cheddar cheese on the market.

You will agree with me that one reason why the householder and the hotel-keeper is not a more enthusiastic buyer of cheese is because of the impracticability of dealing with a large quantity at a time. On the other hand, if a small portion be purchased the extent of cheese surface exposed to the air tends towards drying, and deterioration of flavour and general quality. This can be overcome by the adaptation of modern methods in the direction of the manufacture of small cheeses. I shall not speak of those cheeses which are known on the market as soft cheeses, although there are great possibilities for these—for the methods adopted in their manufacture have been dealt with in bulletins issued from your own dairy school at the Ontario Agricultural College. I want particularly to draw your attention to the making of a cheese, which in its completion incorporates the advantages of both the hard-pressed varieties and the soft cheese varieties, with a minimum of the disadvantages of either. The chief difficulty hitherto experienced has been that practically all attempts to reproduce in miniature such cheeses as Cheddar. Cheshire or Leicester have resulted in a cheese having a thick rind, this causing much waste at cutting up, and further one which failed to ripen properly due to the fact that it dried up and became hard and chalky in texture with little or no flavour.

In 1910, while attached to one of the Dairy Colleges in England, my then colleague, Alec Todd, and I devised, after much experimental work, a method of manufacturing a cheese, 1 lb. in weight, which has overcome these difficulties, and a cheese which experience has proved is desired by the consumer and one which provides a profitable undertaking for the producer. This cheese embraces the qualities of a hard-pressed variety—Cheddar or Cheshire—and yet is ripe and ready for consumption ten days after making. It is, however, equally palatable and typical if trade considerations demand that it be kept in storage for as long as six weeks. It is a cheese which as regards early maturity and the incorporation of moisture bears some relation to certain classes of soft cheeses, while at the same time it possesses the distinctive qualities of a typical ripened hard-pressed cheese with respect to flavour and texture. This cheese rapidly obtained a hold on the market, a hold which has been maintained, and for the greater part of the past year it has also been successfully manufactured at and sold from the Michigan Agricultural College at East Lansing.

That there is not only an opening but a demand for a cheese of such size in Canada is acknowledged; for in the December issue of the *Agricultural Gazette*, Mr. Barr, of the Dairy Division, describes experiments conducted at the Finch Dairy Station in your own Province. These experiments have been successful, and the cheese produced, 1 lb. in weight, is being retailed at 25 cents each. Mr. Barr's experience regarding the suitability of a small cheese which can be placed in the hands of the grocer, the provision dealer and the householder himself, coincides with our experience in England, and with that of the Michigan Agricultural College at East Lansing. I would refer you to the *Agricultural Gazette* for the description given by Mr. Barr, and to-night will deal with the particular cheese with which I have had practical experience. This cheese is a little softer than the Cheddar, and has a flavour all its own; the texture may be described as soft and granular, embodying the salient features of a typical Cheshire and Leicester, while to the touch it is rich and buttery. When bored with a trier the fatty, smeary appearance on the back of the iron is such as is usually found only in a ripe old mellow cheese. If the top surface of a mature cheese be gently pressed with the thumb in a manner so well known to those in the trade, a perceptible break in the surface round the edge of the thumb will be noticed, showing the delicate and fragile nature of the texture.

The utensils required are in general those common in a cheesemaking dairy or factory; but if such need to be purchased it may be taken as a fair average that the initial outlay is about $10 per cow. When small quantities of the cheese are to be made the whole outfit can be purchased for $50; and if large quantities are to be manufactured the only additional expense entailed is that of a larger sized vat. In the making of this, as in all varieties of cheese, a fundamental essential is clean, wholesome milk, free from taint. Starter is added at the rate of ¼ per cent. The cheese may be made either white or colored. and if the latter one dram of annatto to four or five gallons of milk gives a suitable color. The temperature of the milk is now raised to 84°F., and the amount of acidity determined by means of the rennet test, a test which for milk at rennetting is much more satisfactory and one which gives much more uniform results than the acidimeter test. When the temperature and the proportion of acidity are satisfactory, the rennet is added at the rate of one dram to 2½ gallons of milk, 2½ ozs. to 1,000 lbs. milk, or such amount that coagulation is completed in 40 to 45 minutes. For the cutting of the coagulum ordinary curd knives are used, vertical and horizontal, the blades of the former being ⅜ in. apart and those of the latter ½ in. apart. The coagulum is cut lengthwise and across in such a way that it will leave the section of curd ½ in. by ¼ in. The particles of curd are gently loosened with the hand, and this is continued for ten minutes or so. After having remained for a few minutes, in the whey, the curd is subjected to the process of heating, cooking or scalding. This procedure should take some twenty minutes, the curd meanwhile being stirred until a final temperature of 90°F. is reached. Stirring is still continued until a suitable firmness of the curd is apparent and the particles are then allowed to remain lying in the whey for some 20—30 minutes. When the acidimeter test shows .15—.16 per cent. acidity, the whey is drawn off, the curd cut into 4 in. cubes, piled, covered up with cloths, and left for 15 minutes. Again, the curd is cut into similar cubes, turned in bulk and each cube broken into halves; this assists in the getting rid of the whey and has considerable influence on the "short" texture so much desired in the final product. The curd is again covered up and left for 15 to 20 minutes. Grinding is the next operation, and is usually possible about one hour after the drawing of the whey. The acidimeter test should show about 5 per cent. acidity. The curd at this stage is soft and velvety to the touch, and it should break "short" rather than have any tendency to toughness. It is ground to a fine state, salt added at the rate of 1 oz. to 3 lbs. curd, and put into the moulds at once. The moulds are made of well-tinned metal, 4 in. in height, diameter 3½ in.; the bottom of the mould is closed except for a hole in the centre 1½ in. diameter; a loose tin follower is used in the bottom, and a wooden follower 1 in. thick is needed to cover the curd at the top. The weight of curd obtained varies with the season of the year, but averages 1¼ to 1½ lbs. per gallon of milk. Immediately the moulds are filled, they are put under the press and left for two hours with just the dead weight of the press applied. From the time of adding the rennet to the grinding of the curd the whole process has occupied as a rule not more than 3½ hours. After being pressed as stated for two hours, the pressure is released, the cheese are taken out and turned and again pressed for a further two hours, this time a little additional weight being added. The pressure may now be finally released. The cheese are allowed to remain in the moulds during the night and through the following day. They are then smoothed up with a palette knife and bandaged with calico and paste; or if more convenient they may be smoothed up and paraffined. They are removed to the ripening room, and in this connection I may say that we have obtained good results when the cheese are required to mature in say ten days time by using a ripening room at a higher temperature than is commonly in vogue; as high a temperture as 60 to 65° having given satisfaction. Of course if the cheese need to be kept for a longer period they must be moved after the first few days to a cool or cold room. Usually slightly more than 1 lb. ripe cheese is obtained per gallon of milk, and for trade purposes it is recommended that these small cheeses be wrapped in tinfoil.

The cheese is complete; the method of manufacture is not widely at variance with the methods already adopted; the utensils required are such as are commonly in use in any up-to-date cheese factory; and the skill required is such that a trained cheese-maker can with comparative ease adapt himself.

In the short time at my disposal it has been impossible to give more than the main essentials in either of the processes discussed. I should be glad privately to go into further details at any time.

In concluding, I would again appeal to you to find out what the public wants. I have endeavoured to present to you a view of some of the new possibilities in dairying. I have attempted as briefly as possible to impart to you some of the enthusiasm which I cannot help but feel regarding the unique opportunity afforded by the production of clotted cream and the production of small cheese in this country. The dairy industry is in a state of metamorphosis. The era of home consumption has been dawning, and it is now well above the national horizon. To-day success is to be assured as a result not only of expert technical knowledge of the art of manufacture, but by the maker at the same time displaying a due appreciation of the psychology of the public taste. Those who can provide what the public wants enjoy far greater possibilities of success than those who produce that which they think by the public *should* be wanted. The producer of dairy produce must be not merely a successful mechanical contrivance but a human device for tickling the palate and supplying the needs of those who are pleased to call themselves consumers. You are the official link by which the interests of the producers and consumers are bound together. Your object is to further all that pertains to the ultimate success of Canadian dairying; to stimulate your members to greater exertion; to lend your official weight and sanction to all legitimate agencies which will establish more securely the position of the dairymen as an integral part of the community. I appeal to you, an old and influential association, to affix the seal of your official support to the efforts of your members who will take advantage of culture, and develop the "New Possibilities in Dairying."

SOME SUGGESTIONS FOR IMPROVEMENT IN THE QUALITY OF CREAMERY BUTTER IN ONTARIO.

Geo. H. Barr, Chief of Dairy Division, Department of Agriculture, Ottawa.

Before taking up the main topic of my address, allow me to refer to the subject of variations in cream tests. In operating cream-gathering creameries, the question is continually being asked by the patrons, "Why does the cream test vary so much when the separator is not changed?" Let me give you a few figures on this subject from experiments conducted by the Dairy Division in 1915. The figures are the averages of three runs:—

Variation in the Per Cent. of Fat in Hand Separator Cream.

Variation.	% Fat in Milk.	Temperature of Milk.	Speed of Separator.	% Fat in Cream.	% Fat in Skim Milk.
In temperature of milk	3.57	79°	60 Rev.	44.2	.040
	3.57	95°	60 "	29.3	.021
In speed of separator	3.63	95°	65 "	36.6	.018
	3.63	95°	50 "	19.2	.027
In temperature with low speed	3.60	70°	50 "	28.5	.078
	3.60	90°	50 "	21.5	.030
% In fat in milk	3.30	95°	60 "	27.0	.017
	4.50	95°	60 "	35.5	.015

Correct speed of separator, 60 revolutions per minute.

These figures show a wide variation in the cream test with no change whatever in the cream screw. We found it extremely difficult to turn the separator at a uniform speed even with an accurate indicator, and I should judge that in the ordinary use of hand sparators there could be a variation of 10 revolutions per minute made very easily. Any number of Circular No. 14, giving details of this experiment, can be secured by addressing the Dairy Commissioner, Ottawa.

Some Suggestions for Improvement in the Quality of Creamery Butter.

This title would imply that the quality of creamery butter in Ontario is not as fine as it might be. Is this true? Let me answer this question by asking another. When butter dealers in Toronto, Montreal, Winnipeg, Calgary and Vancouver want a car of finest creamery butter, do they seek it in Ontario? I doubt it. They are more likely to seek it in Quebec, Saskatchewan or Alberta. This being the case, we naturally ask the question, what must be done?

It is important that creamery patrons know something about the causes of variations in the per cent. fat in cream, but it is infinitely more important to let them know that sour, tainted cream will not make fine butter, and the most effective way to let them know this is to pay a higher price for sweet, clean-flavoured cream than for sour, tainted cream. Nobody can dispute the fact that overripe and tainted cream is the main cause of the defects in Ontario creamery butter. Nearly all, if not all the creameries in Ontario, are paying just as much per pound of fat for sour, tainted cream as they are for sweet, clean flavoured cream. Are such conditions an incentive to the patrons to produce better cream? Certainly not, and just so long as the creameries pay the same price for tainted, sour cream as they do for sweet, clean-flavoured cream, just so long will they receive it, and continue to make a strong-flavoured and poor-keeping quality of butter.

Will grading the cream and paying a premium for sweet cream improve the quality of the butter? I have a chart here which shows the result of grading cream in a creamery in Alberta in the season of 1914. This creamery commenced grading the cream on the 5th of July. For the four weeks prior to the time grading commenced, the output of butter graded 4.2 per cent. specials, 34.9 per cent. first grade, 56.2 per cent. second grade and 4.7 per cent. off grade. For the first four weeks after grading commenced, the butter graded 49.1 per cent. specials, 47.1 per cent. first grade, 1.9 per cent. second grade, and 1.9 per cent. off grade. For seven weeks after grading commenced, the butter graded 61.7 per cent. specials, 35.5 per cent. first grade, 1.7 per cent. second grade, and 1.1 per cent. off grade. Patrons sending second grade cream were paid two cents less per pound of fat than those sending sweet, clean flavoured cream. Why cannot Ontario creameries do the same?

Allow me to give a few facts regarding the grading of cream in the different Provinces. In 1915 about 96 per cent. of the creamery butter in Alberta was made from graded cream; 59 per cent. of this butter graded specials. Only 7 per cent. graded seconds. In Saskatchewan 98 per cent. of the creamery butter was made from graded cream. In Manitoba 61 per cent. was made from graded cream. As a result of grading the cream, these Western Provinces, especially Alberta and Saskatchewan, were able to compete successfully in the Vancouver market with New Zealand butter. An extensive buyer of butter in Vancouver told me in Calgary three weeks ago that if Alberta and Saskatchewan creamery men made as much improvement in the quality of the butter in 1916 as they did in 1915, their butter would be bought in preference to that from New Zealand, and they would control the Vancouver market. He also stated that Alberta and Saskatchewan butter had practically put Eastern Townships butter out of the Vancouver market.

The Province of Quebec has a Dairy Act which makes grading cream compulsory. Each grade must be churned separately and the patrons paid accordingly. The dairy staff of the Province has been busy during the past season arranging for the enforcement of this Act quite fully in 1916. Two creameries in Nova Scotia commenced grading cream last season and paid the patrons according to grade, with the result that at the Dairymen's Convention, being held in Truro this week, the Dairy Superintendent will advocate the adoption of the system in all the creameries, and I believe many of them will grade the cream next year. In Prince Edward Island, two creameries commenced grading the cream last season. More will grade next year. What will Ontario Creameries do? Grading the cream has done and will do very much to improve the quality of creamery butter. There is, however, another point which we must consider, and that is the keeping quality of butter. Large quantities of creamery butter are stored each year for several months, and that made from raw cream cannot be depended on to keep its flavour for many weeks. At the present time, pasteurizing the cream seems to be the best thing to do to insure a good keeping butter.

In 1914 the Dairy Division conducted an experiment in pasteurizing cream with a continuous pasteurizer and a modern cream ripener. In making this experiment, all the cream was put in the ripener and, with the agitator running, a churning of the raw cream was drawn off and put in an ordinary cream vat. The same quantity was run through the continuous pasteurizer and cooled with a tubular cooler and also put in an ordinary cream vat. The balance was pasteurized and cooled in the ripener. The experiment was repeated ten times between July 1st and 22nd. Ten per cent. culture was used in all the lots of cream. The following table shows the average of the ten churnings in each lot:—

Comparison of the Quality of Butter made from Raw Cream and Cream Pasteurized with the Continuous and Holding Methods of Pasteurizing.

Method.	Pasteurizing Temperature.	% Acid in Cream after Pasteurizing.	% Acid in Cream at Churning.	Temperature Cream at Churning.
Ripener	140°†	.194	.455	56.1°
Continuous	171°	.187	.411	53.6°
Raw Cream	....	.213*	.473	53.5°

——	Time Churning.	% Fat in Buttermilk.	% Moisture in Butter.	Average Score for Flavour.	
				July 22	Nov. 19
	Min.				
Ripener	30.0	.203	13.35	43.17	39.15
Continuous	30.5	.201	13.85	43.17	39.15
Raw Cream	42.4	.170	13.76	42.90	37.40

*Tested same time as pasteurized cream.
†Held at 140 degrees for 30 minutes.

Notes on the Flavour of the Butter.

On July 22nd there was practically no difference in the commercial value of the three lots of butter. On November 19th the butter made from the raw cream was off in flavour much more than the other two lots. Both lots of butter made on July 10th from the pasteurized cream was fishy on November 19th. The butter from the raw cream made on the same date was not fishy. The highest score on the butter from raw cream when fresh was 43.75; on November 19th this lot was fishy and scored only 37 points. We were not able to discover what caused the fishy flavour in either case. There is no doubt that the pasteurization of cream improves the keeping quality of butter.

I also submit a few figures on the cost of using a continuous pasteurizer and a tubular cooler and a modern cream ripener at the Brome Creamery:—

COST OF FUEL AND ICE IN PASTEURIZING CREAM, HOLDING AND CONTINUOUS METHODS. CREAMERY OPERATED 5 DAYS ON EACH.

Method.	Cost of ice per 1,000 lbs. Butter.	Cost of fuel per 1,000 lbs. Butter.	Total cost fuel and ice per 1,000 lbs. Butter.	Average time creamery in operation each day.
	cts.	$ c.	$ c.	
Holding	.22	1 64	1 86	5 hrs. 13 min.
Continuous	.02	1 53	1 55	4 " 57 "

At the Dairymen's Convention, held in Calgary on December 15th and 16th, 1915, the following resolution was passed unanimously:—

"Resolved, that we recommend the adoption of pasteurization of cream for butter-making in creameries throughout the province."

I believe pasteurization will be adopted generally in Alberta creameries in 1916. I saw the Dairy Commissioner for Saskatchewan on my way home from Calgary, and he said all the Government-controlled creameries in the Province would pasteurize the cream next year. This means about 98 per cent. of the cream will be pasteurized. Can the Ontario creamery men afford to continue their present methods? I leave the matter for your serious consideration.

MR. H. GLENDINNING: You have the fat in the cream 44 per cent. at 70 degrees, and at 95 degrees you have 29 per cent. It strikes me that the cool milk has a higher percentage of fat in the cream.

MR. BARR: The cool milk will run through a little slower. You might not get that same condition in all separators. I think that is one place where different makes of separators vary; in that particular make of separator we get a rich cream.

Q.—What would you say was the proper temperature?

A.—As near 95 degrees as you can get it. The milk comes from the cow about 98. With a slow speed and low temperature, you get a very great loss. I think with a separator running the milk in at 95 degrees and at the proper speed, you should have a very small loss of fat.

Q.—Do you use one machine or different machines for these tests?

A.—I just used one machine on this work. These variations might not be the same with other machines, but that is the tendency.

Q.—Was this supposed to be a good separator?

A.—The firm that makes it says it is. We felt that during war times we could not afford to buy all the machines that are made.

Q.—Was that a co-operative creamery?

A.—Yes, and the cream is all made into butter, and they just make two grades. In some of the creameries in Alberta they have five different grades. They usually make a difference of 2 cents per pound of fat. Where there are more grades, they are making a cent's difference in each grade. I was in one creamery in Calgary this winter, and they showed me four grades of cream that they were getting in that afternoon.

Q.—How does the buttermaker keep tab of the cream?

A.—He has a book in which he records the pounds of cream, as well as the grades—first, second, or off grade. They do not test more than once a week, and sometimes only every two weeks. It is all paid for at so many pounds of second or first grade cream.

Q.—That would make a lot of book-keeping?

A.—No, they claim it does not make very much book-keeping. A great many creameries pay for each shipment as it comes in. That makes a lot of work, but some of them are doing it. They send an express order back the day they receive the cream.

Q.—What about the war stamp?

A.—I suppose the patron pays for that.

Q.—Is all the butter graded by the Government?

A.—Not all, but nearly all. There are a few small creameries in Alberta that did not come in.

Q.—Is it optional with the creamery?

A.—Yes, altogether. All the large creameries in Alberta this year came into the grading system; there are only a few small creameries which are not grading the cream; 59 per cent. of the graded butter was "specials," and only 7 per cent. second grade.

Q.—Is the Edmonton Creamery the largest in the world?

A.—Yes, I believe it is; all their butter was graded this year.

Mr. Glendinning: Did you have any trouble with the cream curdling?

A.—Only one lot of cream curdled and it curdled in the ripener; it did not curdle on the pasteurizer. We were doing one operation right after the other.

Q.—Was the temperature the same in both cases?

A.—We were heating one to 140 and the other up to 170 and 175. In the three years' work, we had only two batches that curdled in the ripener. I do not want to say anything against ripeners, any more than that some creameries might be so situated that they could not use both, and I wanted to see if there was any difference in the quality of the butter, and we proved there was no difference in the quality of the butter from using either method of pasteurizing.

Q.—Was that all sweet cream?

A.—It was what we call sweet cream. We did not take any cream from the patrons that was sour.

Mr. Barr: In the course of the discussion, said: The Calgary convention was called for one specific purpose, and that was, "Will We Pasteurize Our Cream Next Year?" Sixty or seventy men were there for that particular object, to find out what they would do about pasteurizing their cream for the next year, so that they would be able to capture the market. I think if there is one thing that is lacking in our Eastern Conventions, it is that we fail to have something definite to work for. The result of that Calgary convention was that every man went home from it convinced that pasteurizing was the only thing for him, and I believe every creamery in Alberta will pasteurize its cream this year. It seems that the dairymen in the Western Provinces will be making a good deal more butter next year than they can take care of in the Western Provinces, and that butter is going to come East, and when it comes East in competition with your butter under present conditions as to quality, you will have to take second place, and that will affect the price. Alberta increased its production last year 35 per cent.; they manufactured over two million more pounds of butter in 1915 than in 1914. Saskatchewan manufactured nearly one million pounds more, and they claim they are going to keep on increasing. and you must consider that in the East.

Mr. Robinson: I would like to take Mr. Barr to task for one thing he said: he said, when the buyers want to get good butter they go to Alberta. I would not like the audience to go away with the impression that there is no good butter made in Ontario. There is plenty of good butter made in Ontario but the people won't pay the price to get it. I realize that there is much poor butter made, and I agree that we should have a campaign for grading the cream for the sake of the name of Ontario butter, but I would like to point out that in our big cities like Hamilton, London and Toronto, they are buying good butter and paying the price, and therefore, the poor butter has to go to other places. However, I agree with Mr. Barr when he makes the statement that we must look alive because competition is coming.

Mr. Barr: I quite realize that there is a great deal of good butter made in Ontario, but, at the same time, I know there is a certain amount of trade in Toronto that cannot be filled by any creamery in Ontario, and that is a pretty hard knock for Ontario, because I know of some orders that they have tried to get filled in Ontario and they could not get the butter, and they had to send to Montreal for it. That is something that the buttermakers of Ontario have got to realize.

REPORT OF DAIRY INSTRUCTION IN EASTERN ONTARIO FOR 1915.

G. G. Publow, Chief Dairy Instructor, Ontario Department of Agriculture, Kingston.

It is with no small amount of pleasure and satisfaction that I present for your consideration my thirteenth annual report of the work of dairy instruction and inspection as carried on by the staff of instructors and myself in the syndicates of Eastern Ontario during the year 1915.

I combine the word satisfaction with pleasure because it has been one of the most profitable years financially to all directly connected with this branch of the great dairy industry, and when everyone is liberally remunerated for his efforts, as the dairy farmers particularly have been, the general state must be one of satisfaction.

The number of syndicates was reduced from twenty-two to twenty-one, after the resignation of instructor D. J. Cameron, who for some years so creditably looked after the Lindsay district, and who in June last was given a more acceptable position with the Dominion Government. Instructor Brintnell was transferred to the Prince Edward district to replace Mr. Whattam, and Mr. Fred Clark was added to the staff and placed in charge of the Kingston group.

As in former years, in April, the instructors attended their special conference and course of instruction for ten days at the Dairy School in Kingston, the intention being principally to promote and continue uniform methods in all details throughout the several districts.

All of the instructors not only endeavor to impart as much knowledge as possible to the dairymen in their allotted districts during the year, but make an effort to secure information regarding many of the details of the production and manufacturing features as well. By the aid of such information we are able to better proceed in the work of instruction, and also in making an annual report for this Association, or for the individual district itself. These details, mostly statistics, I have each succeeding year arranged in tabulated form, and while they are most useful and appreciated in each locality they do not make interesting material for a gathering such as this. I will, therefore, as much as possible, eliminate these from my remarks and give you only those facts which may possibly appeal to you all in a general way.

Cheese Factories.

There were 847 cheese factories in operation in Eastern Ontario during the past season, one more than in 1914. Six of these were destroyed by fire, three of which and four others being rebuilt. The general sanitary conditions of these factories was mostly satisfactory it being necessary to close none for this reason. A few owners of course had to be given warning and a limited time to clean up, but all complied with the exception of one who was brought before a magistrate and fined $30.00 and costs. The proportion of annual expenditure in the upkeep and improvement of factory buildings and equipment has kept up to its high level, 479 owners having expended over $66,000 in this manner.

The Milk Supply.

To these factories there was delivered during the six months, May 1st to Nov. 1st, a total of 927 million pounds of milk, from which there was manufactured over 85 million pounds of cheese. In looking over last year's production I find that for the same period, the yield of milk exceeded that of 1914 by some 85 million pounds and the make of cheese by over 8 million pounds. These figures reduced indicate an increase in the yield of cheese of over 10 per cent., but for the full year the make would, no doubt, exceed 15 per cent. increase, because the amount manufactured after Oct. 31st this year has been unusually large. During 1915 it took 10.88 lbs. of milk to make each pound of cheese. This is slightly better than in 1914 when the yield was 10.90.

The average fat test of the season's milk was 3.58 per cent., or practically the same as in 1914.

Twenty-nine thousand six hundred and seven patrons furnished milk to Eastern Ontario cheese factories, or some 1,100 more than in the previous year, the high cheese prices evidently having the effect in bringing many back to the cheese factories.

Silos.

An interesting feature in connection with the production end of the business is the ever increasing number of silos being built, no less than 1,258 new ones going up in 1915. This is an increase of 446 over 1914 so that the rate of gain is very encouraging.

Care of Milk.

The dairymen are rapidly learning the best methods to follow in the production of milk for profit, but many seem slow to realize or appreciate the importance of modern methods in the care of milk after it has been produced. They fail to realize the losses that occur to them annually from not preserving the milk in a sweet, clean condition until it reaches the factory.

A special effort was made last season to further impress these facts and in each district the instructor devoted two days in demonstrating in a practical manner the increased yield of cheese obtained by properly cooling the milk. On the first day the milk of a number of patrons, cared for in the average way, that is, not caring for it at all except by perhaps airing it so that it assumed the temperature of the surrounding atmosphere. Under these conditions the average temperature of the milk when received was 76 degrees. On the following day the milk of the same patrons was cooled after milking, by ice or cold water, so that when it reached the factory the average temperature was 67 degrees. On the first day the yield of cheese per 100 lbs. of milk was 9.02 lbs. On the second day the average yield of cheese per 100 lbs. of milk was 9.38 lbs. In other words a difference of only 9 degrees in the temperature of the night's milk made an increased yield of over 1-3 lbs. of cheese, which valued at 15c. per pound means a difference of over 5c. in the value of each 100 lbs. of milk. These results representing average conditions proved throughout the whole of Eastern Ontario surely should be a tremendous object lesson to all factory patrons, for while these comparisons were made under average weather and factory conditions, a far greater difference would be found in very hot weather of which every season has its proportion.

There is no doubt in my mind but that our greatest field of labor in improving the cheese industry lies at the farms where the raw material is produced, and in this connection there are two lines of procedure which seem to me to offer excellent opportunities for the future. The first of these is through the use of the sediment test, which is made by filtering or straining a small amount of each patron's milk through a prepared, absorbent cotton disc. All of the insoluble dirt in the milk is thereby collected on the disc and can be used as a practical object lesson to the owner of the milk. All of the instructors were furnished with these tests last spring, and besides the large number of discs shown or forwarded to the patrons directly interested, over 1,400 were visited at their farms in an effort to remedy existing milk defects as found at the factory.

The other field of procedure lies at the cheese factories to which patrons either deliver the milk personally or through milk drawers. It has long been admitted that nobody is in a better position to reach his patrons than is the cheese-maker, but nothing definite in the way of a workable plan has ever been formulated for producing results.

What I have in mind is as follows: That every cheese factory should be equipped with a sediment test, a fermentation test, and a thermometer, all conveniently placed on or near the weighing stand. The maker should then use any or all of these tests on whatever number of samples of milk he has reason to suspect of being unfit for the manufacture of finest cheese. He should also have a supply of ready printed forms on which he could underline the name of any common defect found in any sample of milk, the same printed form to give instructions for remedying such defects.

It is a fact that whenever milk is returned to a patron, that patron should have an explanation as to the cause of rejection at the factory and how to prevent such defect the following day.

But busy cheese-makers do not have time to write many letters to patrons while milk is coming in, nor have they much time to visit patrons at their homes. Therefore, what seems to me to be the best solution of the difficulty is for the Department of Agriculture to provide all factories with a number of printed

REPORT ON WORK OF DAIRY INSTRUCTORS FOR

Instructors and Groups.	No. of factories in group.	No. of full day visits.	No. of call visits.	No. of patrons.	No. of patrons visited.	No. of samples of milk tested for adulteration.	No. of samples deteriorated.	No. of sediment tests made.	No. of factories pasteurizing the whey	No. of factories making whey butter.
Almonte— W. J. Ragsdale	43	67	193	1,697	147	1,286	0	1,155	0	3
Alexandria— C. B. Larry	38	47	360	1,047	41	711	0	1,496	1	0
Brockville East— A. H. Wilson	43	51	248	1,154	29	1,209	0	1,307	19	7
Brockville West— S. S. Cheetham	42	51	155	1,042	65	1,145	1	350	16	16
Brockville North— P. Nolan	45	45	226	1,135	15	757	1	365	0	21
Belleville— Hugh Howey	35	35	297	1,443	127	1,700	2	750	5	0
Cornwall— J. Buro	37	70	440	1,262	164	1,375	3	521	19	0
Campbellford— R. T. Gray	37	47	251	1,415	57	2,351	4	372	1	0
Finch— T. J. Ellis	40	28	284	1,126	17	640	0	720	0	4
Kemptville— W. G. Gardiner	40	74	205	1,454	35	1,074	3	105	1	3
Kingston— Fred Clark	43	47	211	1,244	24	1,306	1	308	2	8
Peterboro' and Lindsay— R. W. Ward	36	66	236	1,722	168	341	1	289	2	7
Madoc— Chas. Linn	38	77	192	1,161	51	93	5	45	2	0
Morrisburg— C. W. Norval	43	54	230	1,364	53	1,094	0	400	0	23
Ottawa— Jas. Mitchell	38	56	231	1,107	21	916	2	128	4	5
Ottawa East— A. McKinley	41	70	280	1,266	22	585	0	1,046	0	4
Perth— J. H. Echlin	42	36	186	1,700	127	343	0	370	3	7
Picton— Herb. Brintnell	33	48	247	2,286	164	2,678	9	428	16	5
Plantaganet— Jos. McAllister	45	71	202	1,238	27	883	8	462	1	0
Napanee— G. H. Bensley	45	30	219	2,692	45	2,828	5	29	4	6
Vankleek Hill— G. H. Barker	43	47	375	1,052	41	890	0	334	1	0
	847	1,117	5,268	29,607	1,440	24,205	45	10,975	97	119

SEASON OF 1914—EASTERN ONTARIO CHEESE FACTORIES.

Lbs. of whey butter made from May 1st to Nov. 1st.	Average % of fat in milk.	No. of factories paying by test.	Lbs. of milk delivered from May 1st to November 1st.	Lbs. of cheese made from May 1st to November 1st.	Average lbs. of milk to make a pound of cheese.	No. of factories with cool-curing rooms.	No. of factories which made improvements in buildings or plant.	Estimated expenditure, including new buildings.	No. of factories kept in a sanitary condition.	No. of new silos built.
11,388	3.56	2	49,022,037	4,509,556	10.87	3	40	5,000	41	178
0	3.60	3	31,995,164	3,043,680	10.51	0	15	4,000	34	18
16,462	3.56	2	50,153,084	4,579,513	10.95	2	19	2,100	41	27
51,146	3.50	3	55,238,137	4,985,934	11.07	3	18	4,110	30	50
67,807	3.51	0	57,449,580	5,212,138	11.02	1	15	2,550	35	31
0	3.57	0	43,234,801	3,936,182	10.92	6	3	800	35	64
0	3.86	12	45,126,779	4,266,230	10.51	1	37	2,440	27	60
0	3.58	0	38,824,992	3,556,144	10.91	3	31	5,272	37	63
14,641	3.62	2	39,728,936	3,655,805	10.84	1	36	3,500	35	80
9,223	3.50	11	44,256,662	3,917,146	11.29	1	25	2,863	38	98
35,385	3.63	2	42,435,360	3,864,018	10.99	0	11	4,300	41	47
17,453	3.56	11	37,427,826	3,373,138	11.09	12	32	2,889	32	153
0	3.60	0	37,469,119	3,401,479	11.01	3	25	2,407	36	40
58,864	3.49	3	49,377,522	4,572,322	10.79	1	40	4,000	35	47
13,289	3.49	15	39,624,343	3,628,817	10.92	1	14	3,410	35	67
4,081	3.57	5	35,710,544	3,418,004	10.45	0	25	4,048	34	30
23,506	3.50	0	41,255,400	3,788,726	10.88	1	22	2,835	35	40
36,733	3.55	0	55,278,577	4,997,236	11.08	11	10	3,000	31	40
0	3.71	0	27,276,341	2,618,897	10.36	0	26	1,974	41	19
21,248	3.55	0	73,957,034	6,815,178	10.85	5	21	4,320	35	80
0	3.65	2	34,560,120	3,217,619	10.75	0	14	865	40	26
381,226	3.58	73	929,402,358	85,357,762	10.88	55	479	66,683	748	1,258

forms which can be prepared in a few seconds by the maker, to forward to the patron and to which when desired a disc from the sediment test can be attached showing just how much real dirt, if any, was present in his milk.

Milk Testing.

As in other years, when requested, the milk was tested for adulteration at the factories and the results show that it is still necessary to keep up this branch of the work, as during the past season thirty-five persons were found guilty of supplying either skimmed or watered milk, and fines ranging from $10 to $50 each were imposed, the whole amounting to $1,047 and legal costs. Apart from some seven cases which I handled myself, the prosecutions were conducted by Mr. Jno. Gibson who was appointed Official Prosecutor and employed only at periods as required.

Quality of the Cheese.

The quality of the cheese throughout the year suffered from the usual common defects, but although the season presented more difficulties than some others the percentage of rejections was comparatively small. I do not think the quality of the spring and early summer cheese was ever better. They were exceptionally good all over the country, and very few defects were noticed. As usual, however, when the hot weather arrived many of the common defects also appeared and a limited number of rejections occurred. In this connection we must keep in mind, however, the fact that the prevailing prices while very high varied much from week to week and this fact coupled with the fact that a great quantity of American cheese were purchased at below Canadian quotations and were shipped to Great Britain by Canadian buyers, made the disposal outlets of inferior grades rather unfavorable.

The first part of September and the latter part of August seemed to be the most trying periods of the year. One of the most noticeable of the special defects and one regarding which I would like to caution all makers for another year is that due to impure rennet or to the use of too little rennet. There is often a tendency by manufacturers when the price of anything goes very high to cheapen the product at a sacrifice of quality, and there is also a tendency on the part of makers to use less rennet with higher setting temperatures, also at a sacrifice of quality in their cheese. This was noticed in many cases last Fall and it should be carefully avoided hereafter.

I regret to have to say again, too, that the practice of shipping green cheese has not been lessened. In fact I believe in 1915 there was more than the usual number of green cheese shipped. Educational means seem to have made little impression on factorymen and patrons who permit this short-sighted practice, and it seems very evident that in the interests of the whole dairy industry some other procedure will be required to stamp out the evil. Not only is it practically impossible for instructors to be of much assistance to makers when they find no cheese in the curing-room when they call, but the makers are much more liable to suffer from rejections because cheese are then at their worst age for passing inspection. The whole fault seems to continue because factorymen seem to think that their whole interest ceases when the cheese leave the factory, and that they are not affected by the final condition of quality as the cheese reaches the consumer.

Creameries.

While the butter industry is of very much smaller proportions than that of cheese in our part of the Province, it is nevertheless of sufficient importance to demand a reasonable proportion of our time and consideration.

We have in Eastern Ontario some thirty-eight regular creameries and new ones have been established at Napanee, Cornwall and Arnprior. The most of the instruction work was given by Mr. Zufelt, who assumed the responsibility of twenty-six, the others being visited by the instructors in whose groups they were located.

With the exception of two all of these creameries were reported as being in a satisfactory condition; 28 are equipped with good storage facilities; 12 collect the cream three times a week and 26 twice a week; 16 are using scales for weighing the samples for testing with the Babcock test. Other interesting statistics will be found in an attached form similar to that used in the cheese report. There was manufactured during the six months (May 1st to Oct. 31st) some 2,800,000 lbs. of butter as compared with over 3,000,000 lbs. in 1914, a falling off in the total make of over 200,000 lbs.

In addition, 119 cheese factories manufactured whey butter and their total make exceeded 381,000 lbs.

Some 4,836 patrons supplied cream to the regular creameries during 1915, or about 100 less than in 1914.

The instructors report an improvement in the quality of the butter and cream, but there is still much to be desired in this respect, and it seems more evident each year that the proper solution of the better cream problem lies in some method of paying patrons a premium of more money for the highest grades, and we will be more than interested in the address Mr. Herns is to make along this line as he has recently devoted some attention to this important matter.

The large creameries in the cities continue to take cream from a large number of patrons and no doubt this field will continue to grow and develop in direct proportion to the growth of the cities themselves. The natural increase in cream shipping will no doubt come from those districts nearest the cities where shipping is convenient.

On the other hand we find new dairy sections developing in Northern Ontario where several creameries and cheese factories have already been established.

In concluding this report I am sure that while we all deeply regret the great life struggle through which Canada is fighting side by side with the mother country, all dairymen must feel most grateful for the wonderful protection and assistance given them by the British navy. All must indeed realize with pride and honor the fact that since the war commenced millions of pounds of cheese and butter have been transported across the Atlantic with entire safety, were it not for this the dairymen would never have received the high prices that have prevailed during the war. Let us all then keep in mind during the coming year our humble indebtedness to the forces that guarantee the liberty and freedom of the seas, and let us do all that lies within our power to assist in whatever manner we can to show our appreciation and gratefulness until peace is again restored.

REPORT ON WORK OF DAIRY INSPECTORS FOR SEASON OF 1914—EASTERN ONTARIO CREAMERIES.

Creamery Instructors	No. of creameries visited	No. of visits	No. of patrons	No. of patrons visited	Average % of fat in cream	Lbs. of butter made from May 1st to November 1st	No. of tests made for moisture	Average % of moisture	No. of samples showing over 16 % moisture	No. of tests made for % of salt in butter	No. of creameries using scales for weighing samples
L. A. Zufelt...	26	78	3,620	....	29	1,897,200	90	15	7	......	11
W. G. Gardiner	4	15	373	....	27	548,683	......	......	......	......	1
J. H. Echlin...	4	14	540	6	28	236,250	2	152	......	......	3
W. J. Ragsdale	2	6	102	3	30	40,108	......	......	......	......	1
R. T. Gray....	1	5	100	....	27	82,000	......	......	......	......	......
C. W. Linn ...	1	2	93	....	28	67,300	......	......	......	......	......
Total	38	120	4,828	9	28	2,871,541	92	......	7	......	16

Creamery Industries	No. of creameries that have good storage	Average temperature of storage	No. of creameries using culture	No. of creameries using coolers	No. of creameries using pasteurizers	No. of creameries using cream tanks for collecting cream	No. of creameries using jacketted cans for collecting cream	No. of creameries using individual cans for collecting cream	No. of creameries collecting cream three times a week	No. of creameries collecting cream twice a week	Total expenditure including new creameries and general improvements
L. A. Zufelt...	20	40	5	6	6	2	13	9	0	26	2,550
W. G. Gardiner	4	45	2	4	2	......	......	4	4	......	1,950
J. H. Echlin...	1	43	......	......	......	......	......	4	4	......	900
W. J. Ragsdale	2	45	1	......	1	......	......	2	2	......	......
R. T. Gray....	1	46	......	......	......	1	1	......	1	......	......
C. W. Linn....	......	60	......	......	......	......	......	1	1	......	200
Total.....	28	......	8	10	9	3	14	20	12	26	5,550

MR. BARR: Many of you are interested in the new rules and regulations connected with cheese boxes. I fancy that a great many of the cheese men throughout Eastern Ontario and other parts of the Dominion are interested in the new Act that has been passed by the Railway Board of the Dominion, in connection with the style of box that must be used next year. We have been receiving some complaints at the Ottawa office on account of the regulations going into force on the 1st of December. They say it is rather unfair to the cheese factories and box makers, because they have a lot of stock on hand and they do not know what to do with it. We have been criticized somewhat for this state of affairs, and I would like to say that a year ago in August a circular letter was sent to every cheese factory in Canada stating that this regulation was being discussed by the produce men of the country, and suggesting that the cheese factory men look after their side of the business. The Dairy Commissioners' Branch had really nothing to do with it any more than they took upon themselves the issuing of this circular advising the cheese factory men throughout the country as to what was likely to take place. One would have thought that the cheese factory men would have realized what it meant to them, but we only received a few letters in connection with the matter, and in October of last year the regulation was passed and settled without even advising the Dairy Commissioner of the fact. The Commissioner thought he had made arrangements with the Board of Railway Commissioners that they would advise with him so that he could discuss the matter with them, but they never advised him about it in any way until after the regulation was passed. As soon as we got the information a circular was sent out to every cheese factory in the country stating the conditions under which cheese boxes had to be made. As far as the Dairy Commissioner's Branch is concerned, we have done all we can do.

I think it is a subject that this Convention could very well spend some time discussing. The only thing you can do now is to try to get the time extended. I do not think there is any use in trying to change the regulation. I think you will find that boxes will be refused at shipping points.

Mr. J. A. Sanderson: They have been refused this year already.

Mr. Barr: It is just a question as to whether you can have anything done to have the operation of the regulation extended to some later date. We did everything we could to place the matter before the cheese factory men in plenty of time so that they could take action, but unfortunately they did not do so.

Mr. Publow: Do you suppose that a resolution passed by this Convention asking to have the regulation extended until the 1st of June so as to give the factory men an opportunity to get rid of the boxes they have on hand, would have any effect?

Mr. Barr: That is the only thing you can do.

Mr. John Forester: A resolution was passed at the Convention last year on this question of cheese boxes. The Napanee Cheese Board has passed a resolution two or three times, and it was forwarded to the secretary of the Railway Commission. If the resolution passed last year had no effect, what good will it do now? Last October when we got the circular stating this regulation was to be in force, the Napanee Cheese Board took the matter up and asked that the time be extended until the 1st of June.

Mr. Barr: If you could get a good committee to back up the resolution, it would make a great deal of difference. It seems to me that is the only thing the dairymen can do at the present time.

The Chairman: This is a big question, and there is going to be a great deal of trouble this spring. I know factories that have a number of boxes on hand. I know of one man who shipped 100 boxes of cheese to the station in cold weather this fall, and the agent refused to take them, and after considerable correspondence the Montreal exporter agreed to accept the shipment and the cheese went forward. This holding up of a shipment is a very serious thing in cold weather. Next year we will have the same condition because factory men who have boxes on hand will be anxious to get rid of them, because they have paid good money for them and they cannot afford to throw them away. My personal opinion is that this convention should pass a resolution recommending that the regulation be not put in force until a later date.

Senator Derbyshire: The Resolutions Committee should bring in a resolution asking that the time be extended, and then four or five men should be appointed on a committee to see the proper parties and discuss the matter with them. There is no doubt the time will be extended; they have got to do it. It is not a question of what they want to do; they have got to extend the time. You cannot take a man by the throat in a country like this, and I will move that this matter of extending the time for enforcement of the regulation regarding cheese boxes by the Railway Commission be referred to the Resolutions Committee.

Motion seconded by G. G. PUBLOW, and on being put to the meeting was carried unanimously.

A MEMBER: I would be glad to hear from Mr. Barr as to the regulation that has recently been put in force as to the inspection of cream cans. It has already touched my pocket to the extent of $10, and that is a very tender spot. I see no necessity for having cream cans inspected, because the cream is bought by weight. In Western Ontario we worked hard to get away from the measuring of cream, and now it looks as if we were legislating back to it. This is not the fault of the Dairy Department, but I think we should take it up and have this matter put right.

MR. BARR: That is a question very similar to the question of the cheese boxes. This regulation was passed before anybody knew anything about it, as far as the dairymen are concerned, and then a vigorous protest was made, and I think in many cases the protest was well taken. On the other hand, I will say that so far as the cream is concerned, I do not see that there is any necessity for having a standard can, because I do not know any place where cream is being sold by quantity. The Chief of the Weight and Measures Branch claims that inspectors have found cans being used in Canada for shipping milk that held almost a quart more than the regulation size, and he makes the statement that some firms are using these and sending them out to the customers so that they will get a quart more milk than they would get in the proper size can. That is the main reason for putting through this regulation. You can understand that if that statement is true, there is need for a standard size can for shipping milk. Then the question comes up, should we have two cans?

Q.—Why cannot they weigh milk the same as they weigh cream?

A.—We have not been able to find but one or two places where they weigh milk.

MR. GILLESPIE: We pay by weight for every pound we buy.

MR. BARR: It would be impossible to weigh all the milk in time before it was shipped, where the milk is sent in by train as it is at some places, and you can easily understand that if these cans are allowed to be used, the farmers will be shipping more milk than they are being paid for. There seems to be some necessity for this regulation as far as milk is concerned.

MR. GILLESPIE: Supposing cans hold exactly eight gallons, and supposing the can is dinged, will it hold less?

MR. BARR: Everybody seems to claim that a dinged can will hold less.

Q.—This regulation covers the whole Dominion?

MR. BARR: Yes, and the Western Provinces are making a big kick in regard to it.

Q.—Could not they pass a law that the milk must be bought by weight?

A.—That would be quite a big contract. Personally, I cannot see any objection to having a uniform can. The only objection I see is that they make the creamery men pay the money. I think the milk dealers should be made to pay for the standardization of the cans.

Q.—Why not exempt cans that are used for the handling of cream?

A.—Then you would have to have a special can for cream.

THE CHAIRMAN: I think there is a great deal in what Mr. Barr says about the little extra milk. I have shipped milk to Montreal and we fill up the eight gallon cans, and I find it takes more than eight gallons to fill them. The dealers in Montreal buy at so much a gallon and if you do not fill the can they will check you a little short. Then what are you going to do about it?

SECRETARY'S REPORT.

T. A. THOMPSON, ALMONTE.

Before reading my report, with the permission of the Chairman, I would like to read a letter that has been forwarded to me by Mr. J. A. Ruddick, Dairy Commissioner for the Dominion of Canada. Mr. Ruddick wishes to express his regrets at not being able to be with us on this occasion.

MR. T. A. THOMPSON, OTTAWA, *Jan.* 4, 1916.
Secretary, Dairymen's Association of Eastern Ontario.

DEAR MR. THOMPSON,—I regret that circumstances over which I have no control will prevent me from accepting your kind invitation to attend the annual convention of your association. It will be the first one for me to miss in over thirty years, except once when I was ill, and twice while I was out of the country, but the loss will be mine rather than that of the Convention.

Had I been able to attend it was my intention to ask permission to present to the Association some views which I hold as to the desirability of improving the conditions under which dairy produce is marketed in Canada, especially in relation to the domestic or home trade which now absorbs more than two-thirds of our total production of butter and cheese.

It seems to me that the time has come when we should give some attention to the matter of national standards of quality for the different grades of butter and cheese, and thus put the trading in these articles on a more clearly defined and stable basis. In the days when the chief interest centered in the export trade the need for established and recognized standards was not so apparent as it is to-day, because the exporters had standards of their own which were and are yet determined very largely by the demands of the market to which that branch of the trade caters.

When, however, a Canadian dealer makes a sale of butter or cheese to another Canadian dealer at some distance apart, both are at a disadvantage owing to this lack of definite grading which I have alluded to. Probably this disability is not felt to the same extent in Ontario and Quebec where the influence of the export trade is at work, as it is in the other provinces whose whole output finds sale in Canada.

Closely allied to this matter of standards is another question which demands attention, namely, that of purchase and sale on a strictly quality basis. The cheese and butter manufacturers do not receive sufficient or just reward for turning out high grade goods. Our marketing methods have a tendency to average prices for a rather wide range of values, and thus we lose the effect of one of the strongest incentives to the development of the highest possible quality in our dairy produce.

This principle of fair acknowledgement for a superior article is being worked out with remarkable results in some parts of Canada by applying it to the payment for cream under a system of grading in connection with the operation of cream gathering creameries.

Payment all round on a quality basis would be more effective in raising the general average of quality in our butter and cheese than all other efforts combined. If this problem were solved the other problems would very largely solve themselves.

These are questions, to which it seems to me, an influential body like the Dairymen's Association of Eastern Ontario, should very properly devote some attention. Of course concerted action with other organizations in other provinces is necessary, and the dairy branch of the Dominion Department of Agriculture may be depended on to do its share. When times become normal again, it may be desirable to have a general conference to deal with the subject in a comprehensive manner. In the meantime I suggest these topics for consideration of your members.

Trusting that you may have a successful convention, I remain,

Yours faithfully,
J. A. RUDDICK,
Dominion Dairy Commissioner.

As Secretary of the Dairymen's Association of Eastern Ontario, it affords me very much pleasure to present my report for the year 1915, which has been a banner year for the dairy industry of Eastern Ontario, the season being one of the most favourable on record for the cheap production of milk; and the average selling price for both butter and cheese being the highest ever obtained in this country.

The dairymen of Eastern Ontario have not been unmindful of the Patriotism and Production Campaign inaugurated by the Dominion Department of Agriculture, and their determined efforts to do their share in supplying food for the Empire in larger quantities than formerly have been crowned with success, having sent some 40,000 boxes of cheese to the Motherland in excess of that sent for the season of 1914.

The quality of the goods, however, has not kept pace with the increase in production, and it is quite evident that greater care must be taken with the milk at the farm, and that the makers become more exacting in their acceptance of it at the factory before the manufactured products can attain that high standard of excellence at which this Association has for years been aiming.

I appeal to the Dairymen of Eastern Ontario to make a united effort to have the coming season a record-breaker both as to the quantity and quality of the goods produced, and thereby do their share in assisting the Empire to carry to a successful issue the gigantic struggle in which it is now engaged. While our sailors and our soldiers are fighting in the noblest cause ever maintained by a nation—that of Liberty, of Justice, and of Humanity—let us show our patriotism to Canada and the Empire by producing food in larger quantities than ever, and let us start right now by seeing that our dairy herds are better cared for during this winter than ever before and turned out in the spring in the best condition possible for a good season's work.

The educational work carried on by this Association throughout Eastern Ontario is slowly but surely bearing fruit. The value of the information received at conventions such as this cannot be over-estimated, and the reports of these conventions which are sent to every member form some of the most valuable and instructive books of the farm library.

The District Dairy Meetings held annually in each county have become very popular and are the means of disseminating much useful information.

The Directors appreciate the assistance the Association has always received from the Ontario Department of Agriculture, and wish to express their gratitude for the consideration received under existing circumstances.

I wish to tender my sincere thanks to the President and Board of Directors for their kindness and forbearance and the assistance rendered me in the discharge of my duties as Secretary.

PLUGS OF CHEESE AND PATS OF BUTTER.

H. H. Dean, O.A.C., Guelph.

As my subject indicates, we shall deal with *pieces* of information or fragments of truths, rather than try to elaborate fully some one branch of dairy knowledge.

Cheese.

Overripe Milk Losses.—Again we wish to call attention to the fact that where milk is not properly cooled and delivered at the factory in a sweet condition it means a loss of cheesemaking material. During the season 1914 at the O.A.C. this loss amounted to an average of 6.24 lbs. per 1,000 lbs. milk. Assuming that one-tenth of the milk delivered at cheese factories in Eastern Ontario during the season of 1915 was in an overripe condition when delivered, that is had .2 per cent. of acid or over, the loss would equal about 600,000 lbs. cheese, worth to the farmers or patrons of factories, at 15 cents per pound, $90,000.

Not only this, but the quality of the cheese is always not so good from the over-ripe lots. However, the difference in quality, with a skilful maker, is not so great as we might expect, showing that fairly good cheese can be made from "acidy" milk, if we know how to handle such milk. The chief loss is in yield of cheese.

Importance of Using Sufficient Rennet.—At the present time when rennet is so scarce and dear, the tendency is to use less rennet, which means loss in quantity and quality of cheese. A few years ago we tested this point by using from one to nine ounces of rennet per 1,000 lbs. milk. From 3 to 3 1-3 ounces per 1,000 lbs. milk was used as a standard quantity and lesser or greater quantities were compared with this standard. We need not refer to the larger quantities, as they are not economical and are of no special value except to hasten the ripening process in the cheese. As the average of four years representative tests, we found the average yield of cheese per 1,000 lbs. milk and average loss of fat in the whey to be:—

Rennet.	Lbs. Cheese per 1,000 lbs. Milk.	Average % Fat in Whey.
1 oz. per 1,000 lbs. milk	92.07	.375
2 " " "	94.07	.275
3 " " "	95.10	.192

We also found the cheese to be poorer in quality as the result of using a small quantity (less than three ounces per 1,000 lbs. milk) of rennet. The time required for coagulation of the milk is also much greater by using the small quantity of rennet—on the average, 30 minutes longer for one ounce as compared with 2 oz. and 10 minutes longer by using 2 oz. as compared with 3 oz. per 1,000 lbs. milk.

It may not be out of place to mention that at the present time Canada is dependent on foreign supplies for an essential agent in cheese manufacture. If these foreign supplies were to be suddenly cut off, the cheese trade would be seriously damaged if not entirely wiped out in a short time, unless we can find a substitute for rennet. Pepsin appears to be a favorable substitute. There are also certain plants which have coagulating power when added to milk. A thorough investigation of this matter is imperative. If the United States should suddenly prohibit the export of rennet to Canada it would be a body-blow to the Canadian cheese trade.

Pasteurized Milk for Cheesemaking.—The modern demand for *safe* food products which requires pasteurized milk and cream for direct consumption is now spreading to butter and may reach cheese before long. This has caused us to investigate anew the problem of pasteurization as applied to cheesemaking which was taken up by us several years ago, when we concluded it was not practicable nor advisable under factory conditions in Canada.

One of the American Experiment Stations is now agitating the system, using hydrochloric acid as a restorative agent in the milk which has been pasteurized, to free lime compounds which are destroyed by heating and which are essential for rennet action.

During the years 1913 and 1914 the results were unsatisfactory in quality of cheese. Those made in 1915 were much improved and scored about the same as did those made from normal milk. Without going into details, the average weight of cheese made from the pasteurized milk per 1,000 lbs., was 87.7; from the normal lots, 83.8; an increase of 3.8 lbs., or nearly four pounds by pasteurizing. The average percentage of fat in the whey was .185 from the pasteurized lots and .265 from the unpasteurized. The moisture averaged about 1 per cent. greater in both green and ripe cheese in the pasteurized lots. The shrinkage during one month was nearly 1 per cent. greater on the pasteurized cheese.

Our tests indicate that fairly good cheese can be made by pasteurizing the milk, but there is considerable extra labour, and it is doubtful if the extra yield of cheese would pay for this, but if pasteurization becomes advisable or compulsory, it can be done, especially in small quantities, and also in large quantities with proper equipment.

Effect of Salt on Curd and Cheese.—Sixteen tests were made between April 14th and October 4th to note the effect of adding salt at the rate of 2.2½ and 3 lbs. per 100 lbs. curd. Altogether there were used 20,438 lbs. milk, testing an average of 3.27 per cent. fat and 2.16 per cent. casein.

The lots salted 2 lbs. per 100 lbs. curd contained an average of 34.42 per cent. moisture; the 2½ lbs. lots, 33.7; and the 3 lbs. lots, 33.79. The percentages of shrinkage in one month were 2.73, 2.6, and 2.69 respectively. The average scores of the cheese were 90.2, 90.91 and 90.64 respectively, for the three lots.

The conclusions drawn: the heavier salting caused a greater expulsion of the moisture in the curd and green cheese, although they shrank slightly less during the ripening process. The medium salted lots (2½ lbs. salt per 100 lbs. curd) scored highest in quality. The lots salted 3 lbs. per 100 lbs. curd were somewhat stiff in texture and required a longer time to cure or ripen.

Butter.

Composite Cream Tests.—During the months of April and May tests were made, comparing the testing of each delivery of cream, with composite sampling. We also compared shaking the composite sample at each addition of a fresh sample with not shaking. The composite sample percentages of fat agreed quite closely with the average of daily sampling. The composite samples not shaken had less mould and were more easily sampled than were those shaken. The practical lessons are: To the man who is buying or manufacturing cream, composite sampling gives satisfactory results and makes less labor in testing; the sample bottles should not be shaken, should be kept tightly corked and in a cool place.

Raw *vs.* Pasteurized Cream for Churning.—Comparing cream, testing 32 to 37.5 per cent. fat and having from .3 to .44 per cent. acid at the time of heating and churned raw, with similar cream pasteuized at 140°F. and 160°F. in Coil and Disc holder types of pasteurizers, the following average results were got:—

Kind of Cream.	Average % Fat in Buttermilk.	Average lbs. Butter per 100 lbs. fat in Cream.	Average score of Butter at end of	
			1 week.	1 month.
Raw	.278	120.88	92.23	91.12
Past at 140° F.	.324	116.95	93.86	92.11
Past at 160° F.	.394	116.91	92.93	91.92

COMMENTS.—1. The loss of fat in the buttermilk was greater from the pasteurized lots, particularly so in those lots having over .4 per cent. acid at the time of heating. The lesson is, have cream sweet, or less than .3 per cent. acid.

2. The "overrun" was about 3.3 per cent. less on the pasteurized lots, as compared with the raw cream lots.

3. The quality of the butter was better from the lots pasteurized.

PERCENTAGES OF FAT, MOISTURE AND SALT IN BUTTER.—At the present time when considerable attention is being given to the questions of Standards in Butter, the following data on 22 samples of O.A.C. butter made during April, May and June, 1915, are of interest:—

Percentage of Moisture			Per Cent. Salt.			Per Cent. Fat.		
High.	Low.	Average.	High.	Low.	Average.	High.	Low.	Average.
15.7	13.2	14.325	4.09	2.4	3.25	85	82	83.454

If these averages be added it will be found that they exceed 100. This is accounted for by "chemical errors." It will also be noticed that no account is taken of "curdy matter." The fat determinations were made by the Babcock method, using nine grams of butter in a 50 per cent. graduated cream bottle. It is probable that this method gives results too high in fat. Further tests will need to be made on this point.

BUTTER SALTS.—Chemical analyses made of six brands of butter salts showed percentages of sodium chloride (na cl) ranging from 96.36 to 99.24. They all contained "traces" of lime and sulphate, with one exception. This brand apparently did not contain any lime.

On May 10th, 949 lbs. cream testing 35.5 per cent. fat and .4 per cent. acidity at the time of pasteurizing, was heated to 145°F. in a "holder" pasteurizer for thirty minutes. The following day the cream was churned and the butter divided into six lots. The lots were salted with each of three brands of these butter salts at the rate of ¾ and 1 ounce of salt per pound of butter. The experiment was repeated on June 22nd with five brands of salt, but unfortunately these latter lots were removed from the Cold Storage before we could examine them as to keeping quality. Of the May lots, when scored about six months after making, there was very little difference in the quality of butter in the six boxes. The highest score out of 50 points for flavor was 45.5, and the lowest 45. The highest total score was 93 out of 100 and the lowest 92.5. So far as these tests go, they indicate very little difference in the preservative effect of the brands, or whether 1 oz. or ¾ oz. of salt per pound of butter be used. I am glad that our friend Mr. Dargavel has a motion before this convention to bring these matters before the attention of the patrons of the cheese factories of the Province. I do not know of any more valuable line of work than that taken up by Mr. Publow. The great difficulty in connection with experimental work is to get the results before the people. If it can be demonstrated to the farmers that it will pay them in dollars and cents to take proper care of their milk, then I think the farmers of this Province have enough common sense and business ability to put up ice in the winter, so as to be able to properly take care of the milk in the summer. Assuming that 10 per cent. of the milk delivered at the cheese factories in Eastern Ontario during 1915 was in an overripe condition, then according to the tests made at the College there was a loss of over $90,000. If Mr. Publow's estimate of 30 per cent. is right, then you will have to multiply those figures by three and you have $270,000 as an estimate of the loss. That is caused by not cooling the milk, to say nothing about the quality of the cheese. I think it is time that we got down to something definite on that subject. I believe these things ought to be brought home to the people. The trouble is that men who ought to be reached with figures of that kind don't attend this convention, and some other means must be found to bring this matter before them. I have great faith in the dairy business. I think the men who are milking cows are doing a wonderful work in this country, and anything that can be done to make a more profitable return for our farmers is money well spent. The reason we have good times at present is because the farmers have more money to spend, and therefore any money which is spent to make the farmers more content on their farms is money well spent.

Mr. Singleton: With regard to standards, I would like to say, we have been trying to make our product up to standard without trying to find out in the first place what the proper standard is. I won't say whether or not there has been a sufficient number of analyses of cheese and butter in this country on which to fix a proper standard from which to work. We have in Canada an Act which deals with the products of butter and cheese: "The Adulteration Act and the Dairy Administration Act." We have a standard for cheese. How was it obtained? The Inspector of Inland Revenue collected samples from differents parts of the country and these samples were analysed, a complete analysis of the fat, albumen and water and lactic acid and salt; the result of this analysis was considered by a Board appointed under the authority of the Adulteration Act. This Board fixed the standard. They found that the fat content of Canadian cheddar cheese was at least 50 per cent. of the dry matter. Then they said, "We will fix the minimum standard at 45 per cent. of the dry matter, allowing 5 per cent. leeway." Our main standard for butter is the water content. The standard is 16 per cent. water. That is the standard in Great Britain. We were exporting butter to Great Britain at that time, and we had to make our butter to suit their standard. That was also the standard of the United States. Whether they fixed that standard before us or not I cannot say. Thousands of samples of butter were analyzed by the Inland Revenue Department, and it was found at that time that the average percentage of water in our butter was around 11 per cent., and they said: "We will fix the standard at 16 per cent., which will give the buttermakers plenty of latitude and allow for variations." The question has come to the front again, because the creamery men got wise, and instead of incorporating 11 per cent. of water they are putting in 15½ per cent. The composition of the butter has been changed to come up to the standard.

Prof. Dean: I have frequently received reports from the Inland Revenue Department, and if these reports represent the samples which they have analyzed, it strikes me that they are a very small proportion of the amount of butter that is manufactured in Canada. As far as I know, the Inland Revenue Department has no man who is giving his whole attention to this matter. You cannot take a standard that was fixed ten years ago and say that applies to conditions to-day. We should have a man working on these problems all the time. Dairying is in an evolutionary stage, and what is true to-day may not be true to-morrow.

Mr. Publow: We have said hundreds of times to the people of this country that if the average milk was cared for as well as the best milk, we believed it would take a half pound less milk to make a pound of cheese, and it would be better cheese. I have made hundreds of tests, and they all carry out what I have said. Some people have said this work has been done under favourable conditions. We have done it under all kinds of conditions. I said to each instructor this year: "I want you to take a factory with average conditions, and spend two days at that factory, receive the milk and take the temperature of the milk as it is received, and talk to the people about it. On the second day take the individual temperature of the milk, and make a test for acidity and for the percentage of fat, then put forth your best effort to make a good cheese and as much cheese as possible out of that milk. Put forth every effort to have the milk received at the factory the second day below 70°." This was done in twenty factories, and it was done under average conditions. The first day some of the milk was as high as 81°, but the average was 76°. The fat test of the milk was 3.5 and the loss of fat in the whey .23 per cent. The number of pounds of milk used that first day was 85,711, and there was manufactured from that milk 7,336 pounds of cheese; or, in other words, it took 11.08 pounds of milk to make a pound of cheese. The second day the average temperature was 67°, or 9° lower than on the first day. We only asked the people who were delivering milk above 76° to make any change. The average fat was the same as the day before. The loss of the fat was .19 per cent., as compared with .23 per cent. the day before. The number of pounds of milk used the second day was 85,444, a difference of only about 200 pounds. The pounds of cheese made was 8,017, or it took 10.65 pounds of milk to make a pound of cheese; about a half pound less milk to make a pound of cheese. About 30 per cent. of the patrons delivered milk above the average temperature. At two of the factories on the first day it was found that all the milk delivered was below 67°, and the second day the milk was down to 62°, and there was practically no difference in the yield of cheese on the second day's work. In every case, except one, the inspectors reported that the cheese made the second day was very much better than the cheese made the first day. If we take all these things into consideration, then a large percentage of the people who are doing what is right in connection with this work should see to it that a special effort is put forth to make the other fellows do better.

Mr. J. R. Dargavel, M.L.A.: I am sure we all feel grateful to Mr. Publow for taking up this work. I will now put my motion:

"That Mr. Publow be instructed to prepare a circular containing these figures that he has given on the question of the importance of properly caring for the milk, and that a sufficient number be printed that each patron of a cheese factory in Ontario may receive a copy."

I am not sure as to who should bear the expense of this, but the Deputy Minister of Agriculture for the Province is present, and I am sure he will give us the benefit of his opinion.

The motion was seconded by Mr. Fraser and carried.

Mr. Publow: I would like the people to understand that this work will bear repeating, but I think it is quite safe to give out the information. It bears out the work that has been done at Guelph and at our own Dairy School at Kingston.

The Deputy Minister of Agriculture, Mr. Roadhouse, stated the Department would be quite willing to bear the expense of printing and circulating to the fullest extent.

STANDARDIZATION OF CREAM AND BUTTER.

Mr. Frank Herns, Chief Dairy Instructor for Western Ontario.

(Read by Mr. G. H. Barr.)

Ontario has made rapid strides in creamery butter production during the past seven or eight years; increasing from 7,000,000 pounds in 1907 to over 23.000,000 pounds in 1914.

This increase indicates the difficult problem which has to be dealt with if a change is attempted in methods of payment for cream and handling the butter.

Some may feel that the initiative in any proposition of this kind should be taken by the creamery owners and producers, for it is they who are most vitally interested.

Creamery operators who manufacture butter by the pound on the basis of quantity cannot be expected to take special interest in a grading plan.

Probably the average dealer would just about as soon see the market low as high. Although they (the dealers) may take action by themselves in this matter of standardization, creamery men and others should be in a position to meet them half way.

1. Is there any need in Ontario for a change in the methods of paying for cream and marketing butter?
2. If so, how shall a beginning be made in this very important work?

Cream and Butter not Paid for According to Quality.

Ontario produces a large proportion of first grade creamery butter, but under the "flat rate" system of marketing, the price at which it is sold must provide for the remaining second grade.

It is true that recently some creamery men and dealers have endeavored to do business on a quality basis, but individuals can do comparatively little. There must be co-operation in the trade as a whole.

Very little has yet been done by the creamery men of the Province to induce producers to recognize payment by grade.

Why Grade?

The home market has for a number of years absorbed most of the creamery butter manufactured. If the Western Provinces continue to increase their output a time is likely to come when a surplus for export will again be available.

Should future conditions bring about an export trade, further preparation must be made to enter a foreign market on the basis of uniform quality or otherwise sell at a lower price.

Should an export trade *not* develop for Ontario butter, other Provinces having adopted a grading plan, which insures a uniform quality of butter reaching the inter-provincial trade, may eventually compete for Eastern markets.

Dealers complain that it is difficult at times to get butter from different creameries of a uniform quality in sufficient quantities to make up large shipments.

The creamery instructors could do a great deal more towards standardizing and improving the quality of the butter if a grading system was adopted.

Looking at the matter from almost any standpoint, it would seem that a point had been reached in the creamery industry of Ontario when the whole situation should be considered and an effort made to devise a plan, the operation of which should not only benefit the quality of the butter, but give credit for quality wherever credit is due.

Grading Practical.

If funds are made available it seems practical to establish in Ontario a grading system of butter, beginning in a commercial way to grade the "solids" intended to be shipped outside the Province. Cream grading should be coincident.

The standards adopted should not be too many in number, and should conform to national standards. It is time that national standards should be decided upon for Canadian dairy products, at least in so far as conditions in the different Provinces will allow.

Many creameries have a large "print" trade, and possibly it would not be advisable to attempt, at first, the market grading of print butter. This butter must compete in the open market under the creamery brands, and consumers are rapidly learning the value of these brands.

Grading Should Improve Quality.

A grading plan should, in time, establish a reliable standard for Ontario butter, which should secure for the Province a permanent reputation for quality.

The extra price received should be an inducement to increase the output of first grade and correspondingly decrease the inferior grade.

It should mean a more uniform product. Flavour is a big factor in butter, but uniformity and workmanship is a close second.

Customs Difficult to Change.

It is fully realized that certain customs and trade systems have become common and no doubt untried methods will not at first appeal to many of those engaged in the industry.

In order, however, not to adversely disturb existing conditions any change must be made slowly, step by step, so that each new movement may be established on a sound basis.

Some Creamery Men Anxious to Grade.

It could not be expected that all creamery men would immediately fall in line, but there is evidence that a number are anxious to grade cream and pay according to quality, *provided it can be shown by practical demonstration that it will not only pay the creamery men but the producers as well.*

Educational Grading as a Beginning.

There are a great many details to be worked out, but this question has been discussed for years and I cannot see how anything may be done unless a start is made. That is the important point just now.

As a beginning in this work it is suggested that arrangements be made to grade, from an educational standpoint, during all or part of the coming season, the butter from one or more creameries.

Having established the fact that under Ontario conditions grading is practical; then if those engaged in the industry will support and co-operate in such a movement, some way may be found to inaugurate a plan of commercial grading.

With the information gained by a season's work as a basis on which to proceed, a committee could be appointed consisting of representative dealers, creamery men, producers, dairy teachers and officials of the Department of Agriculture to go into the whole question and agree upon satisfactory and uniform standards for grading both cream and butter.

If, however, upon thorough investigation it is found that a grading system is not in the best interests of the Ontario creamery industry, it will then be definitely known that it is necessary to continue to bend all efforts along the line of the present excellent educational policy and secure the best results possible.

REPORT OF COMMITTEE ON RESOLUTIONS.

The following report of the Resolutions Committee was read by Mr. G. A. Gillespie, M.L.A.:

1. That we members of this Association desire to express our appreciation of the kindness of the Mayor and citizens of the town of Renfrew for the hearty reception given the members and delegates.

2. That the members of this Association wish to express their sincere thanks to the wardens and members of the County Council for the generous assistance received from them.

3. That we, the members of this Association, desire to thank the speakers at this convention for the splendid addresses that have been given.

4. That the thanks of this Association is hereby tendered to the Canadian Salt Company of Windsor, Ontario, through its General Manager, Mr. E. G. Henderson, for the very handsome badges presented by the company to the Association.

5. That recognizing the great benefits derived from the dairy industry by the assistance received from the Ontario and Federal Departments of Agriculture, we wish to express our sincere thanks and appreciation of the work done by their respective departments.

6. That the members of this Association wish to express our sincere sorrow for the loss which we have received by the death of the late John Hyatt, who for thirty years was one of the most enthusiastic members of this Association, and whose kindly disposition has made him beloved by all. We deeply regret his loss, and wish to express our heart-felt sorrow and our sincere sympathy for Mrs. Hyatt and family. We request that a copy of this resolution be forwarded to Mrs. Hyatt.

7. That we recommend that a committee be appointed to act in conjunction with a committee from the Western Association to deal with the question of cheese-box specifications and also the grading of cream and the regulations enacted by the Dominion Government regarding the standardization of cream cans.

Moved by Mr. Gillespie, and seconded by Mr. Glendenning, "That the resolutions as presented by the resolutions committee be adopted." Carried.

Mr. Gillespie: We took the view that the west were as much interested in these questions as the east, and if they think necessary this committee might meet the Railway Commission.

On motion of Mr. Glendenning, seconded by Mr. Stone:

Mr. J. R. Dargavel, Mr. Gillespie, and the President for 1916 were appointed a committee to interview the Railway Commissioners for Canada. (Carried.)

CLOSING SESSION.

The Honorary President, J. R. Dargavel, M.L.A., presided. In his opening remarks the Chairman traced the history of the Association during the thirty years in which he had been connected with it. He told of the splendid work it had done for the dairy industry of the Province.

ADDRESS.

Mr. Moss, Reeve of Renfrew.

The speaker welcomed the delegates on behalf of the County of Renfrew and expressed gratification in being instrumental in securing $200.00 from the County for the Convention.

"I would like," said Mr. Moss, "to take you over a little trip around the County of Renfrew because I do not think there is a man in the County who knows it better than I do. I was appointed nine years ago as Inspector of Colonization Roads and Bridges for the Counties Renfrew, Lanark and Carlton, and that takes me through the County of Renfrew. This County has a population of 30,000 people; the urban and rural population is just about balanced. Our assessed value is $19,000,000, and before the Government War Tax was put on the County rate was 1⅛ mills on the dollar. We are the lowest assessed County in Canada."

ADDRESS.

Hon. George P. Graham, M.P., began by welcoming the convention to Renfrew, which he thought they would find a pretty good town.

He continued: I have often sat among an audience at a Farmers' Institute meeting—they never would be very large—when some gentleman from the Experimental Farm at Guelph or Ottawa was delivering an address, and those around me would say, "That book-learning is not any good. You cannot farm out of a book." Nevertheless that work continued and there is not a section, I think, throughout this Province that has not been effected by the work done through the agricultural colleges and the farmers' institutes and like associations. I remember distinctly when the Women's Institutes were established. You know that women do not like to be talked to by other women: they are often talked about by other women, but they do not like to be talked to: they do not mind being advised by men, but the Women's Institute has done a great deal of good.

I remember a travelling dairy that was on the road some years ago. At that time every farmer's wife made excellent butter, but his neighbor's wife sometimes made awful stuff. We can remember the days when the butter was made and then put into a dug-out or cellar, and in the fall it was brought to market—some of it good and some of it bad, and some of it indifferent, and some of it with almost internal activity in the tub. This butter was all placed on the market at one time and the buyers, like my friend Senator Derbyshire, always bought the butter at the price of the poorest quality. That is human, and these butter buyers were always human and they have continued to be human. As a result of this, the people who made a choice article did not get rewarded for their labors, because the poorest quality helped to detract from the reputation of the article. As a consequence, Canadian butter did not get the price it should have got in the European market. At that time Morrisburg was the centre for Eastern Ontario and the Eastern Townships was the centre for Quebec. I have known car loads of butter to be brought from Western Ontario, where they did not have the standard as high as the Morrisburg market, and it was sent on as Morrisburg butter to the detriment of the high standard of the Eastern Ontario article.

Following that, we find co-operation in butter making and creameries, such as the Renfrew Creamery. Then we got a very uniform quality of butter, and a good price for the farmer and for the manufacturer as well and a decent article for the people to eat. You know it is said that half the business failures in the world are due to the bad food that the wives feed their husbands. I do not believe it myself, but as Renfrew has no business failures your cooking must be good. The result of all this was the bringing of the farmers closer together and the putting of all their product from the cow into one tub. For years quality was the thing aimed at, and it may be said that no matter what article you are making in this age, if you cannot make it good, the public won't buy it. Our patriotism is a great bubbling thing, but I have yet to find a man that will pay the price for a poor thing when he can get a good article for the same price.

The idea of improvement in quality became supreme. It is absolutely necessary to have quality, and if you do not make enough of good quality there is not much use going into the business; you must have quantity as well as quality. In order to produce quantity as well as quality it was necessary to improve the dairy herds, and the farmers began to look about to see if there were not cripples in their herds that practically had to stand up against the barn to move in the spring. These animals were got rid of and good ones put in their place. As a result we have in the dairy herds of the Province of Ontario some very fine animals.

If you have never attended an exhibition in the County of Renfrew you had better get out next year and we will have a splendid time. I have travelled a good deal over the Province and have been at a good many exhibitions, but I think I am safe in saying that I have never been at a county exhibition that was up to the standard of the County Fair of Renfrew. In addition to excellent dairy herds, they have in this country the best class of horses. They do not confine themselves to one style of horse, and if you have been observant while on the streets of Renfrew you will have seen some pretty good high steppers, and there are also bred here a good many heavy horses.

The improvement in the dairy herds of this section is perhaps more manifest than in any other part of the country. The cow testing has brought about a great improvement in the dairy herds. Every up-to-date farmer can now tell you how much each cow is producing, and in this way he is able to weed out the poor ones.

The Government has paid a good deal of attention to the matter of cold storage and in that way the keeping quality of dairy products has been improved.

I say emphatically that no Government money has ever been expended to greater advantage than the money that has been expended for the improvement of dairying throughout the Province of Ontario and the Dominion of Canada. because after all—and the present testing time has proved it—the soil and its products form the basic industry of the Dominion of Canada and on its success depends the success of every other undertaking. Once let the agricultural end of our industries fail and we find ourselves in trouble. If we have a failure of a crop in the West we at once feel it in the East. I am happy to say that in the Province of Ontario our crops very seldom go below the average, and are quite often a little above the average. That is on account of our position and the diversity of our agricultural industries. We are now in the testing time for all industries, and we should qualify ourselves for improvement in the years to come. We should do our utmost at the present time so that the industry in which we are engaged may not be found wanting when the time for advancement comes.

It is a pleasure to know that the Dominion of Canada is in a good position at the present time. The world over, the people are pointing their finger at this Dominion and saying, "Canada as an overseas Dominion is fully up to the standard." It is one of the most progressive countries and the most thoroughly loyal that you can find in the world, and in this matter of agriculture she is playing a very important part. Canada is sending men to the front and will continue to send more and more, and I believe the call of the Government for another 250,000 men will be responded to by the men of the Dominion. We must have ammunitions, and the town of Renfrew is doing its share in the production of ammunitions, and was one of the first to respond to the Government's appeal for the manufacture of munitions. I suppose you read in the paper to-day that one thousand Canadians were taken out of the firing line in order to assist our friends in England in making munitions. One thousand of the boys we sent from Canada. skilled mechanics, have been, by request of Lloyd George, taken from the trenches and put to making munitions. That is an honor to Canada because two years ago we did not know anything about making munitions at all. It is a tribute to the skill and brains of the young men of this country that they can so rapidly adopt these new conditions. If a choice must be made between young men going to the front and a lathe being kept going making munitions, I think you will find that the view of Lloyd George would be to keep them making munitions. Do not let the lathe be idle.

Then when we come to agriculture we must have men because unless our men at the front are fed everything fails. The product of this country last year was beyond the wildest anticipation of any living man. I am afraid that in the West there is not as much land under fall cultivation as there was last year owing to weather conditions, and the fact that the magnificent crop secured this year has kept the farmers busy threshing, and they will not be through until well on into the spring. We in the Province of Ontario, and you who are engaged in dairying have a duty to perform just as sacred as the duty of the men in the trenches. and that is to see to it that every acre of land produces as much as it possibly can be made to produce, and that every cow produces as much milk as she can be made to produce. By doing that you will be helping to win the war for the allies. It is the duty of the man on the farm to do his utmost to produce a large crop, and that will be one of the greatest aids you can give to the Empire in this struggle in which she is engaged.

We have not made the progress in that struggle that we thought to have made. but on the other hand the enemy has never got any place where he started to go, and as the days go by we become the better prepared and the products of Canada are being landed in the Old Land to feed the boys at the front, and munitions made in Canada are being piled cords high and acres wide ready for the onward move when the time comes.

The bill that was introduced in the British House of Commons to-day will compel the men who have been trying to get away to go into the front line, and we will continue to do well in Canada, and when the maximum of the power of the forces of the allies is reached then will begin the rush that in a few months after its start will bring about a condition which does not now exist and which will ultimately result in peace, which is the great aim for which we are all working. (Applause.)

ADDRESS.

W. Bert Roadhouse, Deputy Minister of Agriculture for the Province of Ontario, Toronto.

The speaker conveyed the regrets and greetings of Hon. Jas. S. Duff, the Minister, whose illness prevented him from being present, it being the first year he had missed since becoming Minister. He paid a tribute to the Association, whose thirty-ninth convention was now being held and emphasized the necessity of applying in actual practise the practical information brought out at these conventions. Following are a few paragraphs from the address which dealt with some phases of agricultural production during the year just closed:

There are many farms across the line which are owned and operated by American millionaires. A farm seems to have that happy combination that it affords comfort and competence to those who desire to make it a livelihood, and it also affords joy and an apportunity for spending surplus wealth to those who are blessed with this world's goods. It was such a farm as this with fancy barns and high priced stock that the millionaire had with great pride shown his friends around and explained the different interests he was endeavoring to carry on. When they came back in the house after it was over he turned to his guests and said, "Now, gentlemen, what will you have, milk or champagne?—they both cost me the same." I wonder if there are any dairymen in Ontario who are producing milk on the champagne basis? I need hardly say that it is not only by reason of the extravagance and high cost of the buildings and of the stock that that is possible, but because of poor stock and careless methods.

It may be that those who have a 2,000 pound cow and those who are not carrying out the principles which have been so well laid down during the days of this convention are producing milk on the champagne basis. As the Hon. Mr. Graham has so well pointed out, there is in this day and age no excuse for any man not knowing exactly where he is at in the cost of production, because there are organizations and departments of the Government that are only too ready and willing to assist him in finding out exactly where the leak is, and in helping him to stop it. I mention this in connection with the advertising campaign because it seems to me that a preparatory step to anything like that would put an emphasis on the quality and the raising and maintaining of a uniform standard of our butter and cheese and other dairy products, because only thereby can we maintain the position which we must ultimately aim to get in the great markets of the world, as well as in our home markets. It is perhaps more important in connection with the export trade than in connection with the domestic trade, but it is of importance for the future success and development of the dairy industry that it should maintain the high level it has attained this year.

If I might be permitted to give you some figures to emphasize the statement which already has been made by Mr. Graham, it might serve to bring home more thoroughly the position which we occupy as a result of this year's work. Speaking of Canada as a whole, we still speak in the currency of wheat. The wheat crop of Canada during 1915 aggregated a total of 336,000,000 bushels. We have in these days come to talk so much of millions that we can scarcely apprehend what they mean, but when I tell you that that represents 174,000,000 or 108 per cent. more than double the previous year, you will realize what that in itself has meant for this country. Not only will we compare it with the previous year, which was below the average, but if we compare it with the best year in Canada's previous history it represents an advance of over 45 per cent.

It is, however, not only of the past but of the future that I would like to speak. The call for production is keen and insistent not only in our own country but to safeguard the Mother Country. The Minister of Agriculture for Great Britain not very long ago issued a statement in which he said the chief needs of the nation are more wheat, oats, meat, bacon, milk, butter and cheese, and he is anxious that as much as possible should be grown at home, but we know that only a small increased percentage can be grown in the British Isles, and we are anxious to see that of the billion dollars which Great Britain spends annually outside of the British Isles and outside of the Empire for food supplies, a greater proportion should come to Canada and other parts of the Empire. That is a purpose which should be kept in view by this country as a whole.

Then there comes the call for enlistment for active service, and in this I know that the rural sections, as in the past, will not be found wanting. We can mention with pride that the first man to win the coveted Victoria Cross among the First Contingent which went forth from Canada, was a man who went from an Ontario farm. (Applause.) And I think it will be found that no better service will be rendered by any of those who have gone to the front than by the men who have the virility and the vigor which is supplied by the rural life of the Province.

I would like to say a word or two on another subject which Mr. Graham referred to, the matter of agricultural education. We are endeavoring to maintain the various agencies which are at work for agricultural education at the highest standard of efficiency. Many new agencies have been developed in recent years, but it is not my purpose to enumerate them all at the present time. You are all familiar with the Agricultural College. The agricultural representatives now number forty-four, and they are also well known to you. School fairs, which is one of the most effective things, have been introduced to interest the younger generation in agriculture, and it has just passed through the most successful season in its history: 234 fairs were held, taking in 2,291 schools and 50,000 pupils. These figures will suggest to your mind the potentiality of the movement and the future which is before it. The short courses in the counties, taking in 1,114 students, is another effort to reach young men, and we are still asking ourselves whether or not there are not other ways which might be adopted for improving the agricultural education in the Province. One other method has been adopted in other provinces. In the Province of Alberta and the Province of New Brunswick they have what is known as agricultural schools. These schools are equipped for giving practical training and demonstrations in agriculture and domestic science to the boys and girls. Connected with these schools is a farm of 100 or 200 or 300 acres, and for four or five months in the year these schools are attended by the boys and girls in the district who are not able to go to the agricultural colleges. The question has come to us as to whether or not the time has arrived in the Province of Ontario when such a school could be made to fit in with the other agencies which we have at work, and I believe that although efforts along that line in the past did not lead those who were charged with the responsibilities to come to the conclusion that the time had arrived when such a school might be established with success, I believe that the work which is being done among the younger generation during the past few years is hastening the time when such a thing may be looked forward to in the not far distant future. It is not my purpose to-night to outline any such plan in any detail, but I merely wish to say that personally, I think the time is not far distant when such a scheme should be tried out in this Province, and personally I believe that the Eastern section of the Province would be the best place to try out such a plan. (Applause.) That is not an announcement, but merely a suggestion of the lines and plans which we have in mind in working out a general scheme of agricultural education, to make it as efficient as possible and to reach especially the young men who will be so much needed in this country in the future. While we have these things in mind, let me say that we should never overlook the fact that the main business of this country is still the prosecution of that conflict, and to that business we should turn with every courage and determination and all our efforts and energies until victory is assured.

At the conclusion of Mr. Roadhouse's address moving pictures representing up-to-date dairying, live stock, parade at the Canadian National Exhibition, school fairs, etc., were exhibited.

Dairymen's Association of Western Ontario

The Forty-ninth Annual Meeting of the Dairymen's Association of Western Ontario was held in the Opera House, St. Mary's, on the 12th and 13th of January, 1915, and proved to be one of the best and most largely attended conventions held.

PRESIDENT'S ADDRESS.

Robert Myrick, Springford.

I am pleased to welcome you to the 49th Annual Convention of the Dairymen's Association of Western Ontario, and doubly pleased to have the privilege of opening the first convention of dairymen ever held in the beautiful and prosperous town of St. Mary's a place so well situated for that purpose, being in the midst of a wealthy dairy district; having in a radius of five miles seven or eight cheese factories, and within its limits two excellent creameries and several other kindred industries.

I have some knowledge of the workings of the Dairymen's Association of Western Ontario since the year 1878. General farming methods, the production of milk, and making cheese and butter were the principal subjects for discussion at these meetings. Here we got our yearly lesson in cheese and buttermaking, some good, others not so good. From these conventions we went home full of new ideas to work out during the following season, for weal or woe as the case might be.

I am pursuaded that good work has been done by these conventions, and the good work is still going on with many new departments.

We also have every winter meetings held at Guelph. These meetings are not only attended by cheese and buttermakers, but by city milk dealers and shippers of cream for city trade and others engaged in different lines of dairying.

The year 1915 was the dairymen's own made-to-order season. The continued showers gave abundant pastures, and the moderate temperatures made ideal conditions for the production of milk. Last year we were able to report an average price of 13½c. per lb., the highest price ever paid to patrons of cheese factories for cheese, but this year we received about two cents per pound more.

The following figures will give some idea of what the 1915 prices mean to the milk producer:

Total receipts of cheese in Montreal from May 1st, 1915, to November 27th, 1915, were 1,937,158 boxes, or about 158,842,956 lbs. The increase over 1914 for same dates was 320,969 boxes or 26,319,458 lbs. The above increase in price and productive means to the cheese factory patrons a net gain, over 1914, of $7,256,454 between the dates mentioned.

Total receipts of butter in Montreal between above dates were 375,087 boxes or 21,004,872 lbs., an increase over 1914 of 9,222 boxes or 516,432 lbs. During the season of navigation for 1915 we exported 54,495 boxes of butter as compared with 7,300 in 1914, and 1,728 boxes in 1913; or, in other words, we were able to export 3,049,720 lbs. of butter after supplying our own home market.

Bountiful crops are not unusual in this fair Province, but we deeply regret the cause of these abnormal prices.

This Association is doing all it can to help along the dairy industry. Our worthy chief instructor and secretary, Mr. Frank Herns, and his staff of instructors are doing much to improve the conditions of creameries and cheese factories. We have not yet reached the goal of perfection. Our methods are still defective. A few factories are still not yet equipped with up-to-date appliances and the bulk of the milk is paid for at so much per hundred pounds, irrespective of its composition.

City milk dealers have a *standard*; milk must contain a certain percentage of butter fat. The Boards of Health of the different cities demand certain sanitary conditions. Is it not time for creomerics and cheese factories to set some standard so that they may receive all high grade cream and milk that has been produced under such sanitary conditions as are already maintained by a large number of our patrons.

On behalf of the Board of Directors, I want to say to the Minister, the Hon. James S. Duff and Mr. George A. Putnam, Director of Dairying, that we appreciate the liberal assistance rendered us by the Department of Agriculture. We have endeavored to use their grants in the best interest of the Dairymen of Western Ontario.

DIRECTORS' REPORT, 1915.

Your Directors are pleased to report that, from the Dairymen's standpoint, the season just closed was very satisfactory. The cheese industry especially, was stimulated by the high prices, and Western Ontario was favored with climatic conditions which, although detrimental to some lines of agriculture, was favorable for the production of milk. The average pounds of milk per cow for the season was, no doubt higher than for many years, owing to the abundance of pasture and the heavy flow of milk that was maintained almost to the end of the factory season.

The increased output indicates that a number of the dairy herds which may have been to some extent depleted during the past few years have, as anticipated, evidently been restocked.

Considerable milk was, during a part of the season, diverted from other channels to the cheese factories, and this materially assisted in increasing the total output of cheese. Indications now point, however, to a revival in other lines of milk consumption, and as evidence of this, two cheese factories have lately been taken over by one of the milk powder companies.

The export of cream has been considerably less this past year, as the price paid for creamery butter has been high enough to make more profitable the sale of the cream in Ontario. We believe that Canadian producers prefer to sell to their own creameries.

Several cream buying stations have been started by a few creamery companies. We doubt the advisability of this movement on account of possible deterioration of quality.

Prices for Dairy Products. The average price for cheese during the past season was the highest ever received in Canada. During the early months prices were extremely high, dropped somewhat for the middle of the season, but regained a high level for the last half. A considerable amount of American cheese was, we understand, exported to England the past winter and early part of the spring season. Had this cheese not been available prices would probably have reached an even higher level. It is a source of gratification to know that the Canadian cheese and butter industry is in a position to supply a large quantity of such excellent food products for the soldiers of the Empire.

The butter market assumed a high level early in the season and has been active most of the year, resulting in good prices to cream producers.

The statistical position of both cheese and butter is strong, and prospects for 1916 are encouraging.

After the war is over there may possibly be a temporary drop in the prices for dairy products, especially during the readjustment period, but the hope is expressed that, should prices decline for the time being, this may not to any extent influence milk producers to decrease their herds, but to continue to make dairying a permanent feature of their farming operations. Past experience has proven that there is no other line of agriculture which will, for a period of years, pay better than dairy farming.

There has never been a time when the prospects seemed better for a steady demand for live stock. We do not know how long this world war is going to last, but when hostilities cease there is every evidence that a great demand for dairy products, live stock and meat products will follow. Depleted European herds must also be replenished, and our country is one of the natural sources from which to draw for this purpose.

MEMBERSHIP. Your Association has a membership of 282. This is 32 members less than in 1914. We trust the number will be increased this year to the usual 300. Subscriptions to *Farm and Dairy* is included in the membership fee of $1.

SPECIAL OFFICER. A special officer was again employed to deal with cases of milk deterioration. Twenty cases were reported, and these patrons were fined from $10 to $50. A few were second offenders. Your directors respectfully recommend to the incoming Board the continuation of this work.

DAIRY HERD COMPETITION. The necessity for economy during war time ininfluenced your directors in not donating any large amount of cash prices for the competition. The Canadian Salt Company and Ryrie Bros. again very kindly donated a Silver Cup and Silver and Bronze Medals respectively. A similar cup and medals were won outright last year and became the permanent property of the winners. The entries are not large, but those who entered are new winners, and others will be encouraged to enter this year if the competition is continued. Several patrons who expressed a desire to enter the competition found that at the end of the season they were, for several reasons, unable to conform to the rules of the competition. There were no entries in Class 2 (creamery patrons). A full report will be submitted.

DAIRY EXHIBITION. For economic reasons your directors decided to leave the prize list the same as last year. We are pleased to report that the exhibitors have come forward with an exceptionally fine, handsome exhibit which is a credit to the cheese and buttermakers of Western Ontario. Your directors wish to express their sincere appreciation of your support, and trust that next year, all being well, the usual prize money may be available. The Dairy Exhibition has been a strong factor in improving the quality of our cheese and butter, and also in advertising our products in the home market. It is an interesting special feature of our annual convention. We wish to thank every person who contributed special prizes.

We wish to express our deep regret at the sudden and unexpected death of one of our esteemed members, M. J. K. Brown, of Ethel, who won the silver trophies at the last convention. His loss makes a break in the long list of successful Western Ontario cheese exhibitors at all the large Dairy Exhibitions. He was a man of fine character, a successful cheesemaker, and a careful and conscientious factory manager. We extend our sincere sympathy to the bereaved family. In this we know all members of this Association and others engaged in the dairy industry will concur.

We respectfully recommend to the incoming Board of Directors to continue the Dairy Exhibition.

Factory Improvements. We are pleased to report that ten new cheese factories have been erected the past season. Several of these were built to replace those accidentally destroyed in the past year or two. The buildings of these new factories indicates the increased interest in the cheese industry. Three new creameries were opened and the factory buildings are being improved as rapidly as conditions and funds will permit. A greater amount of money was spent in 1915 on factory improvements than for several previous years.

Instruction Work. The Ontario Department of Agriculture in co-operation with your Association continued to carry on the the important work of dairy instruction. This work is a strong factor in securing continued improvements in the milk and cream supply and in the finished products. A report will be submitted by the Chief Instructor.

Speakers for Annual Meetings. The Dairy Branch of the Department of Agriculture again provided speakers for the Annual Factory Meetings. This work is giving good results and will be continued during the present winter.

Legislation. The New Dairy Industry Act, after one year's administration, appears to be giving general satisfaction. An amendment to the Provincial Dairy Act seems necessary in order to cover the matter of certificates for the operators of cream buying stations.

Board Meetings. Your directors have endeavored to transact the business of the Association to the best of their ability. We appreciate the assistance given us by the Ontario Department of Agriculture to further the dairy interests of this Province. We also appreciate the work of the Federal Department of Agriculture in their efforts to improve the dairy industry in general. The aim of dairy instruction and of your Association is is to place the industry on a solid basis and endeavor to keep the quality of our products second to none.

Dairymen's Patriotic Fund. In further reference to the Dairymen's Patriotic Fund, mention of which was made at the last convention, we beg to report that a total sum of $4,883.73 was received up to Dec. 31st, 1915. Of this amount $2,706.88 was turned over to the Canadian Patriotic Fund; $1,000.00 to the Belgian Relief Fund, and $1,176.85 to the Canadian Red Cross Fund.

A full report was compiled by the Secretary and copies forwarded to the Secretary of the different cheese factories and creameries contributing to this fund, with the request that the information set forth in the report be given to the factory patrons either through the local press or in some other way. We might say that this fund will remain open until the close of the war, and any factories or individuals who wish to contribute may do so at any time. The amount of the contribution will be sent by the Secretary to be utilized by any of the three funds menmentioned above which the donor may specify.

We wish to take this opportunity to again express our appreciation of the contributions of individuals and of the patrons of the various factories to the Dairymen's Patriotic Fund.

All of which is respectfully submitted.

REPORT OF DAIRY HERD COMPETITION, 1915.

For economic reasons the officers of the Association were not in a position to donate special cash prizes for the Competition of 1915. For the same reason competition in two classes only was arranged.

The Silver Cup, donated by the Canadian Salt Co., Windsor, having become the permanent property of Mr. Jno. Vanslyke, Dunboyne, another Silver Cup was very kindly donated by the same company, through their General Manager, Mr. E. G. Henderson. This Silver Cup was offered as first prize in Class 1.

The Silver and Bronze Medals, kindly donated by Ryrie Bros., Toronto, were offered as second prize in Class 1 and first prize in Class 2 respectively, the Association donating $5.00 as second prize in Class 2.

The Silver Cup, which becomes the property of the patron who wins it twice in succession or three different times, was won for the first time by Jas. Burton & Son, of Sparta.

The second prize, a Silver Medal, was won for the second time by J. C. Harkes, of Listowel.

Special prizes to patrons of cheese factories and creameries in Western Ontario.

Two Diamond Hall Medals (enclosed in handsome cases), donated by Ryrie Bros., Toronto.

One Silver Cup, donated by the Canadian Salt Co., of Windsor, Ont.

Class 1.—For Patrons of Cheese Factories.

To the patrons who furnish the largest amounts of milk per cow to any cheese factory in Western Ontario from May 1st to October 31st, 1915, from herds of 8 cows or over. 1st prize a Silver Cup, to become the property of the patron who wins the same three times or twice in succession. 2nd prize, a Silver Medal, value $10.00.

Class 2.—For Patrons of Creameries.

To the patrons who furnish the largest amounts of butter fat per cow to any creamery in Western Ontario from May 1st to October 31st, 1915, from herds of 6 cows or over. 1st prize a Bronze Medal, value $10.00. 2nd prize, $5.00 in cash.

Rules of Dairy Herd Competition.

1st. No herd of fewer than eight cows in Class 1 and no fewer than 6 cows in Class 2 will be allowed to compete.

2nd. Figures must be taken from the cheese factory or creamery books, and the number of cows and the total average amounts of milk or butter fat must be certified to by the cheese or buttermaker, and the secretary of the cheese factory or creamery.

3rd. The average amount of milk or butter fat per cow must be calculated on the basis of the total number of cows from which milk or cream is sent to the factory during the season of six months, May 1st to October 31st, 1915.

4th. No substitution of one cow for another will be allowed.

THE WINNERS.

Class 1. Cheese Factory Patrons.

1. Jas. Burton & Son, Sparta Cheese Factory; 190 acres in farm; 18 Durham and Holstein cows; 129,147 total lbs. of milk; 7,175 lbs. of milk per cow.
2. J. C. Harkes, Listowel, Molesworth Cheese Factory; 100 acres in farm; 10 Holstein cows (4 P.B. and 6 G.); 70,712 total lbs. milk; 7,071 lbs. of milk per cow.
3. S. H. Coneybears, Listowel, Elma Cheese Factory; 100 acres in farm; 16 Holstein cows (1 P.B. and 15 G.); 108,901 total lbs. of milk; 6,806 lbs. of milk per cow.

LETTER FROM FIRST PRIZE WINNER IN DAIRY HERD COMPETITION.

SPARTA, Jan. 11, 1916.

Mr. F. Herns, London, Ontario.

Dear Sir,—In reply to your request as to the building up of our herd will say that we weed out the poorest ones every year, relacing them to the best of our knowledge with better ones, but will say have never paid high prices, not more than ninety dollars.

Although we keep a good pure-bred sire we do not raise any calves.

As to the handling of our cows when they freshen in the spring we always have sugar beets to feed them along with their ration of chop made up of corn and oats, but generally give them bran mash for a few days when first freshened to bring them to their milk. We always keep our cows in the stable until at least the 24th of May, for we think if turned out before it does not give the pasture good enough start to last out during the remainder of the season.

After being turned out about a week we take the grain away from them, they by that time are used to the grass, not giving them any more until the pasture begins to dry up. About the middle of July or the first of August we start feeding them bran, giving them two quarts each twice a day until about the 1st of October, when we mix with the bran a third oat chop, giving them about three quarts remainder of season.

During the season we did not give them any extra green fodder, but tried to give them a change from one field to another every few days.

We generally have them dry up about the first of the year and have them freshen in February and March, having them dry from six weeks to two months.

We might also state that we have no silo.

JAS. BURTON & SON.

SOME DAIRY HERD RECORDS.

BY CHAS. F. WHITLEY, OTTAWA.

Since last I had the honor of offering a few remarks to this Convention on cow testing, it will interest you to know that we have had a year of plenty in this branch of the work of the Dairy Division. In one month we reached the peak of the load with over 22,000 records of individual cows coming to the office; from the huge stack of figures received I can only single out a few for illustration.

Like Oliver Twist we still want more, for convinced that the usefulness of cow testing can grow almost indefinitely, assured that there are unplumbed depths for every herd owner to explore, it is felt that herd record work should be enjoying further lucrative practice. At present the fogs and shadows of indifference shut out the vision of the gaol of success from many farmers. Your help is asked, you men who know things, to tear the bandage from their eyes. This work is no extra chore, it is no more a burden than sails to a ship or wings to a bird, a burden that carries safely to port. Such occupation is the natural complement to the ordinary dairy farm work in field and stable: without it the owner may hold simply the covers to the index of the library of life, he needs this extra supplemental volume, the dairyman's complete manual.

Herd records show up cows in their true light, their relationship to the ever present problem of making more money. If a cow, or if four cows in a herd are poor, cannot be coaxed into better financial behavior, seem to have joined the union and quit giving milk sharp at the five o'clock whistle, the unfortunate owner needs to know it, so that he may wave a glad farewell to such individual slackers and wasters. Why should men stagger under the burden of poor cows, either the nine-year-old yielding only 130 pounds of fat in a year, or the herd of ten that average only 3,300 lbs. milk and 120 lbs. fat, when this ready reckoning system of dairy records singles them out unerringly? With a trifle more care, a poor cow might be as rare as a sandy haired Chinaman.

While some men, through lack of dairy records, are missing glorious opportunities, men whose mental horizon is bounded by the medium attainments of their own or their neighbors' average yields, we have members, four years ago unknown, who have climbed the rosy-peaked heights of dairy distinction and wide spread fame; the dairy press features their successes frequently.

Could not our average cows do vastly better Perhaps they need better opportunities to make good. Is it their owners who suffer from lack of training? Our records show, for instance, that one lot of 100 cows gave 3,000 pounds of fat in a month, another lot of 100 gave only 2,200 pounds. When conditions for the two groups are almost identical, one can only express the utmost regret that the second lot failed to earn that extra $240.00 which perhaps they would had they received better attention and feed. Good feed, poor breed. foolish creed.

Can we not see how vital this is to every cheese maker, every factory owner? What a huge difference it would make to the standing and reputation of the factory if each lot of 100 cows gave an additional 800 pounds of fat per month! Would not the patrons' cheques soon talk?

So if the factory patron accustoms himself to consider only averages, whether from his own herd or from a herd on the next concession, he is to that extent depriving himself of the benefits of dairy records. For they call every dairyman to gee round out of the deep ruts in the muddy side road of medium and average yields on to the concrete-paved highway of good individuals.

COMPARATIVE YIELDS IN A HERD IN WESTERN ONTARIO.

Cow No.	Age.	Pounds of milk.	Pounds of Fat.
1..........	7	12,773	401
2..........	10	10,525	351
3..........	6	5,965	197
4..........	6	10,360	342
5..........	8	8,810	291
6..........	2	7,294	242
7..........	7	10,995	427
8..........	4	9,433	295
9..........	4	10,590	317
10..........	3	7,235	232

These figures, tabulating 10 out of 16 cows in one Western Ontario herd, indicate the divergence in yields of milk and fat. Notice the good yields of over ten thousand pounds of milk from grade cows 6, 10 and 4 years old.

One 6-year-old, bought at a sale, gave only 5,965 pounds of milk and 197 pounds of fat; another 6-year-old bred on his own farm gave this owner 10,360 pounds of milk and 342 pounds of fat.

Between the best and the poorest cows there is a difference in yield of actually 6,808 pounds of milk and 204 pounds of fat. Assuredly cow testing discovers something.

In general results, note that this dairyman, after two years of record work, has increased his average yield by 2,151 pounds of milk and 65 pounds of fat per cow, having gone up from a yield of 7,368 pounds of milk and 240 lbs. fat from each of 15 cows, to an average from 16 cows of 9,519 lbs. milk and 305 lbs. fat.

Thus he obtained last year over and above the yield of two years ago an additional weight of 41,784 lbs. of milk, worth at least four hundred and fifty-nine dollars. It pays, pays handsomely, to keep dairy records.

Let me press this point again; cow testing stands four square on this plank of individual cow responsibility. The average cannot be poor if each individual is known to be good. It is each man's province to see if the meal ticket of any cow that he owns has run out. Make each one ring up her production on your precise cash register of herd records. Let no cold-blooded statistics dare say of this or any other county in grand old Ontario that twenty or even ten per cent. of the cows kept are disgraceful, hardy-perennial boarders. That might occur in some only semi-ready dairy district amongst half-hearted dairymen.

If you want in your herd several queens of the milky way dairy records will help you. They deliver to you at stated intervals a birthday cake for the mind, freshly baked, with candles lighted to illuminate your judgment of individual performance, your route march plans for steady advancement. The knowledge of the average or total, alone, cannot satisfy.

Surely we do not need to have the poor cow always with us. Dairy records are at your service to discover and retain good cows. Instinct tells us there must be some reason, some significance behind each breath; is it not a rational object of human existence to get the best and the most out of life? Possibly some have been too busy getting a living with poor cows to have time really to live. Cow testing steps in to say that great-hearted nature is yours to work with; you have harnessed dew drop and storm for your cows through suitable feed. Cow testing now asks you to go further; to see if some corner stall in your stable is overlooked, to dredge the blocked up channel, to dig deeper the water way, the river of your unswerving purpose to keep none but the best cows you can secure, and to know through the medium of clear-cut figures just that this cow or that one is the best, to prove to yourself or anyone else just how you know that fact.

Thanks to the help of dairy records we have men on our register who own herds of 22 cows averaging over 8,000 pounds of milk and 250 pounds of fat; several dairymen in various districts of Ontario, Quebec and the Maritime Provinces have good grade cows giving from 9,000 to 18,000 pounds of milk and from 300 to 500 pounds of fat. They would never have been discovered but for dairy records which impress the seal of satisfaction on daily work, becoming the safeguard of quality.

Why these Differences?

69 Good Cows.		73 Poorer Cows.
608,578 lbs.	Total Milk	391,872 lbs.
$6,694.35	Value	$4,310.59.

Good Herd, 16 Cows.		Poorer Herd, 9 Cows.
9,519 lbs.	Average Milk	4,490 lbs.
305 lbs.	Average Fat	149 lbs.
$104.70	Value	$43.39
60.00	Feed Cost per Cow	45.55
$44.70	Average Profit	$3.84

Each one in the good herd makes as much net profit as eleven in the poorer.

Some rather startling contrasts are found in these figures relating to cows in the Listowel district. One lot of 69 pretty good cows gave a total yield of 608,578 lbs. milk; think, one hundred and eight tons more, fifty-five per cent. more milk than a lot of 73 poorer cows close by. They earned over twenty three hundred and eighty dollars more cash.

Included in the first lot of cows is a herd of 16 with an average yield of a little more than *twice* as much milk per cow as in the poorer herd of nine. Above the comparatively high feed cost of sixty dollars the average profit is $44.70 per cow, or *eleven* times as great as the profit per cow in the other herd.

In order to make one thousand dollars clear profit the owner of the first herd would need only twenty-three such good cows, but the second owner would be confronted with the task of handling two hundred and sixty. Phew!

Herd records not only help to solve some of the problems of commercial dairymen who seek a reduction in the cost of feed per 100 lbs. milk, but show them the increasing fertility of their land as concentrates are judiciously used. (The total value of the essential elements in the manure from twenty-five cows is computed at over one thousand dollars.)

From milk and feed records sent to the office by farmers we find, for example, that eight cows in one section produce milk at a feed cost of 62 cents per 100 lbs. even when feed is valued at as much at $51 per cow. That seems a better business proposition than giving $36 worth of feed to a cow that makes the feed cost run up to 82 cents per hundred.

There we have the stamp of efficiency, simply the better way of doing things, keeping eight cows geared up to produce 56,000 lbs. milk instead of the low speed total of 31,000 that a neighbour obtains, each returning a clear profit of 54 cents on each 100 pounds of milk instead of the neighbour's 32 cents.

We have arrangements made through our Ottawa office, whereby any cheesemaker can do the testing for any number of patrons of the factory. The outfit is very simple and can be purchased for from $3 to $4 from any dairy supply house. The Dairy Division pays the cheesemaker for doing the testing and supplies the sulphuric acid and the necessary printed forms free of charge. Once you have the $4 outfit there is no further expense, and your records are sure to go up.

A MEMBER: Is that increase due to the recording or partly due to the better care of the cow?

MR. WHITLEY: The actual fact of weighing the milk does not make the cow give more milk, but it enables the farmer to weed out the poor cows, and he finds out his best cows and can save the calves from his best cows. Then testing usually induces the farmer to feed his cows better and he can see whether the cow is responding to the feed he is giving.

A MEMBER: Do you find that the average milk yield bears any relation to the percentage of fat. Does the percentage of fat run any higher if the yield is low than if it is high?

MR. WHITLEY: Not necessarily. We have cows that give very high yields of milk that test very high in percentage of fat. On the contrary we have cows that give a very low yield and test very low in fat.

A MEMBER: Can you increase the percentage of fat by feeding concentrated foods?

MR. WHITLEY: When a cow is up to her limit, I do not think you can force her beyond that, I do believe that there are a number of cows in Ontario that have not been fed up to their limit.

A MEMBER: Do you think we can improve the quality of the milk by feeding the cow in a better way?

MR. G. H. BARR: You mean to ask, if you had a herd of cows giving 3.5, could you bring them up to four per cent. milk by feeding rich foods? It has never been done. I remember a man at a meeting not far from here stating that he could increase the percentage of fat by feeding, and I said: "If you can do that I will get you a job at $5,000 per year." He never applied for the job. Experiments have been made and individual cows have responded to the feed in such a way that the fat content increased, but these cases have been very few.

PROF. R. HARCOURT: I would like to say a word or two on this question. You cannot permanently increase the percentage of fat; rich feeding may increase the fat for a time by increasing the flow of milk. We must think of the cow as a machine set to produce a certain quantity of milk, you cannot change it without changing the cow no more than you could change a machine. You cannot increase the fat. That has been argued over and over again.

A MEMBER: Why do we find a shrinkage in cows from week to week?

PROF. HARCOURT: There is a natural falling off in the flow of milk as the period of lactation increases and then there is an increase of the percentage of fat.

A MEMBER: Don't you think that if you fed cotton seed meal and oil cake you would get a richer milk?

PROF. HARCOURT: You might increase the flow of milk but not the percentage of fat. There are a number of people who think they can.

A MEMBER: I have fed cotton seed meal and oil cake, and I know it made a difference in the color of the milk.

PROF. HARCOURT: Color is not fat.

HOW TO GET CLEAN MILK WITH A MILKING MACHINE.

T. H. LUND, B.S.A., GUELPH.

(Read by Mr. Frank Herns.)

There is an old proverb that says "Where ignorance is bliss, 'tis folly to be wise."

In these days of commercial competition and the application of scientific principles to the every-day work of the farm, this proverb no longer holds. Ignorance, or let us say more kindly, lack of knowledge, is to-day one of the big factors limiting the profits made on our farms. Ignorance to-day means poverty, and poverty is not bliss, as anyone who has ever tried it knows. Therefore, let us lay hold of knowledge, and we shall find that it means money in our pocket every time. We must be students always, as new problems are arising constantly and methods of farming change from time to time. Let us have an open ear for the words of the investigator, who, with his microscope and laboratory apparatus, is in a position to find out for us many valuable facts that otherwise we should never know.

One of the newer problems that is confronting a number of dairymen to-day is that of securing milk, of a satisfactory sanitary quality, when the old method of milking by hand is discarded and the newer method of milking by machinery is adopted on the farm.

Let us understand clearly from the start that this paper makes no attempt to discuss the construction of milking machines, this subject having been fully dealt with by the previous speaker, but rather to deal with the sanitary handling of machines, many of which are now in daily operation in Ontario, so that a satisfactory quality of milk may be produced on these farms.

Our problem then is: What must we do to get clean milk when using a milking machine? It is a problem that demands the closest attention of factorymen, of milking machine users, of prospective milking machine users, of milking machine manufacturers and their agents, in fact of all intelligent dairymen at the present time.

If it once becomes established that machine milk is usually of an inferior sanitary quality, there will gradually grow up a prejudice against it, and factories will refuse to take milk unless it is drawn by hand. On account of the labor-saving value of the milking machine, we should leave no stone unturned in our efforts to avoid the establishment of such a prejudice while there is time.

There is considerable evidence to show that the quality of machine-drawn milk in Western Ontario is not what it should be at the present time. For this undesirable state of affairs we cannot, with any fairness, lay the blame on the machine. We are satisfied that with proper care and attention, milk, satisfactory in every respect, can be produced by any of the leading machines that we find on the market to-day. It is the man on the farm who handles the machine, and the methods employed by him, that provide the weak link in the chain.

In an article that appeared recently in the *New York Produce Review*, a writer says: "My experience with milking machines has proved to me that not more than one-third of the patrons who own a machine know how to handle the same successfully."

From what I have seen of milking machines in Ontario I would say that in nine out of ten cases the methods used could be easily improved and the quality of the milk very considerably raised.

Let us turn back to the title of our paper and ask ourselves what those two words "Clean Milk" really mean. We shall probably find that there is a great variety of opinion on the question, but it is really only one of degree.

In days gone by every farmer and his good wife told you that the milk produced on their farm was always clean. But along came the sediment tester, and we found that much of this so-called "Clean Milk" was in reality dirty, when we commenced using our sediment tester at the weigh-room door. Those little cotton discs showed it up, and convinced the farmer that it was time to turn over a new leaf, and that he really must clean up and keep clean. This is a simple test and one that is easily understood. Every factory should make sediment tests of their patrons' milk every once in a while and the discs obtained should be returned to them on mailing cards. Bacteriological tests are more complicated and not so easily understood by a farmer, but to one who has a knowledge of the subject, they yield information about the quality of milk that can be got in no other way. The more we know about milk and of the troubles that impure milk brings about, the more we realize the need for improvement in the general milk supply.

A grade of milk known as "Certified Milk" is as near being perfect in quality as any milk produced to-day; the standard that this milk must come up to is high, and the conditions under which it is produced are under strict supervision all the time. It may truly be said that this is Clean Milk; any milk that falls below this standard is not so clean as it might be were it produced with greater care. The quality of milk supplied to our factories to-day is very far removed from that of certified milk, so do not let any farmer imagine that the quality of milk he is producing cannot be improved upon, because if he does he is simply fooling himself every time.

Clean milk is produced from clean and healthy cows in clean and sanitary stables by healthy and clean employees; it must be handled in clean utensils of suitable material and construction and in a satisfactory sanitary manner from the moment it leaves the udder of the cow. No farmer who fails to have his cows tuberculin tested can be sure that he is producing clean milk, as it may contain thousands of germs of this terrible disease. No farmer who fails to groom his cows daily can produce clean milk, as a continual shower of hairs and dirt particles loaded with bacteria falls into the pail at milking time. No farmer who fails to cool his milk promptly after milking can produce clean milk, as at the warm temperature the germs which have already got in will grow and multiply very rapidly indeed. No farmer who fails systematically and regularly to wash his milking machine can produce clean milk, because the new milk is quickly contaminated with germs which lurk in every corner of a dirty machine. No farmer who leaves the rubber tubes and teat-cups of his machine soaking in a solution teeming with bacteria can produce clean milk, as every drop of milk he draws soon becomes contaminated with germs from these teat-cups and tubes.

How many farmers are producing clean milk according to the above definition to-day?

How many farmers think that the conditions around their barns and cows and milking machines could be improved?

Let us ask ourselves again who it is that is interested in the production of clean milk, and why? Everyone who is in the market for milk wants milk of good quality if he can get it, whether it is to be converted into cheese, butter, condensed or powdered milk, or whether it is to be used for city milk supply. Dirty milk contains millions of injurious bacteria which cause trouble more or less pronounced sooner or later along the line; this means spoilt milk and dairy products of an inferior quality with an attendant financial loss for which the farmer in the end will have to pay. Farmers and others who are operating cheese factories and creameries should be interested in turning out only first-class products, and this can only be done when the raw material supplied is of a satisfactory grade. Whether purchasers of milk discriminate sufficiently on the question of sanitary quality is a question that I shall not attempt to deal with to-day. Dirty milk usually gets its owner into trouble sooner or later, but we are not so sure that clean milk gets the premium it deserves over milk of the average kind.

Now let us turn to the question before us and see what we can learn about the sanitary problems of the milking machine.

In the first place let us consider the rubber teat-cups and tubing through which the milk has to pass in all the machines, with one exception, that are on the market in Ontario to-day. Owing to the porosity of its structure, we find that rubber, which comes into frequent contact with milk, is very difficult to keep clean, in fact we may say that it is impossible to keep it really clean by any of the ordinary methods that have been used for cleaning dairy apparatus on the farm. Washing powder, hot water and brushes will remove a lot of the dirt, but they cannot turn out the germs which have lodged in the myriads of minute pores. Live steam in this case cannot be used or the rubber will soon be destroyed. The method employed at the present time is that of immersing the rubber parts in some kind of sterilizing solution between the milkings, after first thoroughly rinsing out any milk that may remain behind. The success of this method depends, as can be readily understood, on the germicidal property of the solution employed. When a suitable solution is used the results are very satisfactory indeed. That the employment of suitable solutions is far from common the following investigation will show.

During the month of September, through the co-operation of Mr. Frank Herns, Mr. A. E. Gracey and Mr. Fred Dean, I was enabled to visit a number of farms in the neighborhood of Woodstock where milking machines were in operation and to learn what I could of the methods used in caring for and operating these machines. Samples of solutions used for immersing the rubber parts were taken and a determination of the number of bacteria in each of these samples was made. The following is the information, with reference to the solutions used, that was obtained. Of 16 farms visited, 7 were using water alone; 5 were using lime water; 2 salt; 1 baking soda; and at one farm, as nobody was at home the composition of the solution was not ascertained. The bacterial content per cubic centimeter of these solutions was as follows:

Water.	Lime Water.	Salt.	Baking Soda.	Unknown.
50,000	4,000	3,500,000	6,500,000	3,240,000
678,000	300,000	10,000,000	....	....
816,000	2,700,000	....	....	....
1,100,000	8,100,000	....	....	....
1,512,000	9,700,000	....	....	....
1,600,000	....	....	....	....
110,000,000	....	....	....	....

The solutions varied in age, some being changed daily, some twice a week, and some once in two weeks, so we were told.

A glance at these figures will convince us at once that we have here something that is radically wrong. In no case was any solution found to be sterile or anywhere near sterile, but, on the contrary, in practically every case, they were teeming with billions of bacteria as the above figures very plainly show. It is plain on the face of it that if we are to get a satisfactory quality of milk with machines, solutions such as these must go. They are absolutely useless for the purpose intended, and it is merely a waste of time using them at all. Let us consider them individually. Water alone possesses no power to destroy bacteria, and so is useless for sterilizing rubber tubes. Lime water has weak germicidal properties if made from unslaked lime; if made from air-slaked lime it is useless and that is the kind of lime that we find is usually used: the lime also tends to cake on the thin rubber parts of the teat-cups and inside the tubing, and for this reason it should not be used. The germicidal properties of even a ten per cent. salt solution are very limited, and in weaker solutions we find bacteria flourish and grow. We have to find something stronger, something that will do the work efficiently, something that can be easily used, something that is cheap and something that will give us a solution free from germs and tubes free from germs, and then we shall find that the quality of the milk will be improved. In chloride of lime we have a cheap and effective germicide with which a very satisfactory sterilizing solution can be made. One pound of chloride of lime is mixed with ten gallons of water and after being well stirred the lime is allowed to settle to the bottom and the clear solution is poured off for use. If only a pint or so of water is added to the chloride of lime to begin with the lumps can be more easily broken up and a strength solution will be obtained. Full strength chloride of lime can be bought in 100 lb. drums at from 3c. to 4c. per pound. That sold in pound and half-pound cardboard packages by drug stores is usually low in strength and high in price and is not recommended where any quantity is to be used. A solution made up as above with full strength chloride of lime retains its germicidal properties for about two weeks in summer and from three to four weeks in winter, depending on the temperature at which it is held. As long as it will turn blue a strip of starch-potassium-iodide test paper dipped into it, its germicidal properties are o.k.; as soon as it fails to produce this change its germicidal properties have gone, and it must be thrown away and a new solution made.

Chloride of lime solutions made as above have been used at the Ontario Agricultural College dairy barn during the past summer with every success.

These solutions have been found sterile at all times when they gave a blue coloration with the test paper, and the tubes were also found to be sterile on each occasion when a test was made.

For use among factory patrons we suggest that chloride of lime solution be made up in bulk at the factory and distributed from time to time as needed to the different farms, As soon as a farmer finds that his solution fails to turn the test paper blue he will apply to the factory for a fresh supply.

We have found no advantage in adding salt to this solution, and have given up using it in our barn. Both the metal and the rubber parts appear to be well preserved after lying in a chloride of lime solution for the greater part of a year.

The addition of some salt may be necessary to keep the solution from freezing during the winter if the solution is kept in a very cold milk-house or barn.

Care must be taken not to make the solution too strong by using too much chloride of lime or too little water, or we shall find that the metal parts will become corroded and spoiled.

Now let us turn to the other factors which have an influence on the quality of the milk, besides the cleanliness of the teat-cups and rubber tubes.

General Cleanliness of the Machine.—The metal parts should be thoroughly washed and scalded each time after use and then should be put in a clean place out of the reach of dust and flies, where they should remain until required again. The teat-cups and tubing should be fitted on to the machine and well rinsed out before and after use every time; warm water should be used for rinsing before milking to remove all traces of the chloride of lime; warm water and washing powder should be used first after milking, and then hot water, putting the tubes in the sterilizing solution again.

All teat-cups should be taken apart at least once a week and given a thorough scrubbing with hot water and washing powder, and the tubing must be well scrubbed out with the brushes provided as well. They should then be rinsed in hot water before putting together and returning to the chloride of lime. If this can be done twice a week so much the better, but it MUST be done at least once a week if satisfactory results are to be obtained.

A point that is often overlooked is the necessity for having the teat-cups and rubber tubing completely immersed in the chloride of lime solution; a sufficiently large container and a sufficient quantity of solution must be used, as we do not get the required results if these parts, as we often see them, are sticking up out of the solution into the air. We must be careful to see that the solution fills the tubing, and not, as we find in some cases, where the ends dip into it but the centre of the tube remains filled with air.

Cleanliness of the Barn.—Feeding, bedding, or brushing up should never take place within two hours before milking. The dust raised by these operations takes a long time to settle, and if these operations are conducted shortly before milking, a very considerable quantity will of necessity find its way into the milk cans and pails. For this reason, also, uncovered cans and pails, with or without milk in them, should never be left standing in the barn, but should be removed to the milk-house where the air is clean.

Cleanliness of the Cows.—In barns where high grade milk is produced the teats and udder of every cow are washed before milking begins. This practice might well be adopted by milking machine-users, as dirt from the teat and udder often gets drawn into the tubes, and we should avoid this if we can. The teat-cups for this reason should also fit snugly, and not be so large that they are sucking air from the outside all the time. In case they fall off into the bedding they should be thoroughly rinsed out before being put on a cow again; if this is not done the milk will be contaminated in the pail. If the cows need stripping by hand this must be done in a cleanly manner; in some cases machine milk is reduced very considerably in quality by the addition of strippings from dirty cows stripped by a dirty milker with dirty hands.

Cooling of the Milk.—In spite of our best efforts we shall find that some germs will find their way into the milk after all, and it is only by promptly cooling to a suitable temperature that we can hold them in control. It is useless going to a lot of trouble to produce clean milk and then be careless about cooling it, as all our efforts are quickly undone.

At the O.A.C. dairy barn, without adopting any unusual precautions, we have secured milk daily from a group of ten to fifteen cows, with a bacterial content of from 8,000 to 10,000 per c.c. Ten samples of machine milk secured from farmers in the neighborhood of Woodstock one morning averaged three and a quarter million bacteria per c.c.; the bacterial content of hand-drawn milk sent to the same factory that morning was less than a quarter of this figure. From this and from other evidence in our possession we have come to the conclusion that the quality of machine milk in Western Ontario can be and must be improved.

To produce clean milk with a milking machine is not as easy a matter as most people at first would suppose, but with proper care and attention to essential details it can be very certainly done.

Mr. T. O'Flynn: Why is it that men are allowed to go about the country selling milking machines, and telling the farmers that they are no trouble to clean? We have inspectors that go around to the cheese factories to see that they are kept clean.

Why cannot we have men to go around to the farms to see that these machines are kept clean? If these milking machines are not looked after, in four or five years from now we will be up against the greatest trouble we have ever had in Canada in the dairy business. I think the Government should say to these manufacturers of milking machines that they must print pamphlets telling the farmers how to keep the machines clean and the proper solution to use for that purpose. The farmer is the man who has to produce the milk for the cheese factories and the creameries. The milking machine will be the ruination of the business if they are not properly looked after. (Applause.)

LIME AND ITS USES IN AGRICULTURE.

Prof. R. Harcourt, O.A.C., Guelph, gave an interesting address on "Lime and its Uses in Agriculture," the information in which has since been published in bulletin form and may be had by writing to the Ontario Department of Agriculture, Toronto. A brief discussion followed this paper.

Q.—What amount of lime would you apply to the acre?

A.—The amount will depend on how acid the soil is. We usually use a ton of lime or two tons of ground limestone. It is a very easy matter to tell whether the soil is sour or not. If you gather a handful of damp soil and make it into a ball and then pry it open and put a piece of blue litmus paper between it and leave it there for five minutes, then break it open, and if the blue litmus paper is changed to red, you may be sure that you have got too much acid in the soil. You can get this litmus paper from the druggist. Of course you may find one place where it will act quickly and another slowly, but it very quickly indicates whether the soil is sour or not.

Q.—What does the lime cost per ton?

A.—About $3 or $3.50 per ton at point of shipment. It is being sold very much lower than that in some of the states. When the demand in this country becomes greater the production will be cheaper. Quick lime is selling at about $5 per ton. If you had to ship any great distance I would consider quick lime because you would have only one ton to pay freight on as compared with two of the other lime.

Q.—Where is the lime produced?

A.—Any limestone would be satisfactory, there is lots of it right in this neighbourhood.

Q.—Is it being ground here?

A.—It is being ground at Beachville. Mr. Slater, who runs a lime stone kiln up here, would put in a grinder if there was any great demand. It is now manufactured at four different places in the Province.

Q.—Does that company at Beachville produce it?

A.—No, they sell the material to the Henderson Company and they grind it. There is another material that might be used by the farmers in this neighbourhood where they are close to a stone quarry. When stone is crushed for road purposes it has to be put through a sieve to take out the dust, that dust is a waste material and it can be used. Of course some of it is too large to come into use for some time.

Q.—Will slacked lime change to carbonate of lime?

A.—Fresh lime applied to the soil quickly changes into carbonate of lime, it is the same thing in the end.

Q.—Have you any system for testing the soil so that the farmers can tell just what their land requires?

A.—During the past year we received over 400 samples of soils. Of course the questions asked when these samples are sent in are very varied. We can examine a soil very quickly as to its acid and get some idea of the amount of lime that should be applied and we will do that willingly for anybody. We cannot undertake to make a full analysis and tell a man what plant food constituents should go on his soil. There is lots of plant food in the soil but nature holds it, and you can only get into solution by cultivation. One of the objects of cultivation is to areate the soil. We do examine soils, but we cannot go far enough to say what kind of fertilizers should be applied, because that would take a long time to work out.

Q.—Do you think land on which there is plenty of lime stone lying around needs lime?

A.—No, land near Guelph, where we have plenty of lime stone, has plenty of lime in the soil. There is plenty of soils lying on top of lime stone rock that is sour. Unless there is lime stone mixed with the soil it will become sour.

Q.—Is it possible for a fertilizer agent travelling through the country to take soil and examine it and tell you the kind of fertilizer it requires?

A.—I think he could make a pretty good guess.

Q.—What do you think of this light, chalky soil?

A.—A soil of that kind will usually be deficient in nitrogen because of the lack of organic matter. If it is really chalky in nature you will not require to give it any lime. I would be glad if you would send in samples of that soil so that we can examine it. We have put in one season's work in going over the soils of the Province.

Q.—Would it do to moisten the grain and mix the lime with the grain?

A.—I would prefer to sow directly on the field.

Q.—Would it be all right to sow the lime with a fertilizer drill?

A.—Yes, provided you can get it on heavy enough. One way of getting cheap lime is by using a portable grinder. They are used in connection with a thrashing engine, which is often idle in the winter, to grind up the rock on the farm, and it is much cheaper than buying the lime.

Q.—Don't you think that if you sowed alfalfa seed with the grain it would go down and bring up the lime?

A.—It won't bring up enough lime to counteract the acid.

Q.—After you plow under the clover you generally have a good crop?

A.—Yes, that is one of the advantages of growing clover. I am convinced that one of the difficulties of getting the alfalfa to stand through the first year is the want of lime. You have seen the alfalfa sickly and yellow in appearance during the first season, and then it looks better after the roots get deep enough to get the lime.

Q.—If you mix it with other grasses it won't do that?

A.—You mean the grass crowds out the alfalfa.

Q.—Sow eight pounds of alfalfa and eight pounds of alsac and eight pounds of timothy?

A.—Yes, the grasses will come on, the timothy will grow in soils that the other won't grow in.

Q.—If the grain crop appears to be weak in the straw, do you think that is an indication of lack of lime?

A.—It might be, or it might be a lack of potash, or phosphoric acid. Phosphoric acid is indicated where you have a big growth of straw and poor filling of grain. One thing I did not mention about lime is that it causes a certain reaction in the soil whereby potash and phosphoric acid are rendered soluble.

Q.—Do you find that the percentage of carbonate of lime in ground rock varies very much in different parts of the country?

A.—We have in this Province dolomite rock: it contains about 40 per cent. of magnesia carbonate and 60 per cent. carbonate of lime. We have our magnesia lime stones as well as pure forms of carbonate of lime. I suppose the purest form of calcium carbonate is that at Beachville. It analyzes some 98½ per cent. pure calcium carbonate. The lime stone we get in the neighbourhood of Guelph is dolomite, which will carry less than 60 per cent., but it has got the other part made up of magnesium carbonate, which is just as good as the calcium carbonate for neutralizing acids; in fact, it will neutralize more acid than the other. There is a feeling against using too much of the magnesium carbonate in the soil because if we get a predominance of magnesium over carbonate it is harmful. I would not pay a cent. more for the one than the other. I would take that which I could get the most convenient and the cheapest.

Q.—How often should this lime be applied to ordinary soil?

A.—Every three or five years.

Q.—About how much per acre?

A.—That depends on the acid in the soil. Soil that is not real bad, one or two tons per acre. Some have felt that we should not recommend the use of rock that carries magnesium. I have corresponded with a number of those who have been in touch with this work in the United States for years back, and the answer I received was that it was the quickness and cheapness that they looked to. We want the carbonate, but not necessarily the pure calcium carbonate; one has as good effect as the other. Lime, of course, is also a stimulant, and if it is over applied it can be harmful. If we apply heavy applications of lime to the soil, we check the growth of the organisms that are in the soil and make the soil sterile. There is an old saying that—

"Lime and lime without manure;
Will make the father rich and the son poor."

It over stimulates the soil.

NOMINATING COMMITTEE.

The following Nominating Committee was appointed: T. O'Flynn, E. M. Johnston, Geo. Cousins, C. C. Travis, and Charles Barber.

ADDRESS OF WELCOME.

Mayor Weir, of St. Mary's, delivered an address of welcome, at the same time emphasizing the importance of the dairy industry.

An address was also delivered by Captain Wright, appealing for recruits for the local battalion.

A TRIP TO THE ORIENT.

Dr. G. C. Creelman, President of the Ontario Agricultural College, Guelph.

Before starting with you on a trip to the far east I want to say some things about our own country, because I want to say at the beginning, after having travelled pretty well all over the world and visited agricultural contries everywhere, it is my privilege after doing that to return to the Dominion of Canada and to say to you candidly and honestly, taking everything into consideration, we have in my opinion, the fairest agricultural country in the world. (Applause.) Therefore, you will bear with me while I make one or two opening remarks with regard to the Dominion of Canada, because while we are going to sail away from home by and by we are going to come back.

Canada at the present time is one-third of the entire British Empire. Canada has one million square miles of practically unexplored area in our great north. Canada has a sea coast one-third of the circumference of the whole earth. Canada is larger than the United States. Canada is eighteen times as large as Germany and France put together. Canada begins in the 20th Century just where the United States began the 19th in population. If Canada were as thickly populated as the British Isles, we would have one thousand million people here. Canada has more railways than all the South American railways put together. Canada has more than one-half of the fresh water on the Globe, and Canada is banded together from east to west as one people without state or provincial dissensions of any kind, one people north and south, east and west. What then is going to be your responsibility and mine in the development of this country in the days that are to some. The whole country is here for us and our children and our children's children. What are we going to do as farmers of Ontario in this day of stress and war, and what are we going to do after the war is over and when people will be looking from all over the world to a country like Canada which is the last great country in the world in which they can settle, and they will come here in hundreds of thousands? I have heard people say that they will come here at the rate of a million in a year after the war is over. What are we going to do with them and what are we going to do with our own people that will return after the war who will flock to Canada to make this their future home?

Sir Robert Borden, who is a man not given to rash statements, and is in a position to know, said recently: "There are children within the sound of my voice who will see the Overseas Dominions surpass in wealth and population the British Isles; there are children playing in our streets who may see Canada alone attain that eminence." Canada is all right. But her people should use judgment and show wisdom in guiding her great destiny. Before the war we borrowed a million dollars a day—or rather that was the proceeds of our securities sold abroad. This whole business was cut off as though with a sword at one fell swoop, and yet we have recovered and business conditions are now fundamentally sound throughout Canada. We must, therefore, have faith and go in for a larger production. Our people withstand great shocks and recover quickly because they are a steady people —prudent, energetic, and essentially honest. But at present war is our first business.

I started on my trip with the idea of seeing the agricultural resources of some of our competitors, the people of New Zealand and Australia, and to look at some of the concrete examples of intensive agriculture that we find in the old established civilizations on the Continent of Asia, namely China and Japan. The reason for going was an invitation from the New Zealand Government to come over and help them to lay plans for the establishment of an agricultural college and experimental farm similar to the one at Guelph. I was selected, not because there was any personality or any special information that I had on the subject, but I was selected first as an Ontario man, because when I got there they told me they had been reading our reports and bulletins, and that they knew all about a great many of them. They knew about the Western Ontario Dairymen's Association and the Eastern Ontario Dairymen's Association, and they knew what we had been doing in this Province of ours, and they had noticed the splendid intermingling of English, Irish and Scotch people that had produced great results, and they wanted somebody to come over and tell them how it all happened and to put them on the way of doing these things themselves. I was not able to tell them very much in the way of dairying for two reasons: one, because they were pretty well up in dairying themselves, and told me some things. The other one was that I found Canadians in charge of their dairying business everywhere, and that had helped New Zealand to raise their standard of butter, so that when it comes into the British Columbia market it can hold its own in competition with any other butter. I was pleased to find that Mr. Ruddick had been there and started them right, that Mr. Singleton had followed him up, and that they knew Canada and Canadians, and they had found our best ways and methods and they took some of our best men. It was with a great deal of pleasure that I found I was going to a country where Canadians had made a good impression.

We sailed from Victoria in total darkness on the night that war broke out. Nothing has impressed me so much in all my life as the cheering at midnight on the wharf of Victoria as our lines were thrown off, and then resounding cheers were given for the Victoria people, for Great Britain and for France, and everybody joined in, and then for Russia, but not quite so strong because we then had not been brought up to look upon Russia in the same light that we do now. We have found out since that they are a pretty good kind of people to have on your side when you are fighting Germans. For two weeks we were in total darkness, even no light at the mast head. We got to New Zealand in good time, but before we got there I found time to study, in the ship's library, some of the things peculiar to the Pacific Ocean. I had been over the Atlantic more than once, but I found I was particularly rusty and ignorant in regard to matters on the Pacific slopes, and for fear you might be in exactly the same shape I want to tell you something about the Pacific.

I found out that the sea borne trade of the Pacific was enormous. It actually staggered me. I found that the ocean trade of Australia was $700,000,000; New Zealand, $200,000,000; United States dependencies, $200,000,000; China, $560,-000,000; Japan, $460,000,000; U.S. Pacific Company, $150,000,000; Canadian Pacific Company, $30,000,000; Latin States of South America, $700,000,000; or a total overturn and interchange each year of $3,000,000,000. Can you think of that amount of money, three thousand millions, or three billions of dollars worth? and Canada only indulged in it to the extent of thirty millions. I found in these countries I visited on the other side of the Pacific that there were 9,000,000 of people willing to do business with us if we would give them half a chance.

Our first stop was on an island in the middle of the Pacific, called Honolulu. I visited the people on the island and saw them plowing three feet deep for sugar cane with great steam engines hauling the plows. They have hundreds of thousands of acres devoted to the growth of sugar and tropical fruits, bananas, lemons and oranges, and I came to the conclusion that it would have been a good thing, if it were possible, when the Hawaiian Island was sold, if Canada could have added it as part of the Dominion, because it produces so many of these things that we cannot produce in our climate. Therefore, that island is being well developed by the American people with the assistance of the Japanese, because sixty per cent. of the population are Japanese, and they are good workmen and are developing the island in a good way. It has a climate where the temperature changes only 10 degrees the year round. It alters from 70 to 80 and although you might get tired of it it is very pleasant for a short visit.

I had always wanted to go to New Zealand and now I was on my way. We sailed along for another couple of weeks then finally one Sunday morning we sighted land, and that was the first land we had seen for two weeks and it was the Island of New Zealand—a right little, tight little island that is extremely British and only seventy years old. It is populated by a fine people, and they have a splendid climate. For agricultural production and relative wealth and for financial ease, it seemed to me to be the best country in the world. Nobody seemed to be hurrying; everybody seemed to be successful. They were producing great wealth out of the soil. They did not seem to have any tidal waves of heat or cold or immigration or fashion. Last year's hat was good enough if it was a good hat; they did not seem to have any speculation. Land values did not change; all that was regulated by the Government. If you wanted to buy a farm all you had to do was to go to the Government office and say, "I want to buy a farm," and the Government would tell you there was a subdivision of 30,000 acres, and you could buy a farm there of 40 acres, of 240 acres, or whatever you wanted. The Government has their own railway into the middle of the subdivision, and if you wanted the farm you could have it for what it cost, plus the additions that were made to it for the benefit of the district. Different prices were put on different farms; one would be $40 an acre, the next one $60; another one perhaps $58, and a better one $75 per acre, and perhaps another one $30—you take your choice. You can settle on the farm and all you have to pay is interest on the money and taxes, and they won't ask you for the principal until you have lived on it for ninety-nine years, and all the interest you have to pay is four per cent., and then the farmer has the rest of his money to buy stock and to build a house and improve his property. I asked them, "After the man had done all this work and wanted to get off the farm how would he sell his improvements?" They said. "The land will be worth more than the price we are asking for it in four or five years, and you will get a bigger price for it, but in the meantime you can spend your money and we will guarantee that you will not be turned off so long as you live and pay the small amount of interest." I said, "Probably I would not like the land at all and would not like to live in that district," and they said there would be no trouble about that; I could change if I wanted to. I found there was no speculation in land and the people who did work like the farmers in this country on the land got the benefit from it, and no man could come along and squeeze him out when he was in a place where he could not help himself. Nobody could foreclose his mortgage and drive him off his land, but he was encouraged to improve his property, and it seemed to me that was good business on the right little, tight little Island of New Zealand. I got there within a month after the war broke out, and yet I found some of the farmers breaking up some of the finest pasturing land I have ever seen. I asked them how many sheep they could keep on land like that, and they said they had for five years kept nine sheep to the acre or one cow to the acre the year round. I asked them if they meant for the summer season and they said they had cows that had never been out of the pasture since they were born. They lived there on grass all the year round. That is the kind of climate they have. When I saw these men breaking up their permanent pastures, I said, "That is not a very good thing to do," but they said, "It is not our will; the Premier of New Zealand last week made the announcement in the Legislature that the British Army might want a large quantity of food from all parts of the Empire, and we are plowing up the land to put it in wheat. It will not be so profitable for us, but we are doing it for the sake of the Empire," and that in my opinion was patriotism and loyalty to the core. (Applause.)

I visited the schools of New Zealand, and was pleased to see they had improved on our schools in some respects, and some of the things we are trying to do they have already accomplished. They are teaching agriculture in their schools really and truly, not getting some young girl to read an essay on turnips. They say, "Boys, go home and grow them." They have real teachers of agriculture, and they believe the country schools should be for the education of the country boy so as to enable him to live in the country. They believe in what they can actually do, not upon luck but upon pluck. They believe in working when they work and playing when they play, and in giving a square deal in every act in life.

The Maori, or native races, are the most remarkable black people perhaps known. It was wonderful how they have developed with the country since the advent of the whites. Both men and women enjoyed the franchise and appeared to use it with intelligence and a sense of responsibility. Members of their race not only sat in parliament, but occupied positions in the cabinet. They had risen true to their faith. The island, which was first settled by the Maoris about five hundred years ago, was discovered by that famous navigator, Capt. Cook. Sixty or seventy years ago it was decided to make it an English colony. When first it was conquered and the natives subdued it took some time to overcome their resistance.. As they were driven back they retired up the sides of the volcanic mountains. At one time the English forces of about 5,000 men ran out of food and a halt had to be made to await supplies. The story goes that the Maoris, hearing of their enemy's difficulties, sent them a generous supply of sweet potatoes so that as they said the fight might go on. This would have cheered the heart of an Irishman, for what true son of Erin could resist the temptation of potatoes and a good fight?

There are people living in New Zealand yet who can remember that first fight. These hills are now covered with sheep, and these people and the Maori are loyal to the British Crown. The British never forgot that first fight and they have always treated the natives well since. They are honored in the Legislative Council and Cabinet. They are lawyers and doctors and teachers and live side by side in perfect unison with the whites.

They make their own laws; they govern themselves, and if they make a mistake they change the laws and they turn men out of Parliament, and they won't elect people who they know are not honest. They are funny people that way. They seem to think the best is none too good for them in Parliament. They turn out one party and put in another if they don't suit them, and they will turn one out in six months after they have been elected and put in another party. They govern themselves literally.

They also think the women are white people over there. I mean their own wives and daughters, and they give them a vote on everything that a man votes upon, and they find they have a pretty good community after all, and that things have not been destroyed and have not gone to the devil as some people said they would. (Applause.)

We started from there to Australia. In Canada New Zealand is looked upon as a very close neighbour of Australia, but it is 1,200 miles from New Zealand to Sydney, a five days' journey, about the same time as it takes between Canada and the Old Country. Australia is an immense country of 3,000,000 square miles, 2,500 miles long and 2,000 wide; larger than the United States without Alaska; nearly as large as Canada; three-quarters the size of Europe, and one-quarter the size of the Empire. Canderra, the new Capital, is being planned on an immense scale and covers 100 square miles of territory. The climate is mild and ninety-six per cent. of the population is Australian or British born. Even the Australians themselves admit that they have the best country under the sun. It is easier to make a living there than here, and there is a fine national sentiment, but the people have no better moral fibre than Canadians. They look to Europe for everything, and it is a regular little England. Everything from drugs to tobacco is from the Old Land, even the frames and glass in the shop windows. Their chief products are wool, of which they export $130,000,000 worth a year, more than Russia and Argentine together; mutton, butter, rabbits, and 90,000,000 bushels of wheat. Their exports are $80 per head, while Canada's are $50, and their imports $70, about the same as in Canada.

Twenty thousand miles of railway connects the various states, but owing to the delay in confederation these were built by the various states, with the result that they are of different guages. There are the 3 feet 6 inches, the 4 feet 6½ inches, the 5 feet 3 inches, the 2 feet 6 inches and the 2 feet guages. Nothing could be more awkward, as trains cannot run through the whole journey. Every time the guage changes a change of cars is necessary, and it is not pleasant to be turned out of a sleeper in the middle of the night.

It is a shame that in a country like Canada, with acres and acres of unoccupied land, that land outside the cities and towns should be sold by the foot. If a man could have a lot large enough to keep a garden of his own the cost of living would be materially reduced. But when a workingman is asked to pay for a lot by the foot he cannot afford to buy or hold more than is required to place his house on. In Australia land near the cities is still cheap, and thousands of people working in town live on a good sized lot in the country. It not only helps to make living cheaper, but it is a good thing for the children to grow up away from the crowded cities. The fact that they have some chores to do in the evening helps to give them a better start in life. This is an aid towards good citizenship that our boys do not get.

One day on going to the station at Melbourne I became anxious lest I should miss or take the wrong train. In a few minutes after my arrival six trains came into the station. I enquired of the station master whether my train had arrived, and was asked what train I wished to go by. "The 9.06," I said. "Well, it will go at 9.06." "But aren't they sometimes late?" "No, all trains run on time here." "But I have heard of trains on time that weren't on time." "That makes no difference, trains run on time on this road." "But why are there so many to-day, and where are the people coming from?" "From the country, and there are no more than usual." "But what is bringing all the country people to town to-day?" "What do you mean, these are not country people, they are people who work in the city, coming in." "Why do they leave the city, is there a pestilence?" "Why no, they live there all the time on their own property."

One thousand five hundred trains run in and out of Melbourne every day, and a workingman can come in 10 or 11 miles for 5c. These suburban trains carry 200,000 passengers a day out of a population of 500,000. This would be impossible in Toronto or Montreal on account of the price of land and the state of the transportation facilities. The Australians say, "Why not? We own the land and the railways." Here only a few wealthy citizens have the privilege of a house in the country. In Toronto the sole topic on a street car is the price of land on Yonge Street or in Rosedale. In Australia land prices are not mentioned. One hears of the jockey races, though, as there are 300 horse meets in a year and 16 race courses within a radius of ten miles of Sydney. And the people coming in in the morning are usually laden with flowers grown at their own homes.

Like New Zealand, Australia always feels that trouble, especially with Japan, may come at any time, and it is well not to be altogether unprepared. They begin to train the boys in the schools. Cadets from 12 to 14 years drill 90 hours a year; senior cadets from 14 to 18 years of age drill 12½ days or 24 evenings, and the citizen forces, from 18 to 25 years of age, drill 16 days. This gives them 170,000 men over 25, and 360,000 men over 18 years of age, trained for defence purposes. The training camps are well conducted, and no parents need be afraid to allow their boys to go to them. They are quite popular, and a lot of hard work is turned into fun. At one big camp 50,000 men drill and return home tanned and stronger for their outing.

There has been a great deal of advanced industrial and social legislation. In fact almost everything has been tried. They have old age pensions, and very good factory laws, with no sweating. The minimum wage, though, does not reduce the number of unemployed. One of their slogans has been "Eight hours of work; eight hours of play; eight hours of sleep, and eight bob a day." A law that has done much good is the maternity allowance. $50 has done a lot for both mother and child at a time when a little extra money is required to procure proper care and nourishment. In 1912, $3,000,000 was given under this Act.

From time to time Australia suffers terribly from drought. These dry spells come without warning and at irregular intervals. On a trip through a section suffering from this affliction not a single blade of grass was to be seen. The Murray River, a stream as large as the Ottawa River, was dry long before the sea was reached. 30,000,000 sheep were destroyed, and large numbers of colts, together with their mothers, had to be taken out and shot. This state of affairs frequently last for months, the Canadians would be driven mad. Not so, however, with the Australians, who are ever hopeful. "Come back, Dr. Creelman, in a few months," they said, "And we'll show you the finest country under the sun."

The state debts are something enormous, amounting to $1,355,000,000 or $300 per head. This money has been spent on railways, telegraphs, telephones, irrigation and harbours. Confederation was put off too long in Australia, and we in Canada owe a debt to the Fathers of Confederation who welded this country into a nation so early in its history. In Australia one state or section wonders how Providence can allow the people in other portions of the Commonwealth to live, and when it comes to the central parliament it is generally a case of every state for itself. The centre and north are hot, while the south of the island is quite moderate. While all these countries had some things we lacked, yet it was a pleasure to come back to old Ontario, which had never had a heat, a flood or a drought.

I want to say something about China and Japan. The Chinese and the Japanese are very much alike in some particulars. They are laborious and patient to the utmost extreme. I found that the agricultural laborers on the farms, both in China and Japan, worked hard. They came on the ground before daylight and did not leave it until after dark, and they worked for $50 a year and boarded themselves, and they were not running around looking for another job. I found that was the average pay throughout China and Japan for good farm laborers, and they work a good deal harder than either you or I work here because they have longer days. I never got up early enough in the morning—and I got up just before the sun broke in my window—I never got up early enough to see them commence working. They were standing with their hoes in their hands watching for the first rays of sunlight as if they had been there all night. I stayed around until it was dark to see them stop work and they worked until you could not see them from the road, and then they started to do chores or put out some plants which they thought ought to be put out after the sun was down. They did this with a little lantern in their hands. That is the kind of workmen they have in China and Japan.

Japan is a month away from Australia, but on the way a call was made in China. It almost bewildered one to look back on the history of that huge country, with her teeming population. For forty centuries that wonderful people had been tilling the same soil much in the same way. China, unlike Japan, is altogether unorganized and it is doubtful if more than two per cent of its population yet know whether its government is republican in form or a monarchy. Shanghai, a great seaport with a population of several millions, is ruled by about 30,000 foreign residents. Their part of the city is quite modern, but the native sections are without even sewers. On the great Yangtsekiang River, 3,000 miles long, there are 1,300 big steamers. China keeps industrially strong, but as she hates militarism she is not in a good position to deal with other nations. Japan is only seventy years old, but look out for Japan. Japan is ambitious, fully organized, with a strong army and navy, and they are developing railroads and telegraphs and highways, and they have a great museum in which there are exhibits of the latest kinds of implements. There you will see implements made by the International Harvester Company and the Massey-Harris Company, and by Frost and Wood, and waggons from the Chatham Waggon Works, and from the big factories in Hamilton, Ontario. What are these for? The boys from the schools make drawings of the parts of these waggons and they take patterns and they will manufacture these same articles whether they are patented or not. They will sell you an article, and if you don't take it away and pay the money and some other fellow comes along and offers them two cents more, they will let him have it, and if you say to them, "I have contracted for this," they will say, "The other fellow offered two cents more, and what are you going to do about it?" They are teaching English in all the schools, and some day we will have to look out for Japan. They are a great people and in the days to come they will want our produce. They will want things that we produce in Canada that they cannot produce in Japan. They are a great little people and, in their own way, they live moral lives.

The love of children is conspicuous at every turn you make in China, and even more so in Japan. Children are loved everywhere; no scolding or quarrelling at any time. I have noticed them in the streets, in parks, in shops, and in their homes. It is the same everywhere. The old grandfather and grandmother will be seen walking out with a child holding to each hand and perhaps one strapped on the back. They see everything, pointing out to the children the trees and flowers and birds, and buying little things for them. Girls and boys—mere children themselves—will have little tots strapped on their backs and will engage in play with them, and never a sign of impatience. I tell you that Christian Canada, and Christian United States and Christendom everywhere may learn much from that thorough education—partly inherited from the ancestors and partly inherent in the atmosphere—which brings up the child in Japan to an absolute and uniform respect, not only for those that are older, but also for those that are of the same age. When a little miss comes into a Japanese home she is bowed to as if she were a lady, and she bows in return; and all the way through the processes of education parental authority is absolute, with a peaceable, patient, willing giving in to the observance of the rule of kindness and affability and love from one member to the other (Applause.)

ADDRESS.

W. Bert Roadhouse, Deputy Minister of Agriculture for the Province of Ontario, Toronto.

First, let me congratulate the members of this Association upon the fact that they have just concluded one of the most successful years in the history of the dairying industry in this Province. Let me also congratulate you most heartily upon the success of this convention because one needs no better evidence than the splendid audience which has come to-night under the most inclement weather that one can imagine to see the vitality of this organization and the strong hold it has on the people of the western section of the Province. This Association has behind it many years of splendid service, and I think I might interpret this meeting to-night and the ones which are to follow as an augury that there lies before it still greater opportunities for usefulness.

Let me say, however, that some of the success of the past year has been due to the peculiar circumstances of market conditions. The excessive demand which we have experienced is due to the war. The problem of the future, and one of the most important problems, is to maintain the industry at the high standard which it has attained this year. The export trade has been greater this year than for many years, and I think we should make every effort to hold that export trade and also to develop the home trade as well.

Permit me to briefly mention a plan which has been worked out across the line where they are alive to the opportunities of development for the dairy industry. Over there they are laying plans for the development of their home market. One of these plans consists in a campaign of extensive advertising. Such a plan has been discussed in this Province many times, and it might be of interest to note how they are endeavouring to work it out on the other side. The National Dairy Council of the United States has undertaken to raise the sum of $600,000 to cover the advertising campaign of three years duration. They intend to raise this from the industries which are allied to the dairy industry, from the Dairy Associations, from the Breeding Associations, from the Carrier Company, from the Ice Cream trade, and all these organizations which benefit from and depend upon the dairy industry for their sustenance. In this way they expect to attract the people to a greater appreciation of the splendid qualities of the dairy products. They base that confidence on the fact that they find dairy products are not being consumed in anything like the proportion which they deserve. For instance, they find that the annual amount paid for dairy products as consumed, per capita, is $5.92. Against that they find that the annual amount paid per capita for spirituous liquors is $32. I do not say that these figures apply on this side of the line; in fact, I would fancy if they are not reversed here now, they soon will be from what I have heard. However, be that as it may, it indicates the opportunities for increasing the consumption in the home markets.

"It is very necessary to keep in mind the cost of production and to keep in mind the quality of the product which is produced. From the discussions which I have heard I have formed the conclusions that the grading of our products is one of the questions that will have to come up for solution in this Province in the very near future if we are to maintain the position which we have secured, and broaden and extend it. While no definite plans have been agreed upon, I may say that it is the purpose of the Ontario Department of Agriculture during the ensuing year to do more work in the way of demonstrating the value and practicability of the grading of cream than has been done in the past. (Applause.) That is something, I think, which is very much needed. If there is anything which we, as a Department can do in building up the industry, we are only too anxious to do it.

You are likely all familiar with the story of Max O'Rell, who on his visit to the people to the south of us, began his address by saying, "The American people, I believe, are the greatest people on the face of the earth," and then, before the applause which had greeted that remark had died away, he added in parenthesis, "in their own estimation." It may be possible that we are too modest, but we do not want to err on the other side, still I think we are entitled to take some satisfaction out of the achievements we are making in this new country. It may be said that while the crop was great, the price was not as great as expected, and that is quite true. We have before us the history of the Napoleonic wars of 1812, when wheat went as high as $3.85 per bushel. We had also the history of the wars of 1854 and 1856, when it was sold at $2 and $2.27 a bushel, but we must remember that in these times, the great producing countries of the Argentine and the United States and Canada had not come into being, and it is not surprising that with the great world crop of the present year, prices should not attain the maximum of these previous great war prices. Although the crop all over the world has been great, I want to say no country shows such a percentage of progress as the Dominion of Canada. (Applause.) We should look upon this not merely as the price per bushel, but from the standpoint of the price per acre. The average yield per acre this year 25.89 bushels, and the price is 80c., giving us a return of $20.95 per acre as compared with the average for the four years previous of $12.80 per acre, so that, even though the price is not so great as was anticipated, there is no great cause for mourning on that account.

Let me say, in conclusion, that I would like to link up this story with the thrilling address to which we have just listened from Dr. Creelman. It must be with a degree of satisfaction that the majority of the trip which he made and of the countries which he described are part of the British Empire, and thrive under the same flag as we do. That means more to us than it did two years ago, because after eighteen months of the worst war that the world has ever known, we are able to point with pride to the fact that the invaders' foot has yet to rest upon the soil of this great Empire. We may, then, rejoice in the fact that we are not isolated, but that we are part of the great communion of nations, and that we are working out our destiny step by step and side by side with people of British stock and of

British aims. Let us note these facts for our encouragement, and against that let us note the fact that the great Colonial Empire, which our chief enemy has spent years and millions of dollars to build up, has already crumpled and fallen away, and that to-day scarcely any of the territory which Germany had sought to bring under her rule, remains to acknowledge her sovereignty. There in brief is the story of the two Empires, and in that story you will see, if you look deep enough, the secret of the success of the British Empire. It is only fair to say that we owe this to the might of the British Navy, by reason of that our own fair land has been protected against invasion, and other portions of the Empire and the whole world as well has been protected. When the day for making peace comes, and Heaven grant it may soon, but on proper terms, when that day comes, the greatest factor to be reckoned with on our side is the supremacy of the British Navy, which to-day holds the sea so free and which has swept three billion of foreign trade of Germany from the high seas, and which has kept our homes inviolate, and which has retained for us a heritage which was developed by the men of this country in the pioneer days. Let us, as young men and old, all realize that what these old pioneers built up is worthy of the highest sacrifices, and that we owe it to ourselves and to them to maintain the Empire in its entirety.

Let me conclude by quoting to you what has been described as one of the finest poems which this war has brought forth:

THE SEA IS HIS.

The Sea is His: He made it, black gulf and sunlit shoal,
From barriered bight to where the long leagues of Atlantic roll.
Small strait and ceaseless ocean He bade each one to be,
The sea is His: He made it—and England keeps it free.

By pain and stress and striving beyond the nation's ken,
By vigils stern when others slept, by many lives of men:
Through nights of storm, through dawnings blacker than midnights be—
This sea that God created, England has kept it free.

Count me the splendid captains who sailed with courage high
To chart the perilous ways unknown, tell me where these men lie;
To light a path for ships to come they moored at Dead Man's Quay.
The Sea is God's: He made it—and these men kept it free.

Oh, little land of England, Oh, mother of hearts too brave,
Men say this trust shall pass from thee who guardest Nelson's Grave.
Aye, but these braggarts yet shall learn who'd hold the world in fee,
The Sea is God's—and England, England shall keep it free.

PRIZE WINNERS, 1916.

Report Presented by Mr. Frank Herns.

Sec. 1, September White Cheese.

1. Henry Youn, Listowell; 95.82. (Won on flavor)
2. Peter Callan, Woodstock; 95.82.
3. H. E. Donnelly, Straffordville; 95.66 (won on flavor).
4. C. J. Donnelly, Scottsville; 95.66.
5. F. E. Travis, Eden; 95.65.

Sec. 2, September Colored Cheese.

1. Peter Callan, Woodstock; 96.48.
2. F. E. Travis, Eden; 95.82.
3. H. E. Donnelly, Straffordville: 95.49.
4. C. J. Donnelly, Scottsville; 95.32.
5. Henry Youn, Listowel; 95.16.

Sec. 1, October White Cheese.

1. J. K. Brown & Sons, Brussels; 96.49.
2. Peter Callan, Woodstock; 96.16.
3. H. Hastings, Britton; 95.99. Same on flavor. } Tie
4. Connolly Bros., Thamesford; 95.99. }
5. Wm. Zulauf, Brunner; 95.83.

Sec. 2, October Colored Cheese.

1. Wm. Zulauf, Brunner; 96.16.
2. C. J. Donnelly, Scottsville; 95.99. Won on flavor.
3. Henry Youn, Listowel; 95.99.
4. Norval Bell, Ripley; 95.66. Won on flavor.
5. H. Hastings, Britton; 95.66.

Sec. 1, Winter 56-lb. Box Creamery Butter.

1. W. R. Dinwoodie, Belmont; 95.50.
2. E. M. Johnston, Innerkip; 95.16.
3. Duncan Doan, Southwold Sta.; 94.99.
4. John Cuthbertson, Stratford; 94.82.
5. Jas. E. Wilson, Forest; 94.32.

Sec. 2, Twenty 1-lb. Creamery Prints.

1. Jno. Cuthbertson, Stratford; 95.66.
2. R. C. Bothwell, Hickson; 95.00.
3. Carter Bros., Stratford; 94.42.
4. H. J. Neeb, Tavistock; 94.33.
5. J. E. Wilson, Forest; 94.32.

Sec. 1, 56-lb. Box Creamery Butter.

1. Mack Robertson, Belleville; 94.83.
2. H. A. Clark, Warwick; 94.66.
3. J. E. Wilson, Forest; 94.65.
4. W. G. Medd, Woodham; 94.48.
5. W. B. Dinwoodie, Belmont; 94.33.

Sec. 1, Three September Stilton Cheese (10 lbs.)

1. H. W. Hamilton, Thedford; 96.32.
2. Henry Youn, Listowel; 95.99.
3. Garnet Bain, Lakeside; 95.83.

Sec. 2, Two September Flat Cheese.

1. F. E. Travis, Eden; 95.66. Won on flavor.
2. H. Hammond, Moorefield; 95.66. Won on flavor.
3. H. E. Donnelly, Straffordville; 95.66. Won on flavor.

SPECIAL PRIZES.

By the Heller & Merz Co., 22 Cliff Street, New York—C. Richardson & Co., St. Mary's, Ont., Canadian Agents for Alderney Butter Color: $10.00 in cash—To the Buttermaker securing the highest score on butter exhibited in Class III., colored with Alderney Butter Color.—Jno. Cuthbertson, Stratford.

$5.00 in Cash—To the Buttermaker securing the second highest score on butter exhibited in Class III., colored with Alderney Butter Color.—W. B. Dinwoodie, Belmont.

By C. Richardson & Co., St. Mary's: $10.00 in cash—To the Buttermaker securing the highest score on butter exhibited in Class IV., colored with Alderney Butter Color.—H. A. Clark, Warwick.

$5.00 in cash—To the Buttermaker securing the second highest score on butter exhibited in Class IV., colored with Alderney Butter Color.—J. E. Wilson, Forest.

Note.—The winners of the Heller & Merz Co., and C. Richardson & Co's. special prizes will if required be expected to take an affidavit stating that they have been *continuous* users of Alderney Butter Color *during the past twelve months.*

By the R. M. Ballantyne, Limited, Stratford, Ont., for D. H. Burrell & Co., Little Falls, N.Y., manufacturers of Chr. Hansen's Rennet Extract and Color: One case of Hansen's Rennet Extract—To the Cheesemaker securing the highest score on September White Cheese, Class I., Sec. 1.—Henry Youn, Listowel, Ont.

One case of Hansen's Cheese Color—To the Cheesemaker securing the highest score on October Colored Cheese, Class II., Sec. 2.—C. J. Donnelly, Scottsville.

By C. H. Slawson & Co., Ingersoll, for D. H. Burrell & Co., Little Falls, N.Y., manufacturers of Chr. Hansen's Rennet Extract and Color: One case of Hansen's Cheese Color—To the Cheesemaker securing the highest score on September Colored Cheese, Class I., Sec. 2.—P. Callan, Woodstock.

One case of Hansen's Rennet Extract—To the Cheesemaker securing the highest score on October White Cheese, Class II., Sec. 1.—J. K. Brown & Son, Brussels.

Note.—All cheese competing for the special prizes offered by the R. M. Ballantyne, Limited, and C. H. Slawson & Co., must be made with Hansen's Extract and Color. No special cheese required.

By the J. B. Ford Co., Wyandotte, Mich., manufacturers of Wyandotte Dairymen's Cleaner and Cleanser: One Eight-day polished mahogany, Puritan style, mantel clock—To the Cheesemaker who is a regular and exclusive user of Wyandotte Dairymen's Cleaner and Cleanser, having the best finished and most stylish looking cheese on exhibition.—C. J. Donnelly, Scottsville.

One Eight-day, polished mahogany, Puritan style, mantel clock—to the Buttermaker who is a regular and exclusive user of Wyandotte Dairymen's Cleaner and Cleanser, having the neatest and most attractive exhibit of butter.—Wm. Webb, St. Thomas.

Note.—All exhibits (except Stilton and flat cheese) are eligible for these two special prizes.

By the Canadian Salt Co., Windsor, Ont., E. G. Henderson, Manager: $25.00 in cash—To the Cheesemakers securing the highest scores on cheese (except flats and Stiltons) exhibited in any class. The be divided as follows: 1st, $10; 2nd, $8; $3rd, $7.—1—J. K. Brown & Son, Brussels; 2—P. Callan, Woodstock; 3—P. Callan, Woodstock, Wm. Zulauf, Brunner (tie).

$25.00 in cash—To the Buttermakers securing the highest scores on butter exhibited in any class. To be divided as follows: 1st, $10; 2nd, $8; 3rd, $7. 1.—Jno. Cuthbertson, Stratford; 2—W. B. Dinwoody, Belmont; 3—E. M. Johnston, Innerkip.

By the Western Salt Co., Courtwright, Ont., N. A. Leach, Manager: One barrel Purity Cheese Salt—To the Cheesemaker securing the highest score on September White Cheese, Class I., Sec. 1.—N. Youn, Listowel.

One barrel Purity Cheese Salt—To the Cheesemaker securing the highest score on October Colored Cheese, Class II., Sec. 2.—Wm. Zulauf, Brunner.

One barrel Purity Dairy Salt—to the Buttermaker securing the highest score on fifty-six pound box Creamery Butter, Class III. or IV., Sec. 1.—W. B. Dinwoody, Belmont.

One barrel Purity Dairy Salt—To the Buttermaker securing the highest score on twenty one-pound Creamery Prints, Class III., Sec. 2.—Jno. Cuthbertson, Stratford.

Note.—No special butter or cheese required.

By the DeLaval Dairy Supply Company, Limited, Montreal, Canada: A Silver Cup—To the Buttermaker securing the highest score on butter made during the month of October from collected cream, Class IV., Sec. 1.—Mack Robertson, Belleville.

Note.—No special butter required.

By the W. A. Drummond & Co., Toronto: $10.00 in cash—To the Buttermaker securing the highest score on fifty-six-pound Box Butter made from collected cream pasteurized and properly ripened, Class III., Sec. 1, or Class IV., Sec. 1.—E. M. Johnston, Innerkip.

Note.—No special butter required.

By Wells & Richardson Co., Montreal: $10.00 in gold—To the Buttermaker securing the highest score on butter exhibited in any class colored with Wells & Richardson's improved Butter Color.—Mack Robertson, Belleville.

$5.00 in gold—To the Buttermaker securing the second highest score on butter exhibited in any class colored with Wells & Richardson's improved Butter Color.—R. Scott & Co., Mount Forest.

A Fountain Pen—To each Buttermaker securing a score over 93 points on butter exhibited in any class colored with Wells & Richardson's improved Butter Color.—R. Scott & Co., Mount Forest; Mack Robertson, Belleville.

Note.—No special butter required.

By the Dominion Chemical Co., Syracuse, F. W. Valleau, Kingston, Canadian Agent for Dominion Cleanser: $5.00 in gold—To the Cheesemaker who is a regular and exclusive user of Dominion Cleanser having the neatest and most attractive exhibit of cheese.—Peter Callan, Woodstock.

$5.00 in gold—To the Buttermaker who is a regular and exclusive user of Dominion Cleanser having the neatest and most attractive exhibit of butter.—Jno. Cuthbertson, Stratford.

Note.—All exhibits (except stilton and flat cheese) are eligible.

By the Imperial Bank of Canada: A Silver Cup—To become the property of the Cheesemaker securing the highest total score, three times, or twice in succession, on two cheese; one cheese either white or colored, exhibited in Class I., and one cheese either white or colored, exhibited in Class II. In awarding this cup the scores of the two cheese securing the highest score in Classes I and II. (belonging to the same exhibitor) will be added. In case of a tie, settlement is to be left with the judges.

Won in 1910 by J. E. Stedelbauer; won in 1911 by R. A. Thompson; won in 1912 by D. Menzies; won in 1913 by R. E. Hastings; won in 1914 by Mrs. O. Cuckow; won in 1915 by J. K. Brown.—Peter Callan, Woodstock.

Note.—No special cheese required.

Cheese Buyer's Trophy: Challenge Cup, valued at $150—To become the property of the exhibitor of cheese (except flat and Stiltons) at the Winter Dairy Exhibition who shall receive the highest score three times, or twice in succession. Won in 1903 by Frank Boyes; won in 1904 by R. H. Green; won in 1905 by O. Schwietzefr; won in 1906 by J. Patton; won in 1907 by J. E. Stedelbauer; won in 1908 by Mary Morrison; won in 1909 by J. T. Donnelly; won in 1910 by Mary Morrison; won in 1911 by B. F. Howes; won in 1912 by D. Menzies; won in 1913 by R. E. Hastings; won in 1914 by Geo. Empey; won in 1915 by J. K. Brown.—J. K. Brown & Son, Brussels.

Note.—Cheese without a bandage shall be considered unfinished, and shall be scored off for finish accordingly.

Cheese on exhibition may be paraffined.

All one-pound print butter on exhibition must be wrapped in plain wrappers.

All October butter must be sent to London Cold Storage by Nov. 10th.

Mr. Frank Herns: I asked one of the dealers who scored the butter how much he would give me for the first grade creamery scoring 41, compared with the third packet that scored 33, made from the third grade cream, and he said it is worth five cents a pound more. I said to him, how much difference is there between the butter made from the average cream, compared with the butter made from the first grade cream, and he said, "Well, it is worth two or three cents more, at least." It seems to me that, so far as that little experiment goes, there is something that we have not, in Western Ontario, fully realized. I can quite understand some of the difficulties that come before you when you talk about grading cream. I know there are a lot of things that you will have to contend with, but all these things are worth discussing, and we should make every effort possible to overcome them.

REPORT OF CHIEF DAIRY INSTRUCTOR AND SANITARY INSPECTOR, 1915.

Frank Herns, London, Ont.

I beg to submit my Ninth Annual Report. The work of dairy instruction was carried on along similar lines to that of previous years. The instructors attended the usual Short Course held in April at the O.A.C. Guelph, which was much appreciated by them.

Cheese Instruction Report.

Cheese Factories.—One hundred and fifty-one factories, 7 of which made butter, received 374 full-day visits and 556 call visits, a total of 930 visits by the cheese instructors.

New Factories.—Ten new factories were built, 7 of which replaced factories which have been burned down during the last two years.

Whey Butter.—Three factories made whey butter.

Milk Supply.—Eleven thousand eleven hundred and twelve patrons supplied milk to the cheese factories. This is 1,570 more patrons than in 1914. The estimated average of fat in the milk for the season was 3.4 per cent. (slightly less than 1914), and the loss of fat in the whey .212 per cent; 162 patrons were visited.

Pay by Test.—Twenty-two factories paid for milk by the test.

Cool Curing Room.—Twelve factories have ice cool curing room. Two of the larger factories will be remodelled this winter and cool curing rooms installed to be ready for next season.

Pasteurize Whey.—About 70 per cent. of the factories pasteurized the whey and five factories fed all or portion of the whey at the factory.

Quantity of Cheese.—The cheese factories produced in 1914, 21,009,065 lbs. of cheese, and in addition produced during the winter months 880,052 lbs. of butter. The output of cheese for 1915 is estimated to be at least 20 per cent. greater than in 1914. The returns for 1915 will be ready about June next.

Average Yield and Price.—The average yield (lbs. of milk to make a lb. of cheese) in 1914 was 11.11. The average price (per lb. of cheese) was 13.5 cents in 1914. This is seven one-hundreds less lbs. of milk required to make a lb. of cheese and seventy-eight one hundreds cents greater average price. The prices for 1915 are the highest ever realized in Canada.

Quality of Cheeses.—The cheese up to the end of June was very fine. During a few weeks in July and the extreme warm weather of the first half of September some open and coarse textured cheese were produced. From that time on the cheese maintained the usual high grade. Fewer complaints were heard the last year regarding the quality of boxes, and we trust that the classification agreed to by the Freight Departments of the railroads and the Dominion Railway Commission will be the means of keeping this improvement permanent.

The season was very wet and a larger proportion than usual of rain water was present in the milk. This rain water is detrimental not only to the yield but to the quality, as it interferes somewhat with a proper coagulation of the milk by the rennet. The law regarding milk adulteration makes no distinction as to how the extraneous water gets into the milk, and cheese factory patrons should provide covered stands or in some way prevent the adulteration of the milk by rain water.

We trust the increased price of rennet may not tend to induce some makers to "skimp" the proper quality; it would be a very short-sighted policy to risk the quality of the cheese through a misguided sense of economy. Insufficient rennet means slow and imperfect coagulation, loss in yield, and possibly coarse textured cheese.

Milk Sediment Test.—The milk sediment test is developing a special interest among the patrons, and better means is being provided to deliver the milk in a sweet, clean, cool condition. We would appreciate the co-operation of the cheesemakers in assisting to get the sediment test "disks" to each patron.

Turning Cheese in Hoops.—Seventy per cent. of the factories turn the cheese in the hoops. This is a very important point, and we trust the other 30 per cent. of the makers will fall in line with the majority.

Annual and District Meetings.—From Nov. 1, 1914, to Oct. 31, 1915, 87 factory meetings were attended by the instructors and myself. Total attendance, 5,015.

Prosecutions.—Twenty patrons pleaded guilty before a magistrate to delivering deteriorated milk to cheese factories and paid heavy fines.

Sanitary Conditions.—One hundred and twenty-five factories are reported as kept in good sanitary condition. The others are only fair. A few of these are in poor sanitary condition and must be improved next year.

New Milk Cans.—One thousand one hundred and sixty-three new milk cans were bought and 59 cans were condemned as unfit for use and discarded.

Septic Tanks.—Thirteen factories now have septic tanks for disposal of wash water and these are working well.

Expenditure for Improvements.—Twenty-six thousand six hundred dollars is the estimated value of the ten new factories; $20,945.00 was expended in general improvements, making a total expenditure of $47,545.

Creamery Instruction Report, 1915.

One hundred and twenty-five creameries and 40 cream shipping stations were visited by the three creamery instructors. Four new creameries were opened and four closed. The prices for butter during the past season was remarkably good. Owing to the high price of cheese, however, there may probably have been a slight decrease in the total output for 1915.

Quantity of Butter, 1914.—Western Ontario creameries produced 19,236.052 lbs. of butter in 1914. This amount includes about 3½ million lbs. manufactured by the several Toronto creameries, a portion of the cream for which was produced in Eastern Ontario. If is included the 880,052 lbs. of butter manufactured at the cheese factories in winter we have a total of 20,116,104 lbs. This is a little over two million lbs. more than was manufactured in 1913.

Patrons.—Thirty-two thousand five hundred and twenty-three patrons supplied milk and cream to the creameries.

Average per Cent. of Fat in Cream.—27.9.

Creamery Visits.—Three hundred and thirty-four full-day visits and 52 call visits, a total of 396 visits, were made by the instructors to the creameries.

Moisture in Butter.—Six hundred and twenty tests for moisture were made. The average moisture was 14.66 per cent. A proportion of these tests were made at each creamery. Forty-one samples contained over 16 per cent. of moisture and these samples were taken from twenty-two creameries.

Salt.—Five hundred and forty-six salt tests were made. The average amount of salt used was 5.19 per cent., and the average amount of salt left in the butter was 3.27 per cent.

Testing Cream.—Fifty creameries used the scale for weighing cream samples. Three creameries only used the oil test.

Pasteurization.—Thirty-six creameries pasteurized the cream, a few only part of the time. This is an increase of eleven over 1914.

Storage.—Forty-five degrees average temperature of creamery storages.

Cooler.—Fifty-two creameries used coolers for cooling the cream.

Culture.—Fifteen creameries used culture.

Sewage Disposal.—Twenty-one creameries have septic tanks for the disposal of sewage, 7 more than any previous year.

Expenditure.—Four new creameries were built at an estimated cost of $59.700 and $79,895 was spent on general improvements, making a total expenditure of $139,595. Several creameries have put in mechanical refrigeration plants and many others are improving their present equipment.

District Meetings.—The Annual Cheese and Creamery meeting was held at Guelph during the time of the Winter Fair. There was the usual large attendance and a free discussion on several important points affecting the dairy industry. Special features of the meeting were:—

(1) A unanimous decision to support a movement for the distribution among cheese factory and creamery patrons of an official milk and cream cooling tank.

(2) A resolution suggesting an amendment to the Provincial Dairy Act to cover the granting of certificates to operators of cream buying stations. These stations already come under the Sanitary Act.

(3) A resolution suggesting a change in the butter fat standard from 82½ per cent. to 80 per cent.

(4) The importance of pasteurizing cream for buttermaking and grading standards for cream were also emphasized.

A report of the meeting will no doubt be published as an addition to the Annual Report of this Association.

Cream Grading Experiments.—With a view to securing more information in connection with grading cream, some experiments were conducted during August on this point. The cream as it came into the creamery was graded according to what was believed to be a practical standard, butter made from this cream and 14 lb. sample packages were sent to the London Cold Storage. A detailed description of this work follows and these packages of butter are now on exhibition. I shall not make any special comments at this time, but hope to say a few words on cream and butter grading when we take up that question this afternoon.

Cream Grading Experiments, 1915.

Box No. 1, made from first grade cream, Aug. 5th. Cream sour, but clean in flavor; 29% fat; churned at 46, washed at 48 degrees. Salt—used 5.7%, retained 1.7%, moisture 14%—score.

Box No. 2, made from second grade cream, Aug. 3rd. Cream sour and slightly old flavor; 28% fat; churned at 46, washed at 48 degrees. Salt—used 6%, retained 2.8%; moisture 14%—score.

Box No. 3, made from third grade cream, Aug. 3rd. Cream very sour. Some yeasty and one can old, stale flavor; 23.5% fat; churned at 48, washed at 48 degrees. Salt—used 5.4%, retained 2.6%, moisture 14.3%—score.

Box No. 4, made from first grade cream, Aug. 25th. Cream, two-thirds fresh and sweet. Balance slightly sour but good flavor; 30% fat; churned at 46, washed at 48 degrees. Salt—used 3.76%, retained 1.6%, moisture 13.8%—score.

Box No. 5, made from mixed average cream, Aug. 25th. Cream, one-half No. 1, one-quarter No. 2, one-quarter No. 3; fat 29%; churned 46 degrees, washed 48 degrees. Salt—used 6%, retained 2.2%, moisture 15%—score.

In closing I wish to again thank the instructors for their hearty co-operation in the work of the past year. They have worked hard to improve the dairy products turned out from their respective groups and each year sees substantial progress made. I also wish to thank the President and the Directors of the Association, the buyers, factorymen, patrons and all in the trade for their hearty support and good will. All of which is respectfully submitted.

Mr. Johnson: Mr. Hearns states in his report that there was a tendency to cut off the quantity of rennet used. I would like to ask if he observed the same tendency in regard to the quantity of coloring used?

Mr. Herns: Yes, there was. I am very glad Mr. Johnson has brought out that point. I did not say anything about it in the report because I did not think it was as important as the cutting off of the amount of rennet, but I think I am quite justified in saying that it would be a mistake to cut down the quantity of coloring that is used.

Mr. Johnson: I found in our district quite a few cheese that were too light in color.

Mr. Herns: The tendency naturally would be to use just the least amount. I know that it has been a rather difficult matter to get it, but at the same time so long as we are able to get coloring and rennet—and we have been fortunate up to the present time in being able to get them, although we will have to pay a higher price until the war is over, and it may take three or four years before the price will become normal—I do not think it would be wise for us to cut down the amount of rennet or coloring that is used, because if we do we are bound to lose on our reputation. And we must look at the trade as a whole; we must feel that so far as we are concerned we must do our share even if we lost a little by doing so. I think the people who are supplying milk to the cheese factories to-day could well afford to pay a little more for manufacturing in order to cover the extra cost of the rennet and coloring. It would pay them to do that rather than have the reputation of the cheese suffer and the price depreciate.

Summary of Creamery Report, 1915.

	Instructors.			
	D. McMillan.	J. Smith.	G. Rickwood.	Total
No. Creameries visited	46	44	35	125
No. of patrons	13,813	9,790	8,915	32,523
Pounds of butter made, 1914				20,116,104
Gain over 1913				3,711,790
No. full day visits	113	136	85	334
No. call visits	15	6	41	62
No. patrons visited			52	52
Average per cent. fat in cream	27.1	27	30	27.9
No. tests made for moisture in butter	244	250	126	620
Average per cent. moisture	14.29	14.7	14.99	14.66
No. samples showing over 16 % moisture.	9	17	15	41
No. creameries these samples taken from	6	7	9	22
No. of tests made for salt in butter	226	200	120	546
Average per cent. salt used	4.87	5.7	5	5.19
Average per cent. salt left in butter	3.02	3.5	3.29	3.27
No. of Creameries Cream Collect	46	43	28	117
" " Separator		1	5	6
" using Babcock test	43	44	33	120
" " " Oil test	3			3
" " " Scales (Metric)	26	8	16	50
" " " Pipette	17	35	21	73
" " " Cooler	20	20	12	52
" " " Pasteurizers	11	15	10	36
" " " Culture	7	3	5	15
" " having poor water supply	1	2	3	6
" " " septic tank for disposal of sewage	3	7	11	21
" " making casein				0
Average temperature of storages	44.5	46.6	44	45
	(2)	(0)	(2)	(4)
Expenditure: New creameries[1]	$ 3,200 00		$56,500 00	$59,700 00
Expenditure: General improvements	19,090 00	$13,900 00	46,905 00	79,895 00
Totals	$22,290 00	$13,900 00	$103,405 00	$139,595 00

CREAM GRADING EXPERIMENTS, 1915.

Date 1915.	Lbs. of cream used.	No. of sample box.	No. of grade.	Condition of Cream as to Flavor, Acidity, etc.	% fat in cream.	Temp. Churning.	Temp. Wash water.	Salt % Used.	Salt % Retained.	% moisture in butter.	Score. Flavor. 45	Body. 25	Color. 15	Salt. 10	Style. 5	Total. 100
Aug. 5......	996	1	1	Sour but clean in flavor	29	46°	48°	5.7	1.7	14	38	23.5	14	10	5	90.5
" 3......	1,100	2	2	Sour and slightly old cream flavor	28	46°	48°	6	2.8	14.8	35	23	12.5	10	5	85.5
" 3......	1,401	3	3	Very sour, several cans yeasty. One old stale flavor	23.5	48°	48°	5.4	2.6	14.3	33	23.5	14	10	5	85.5
" 25......	1,038	4	1	*709 lbs. fresh and sweet; 329 lbs. slightly sour but good flavor	30	46°	48°	3.76	1.6	13.8	41	24	14.5	10	5	94.5
" 25......	2,099	5	Av'g.	Average lot of cream as delivered at creameries at this season of year. Considering flavor as a basis for grading it would grade about: 1,130 lbs. first grade; 738 lbs. second grade; 231 lbs. third grade. All mixed and allowed to stand over night	29	46°	48°	6	2.2	15	36	23.5	13.5	10	5	88

*A 56 lb. box from this churning secured 1st prize at Western Exhibition.

INSTRUCTION WORK, 1915.—CHEESE.

Instructor and Group.	Factories visited.	No. of Patrons.	No. of full day visits.	No. of call visits.	No. of Patrons visited.	No. of curd tests.	No. of lactometer tests.	No. of Babcock tests for adulteration.	No. of Sediment tests.	Factories making "Whey Butter."	Factories paying by test.	Factories having ice cool curing room.	Factories pasteurizing whey.	Whey fed at factory.	Average per cent. fat in milk for season.	Average per cent. fat lost on whey for season.	New factories.	Cost of new factories.	Estimated expenditure for other improvements.
																		$ c.	$ c.
LISTOWEL— R. A. Thompson	31	2,729	83	101	4	35	2,975	47	1,238	1	7	3	22	2	3.36	.222	2	7,500 00	2,235 00
STRATFORD— G. M. McKenzie	28	2,466	92	114	36	39	5,028	173	1,295	0	11	7	17	2	3.54	.205	2	7,500 00	5,950 00
INGERSOLL & WOODSTOCK A. E. Gracey	31	1,906	65	139	37	30	3,255	281	2,308	1	4	2	19	0	3.35	.217	0	0	5,285 00
SIMCOE & BRANTFORD— Geo. Travis	29	2,066	56	93	41	30	3,600	480	1,400	1	0	0	9	1	3.40	.210	5	9,100 00	4,725 00
LONDON— T. F. Boyes	32	2,411	78	109	44	0	4,784	310	2,179	0	0	0	12	0	3.39	.208	1	2,500 00	2,750 00
Totals and Averages ..	151	11,578	374	556	162	134	19,642	1,291	8,420	3	22	12	79	5	3.40	.212	10	26,600 00	20,945 00

PAYING FOR MILK AT CHEESE FACTORIES.

GEO. H. BARR, OTTAWA.

To divide the proceeds from the sale of cheese accurately among the patrons of a cheese factory, each patron's milk would have to be made up into cheese separately. This, of course, is not practicable. It is, therefore, necessary to adopt some other method of dividing the money. In the early days of cheese-making, there was no practical method of testing the milk from different herds to ascertain its cheesemaking value; a hundred pounds of milk from one herd was considered equally as good for making cheese as that from any other, so the method of paying each patron the same price per hundred pounds of milk was adopted. The introduction of the Babcock test, however, gave a simple and practical method of determining the percentage of butter-fat in the milk, and it was found from experiments and regular factory work that when the fat in the milk increased the yield of cheese increased also. Although it is now over twenty-five years since the Babcock test was introduced, and we have known all that time that one hundred pounds of four per cent. milk will make more cheese than one hundred pounds of three per cent. milk, we still find a large majority of the cheese factories in Canada paying the patrons the same price per hundred pounds of milk. No small amount of experimental work bearing on this subject has been carried out at the agricultural colleges and experimental stations in both the United States and Canada, and it was with a view to emphasize what has already been done rather than with the expectation of throwing new light on the subject that the Dairy Division attempted some further work along this line.

In 1913 the staff of the Dairy Division at the Finch Station, after considerable testing of milk with the Hart casein tester, found that it was difficult to get reliable results under ordinary factory conditions. A continuation of the work in 1914 gave the same results.

The Walker casein tester was tried with better success and it was used in making tests for casein in the experiments made in 1914 and 1915.

In 1914 the milk from individual herds was made into cheese in small vats, the quantities varying from 350 to 800 pounds in each vat. The fat in the milk varied from 3.1 to 4 per cent. milk.

The yield of cheese from 100 pounds of milk varied from 8.29 pounds to 10.75 pounds, or nearly 2.5 pounds more cheese from 100 pounds of 4 per cent. milk than from 100 pounds of 3.1 per cent. milk.

The yield of cheese per pound fat varied from 2.55 pounds to 2.81 pounds, just about one-quarter of a pound.

The yield of cheese per pound casein varied from 3.47 pounds to 4.68 pounds, almost 1¼ pounds.

The yield of cheese per pound fat and casein, added together, varied from 1.47 to 1.73 pounds, or exactly the same variation as in the pounds of cheese per pound of fat.

Taking the actual cheese made as the correct basis for paying patrons, we compared this with five different methods of paying for cheese milk and found the following variations in the price of 100 pounds of milk testing from 3.1 to 4 per cent.

Pooling basis (dividing the total money among the patrons at the same rate per 100 pounds of milk) paid 10.6 cents over and 14 cents under that paid from the actual cheese made, a variation of 24.6 cents.

Fat and casein basis (the actual amount of fat and casein in the milk as shown by the Babcock test and Walker casein test) paid 8.1 cents over and 6.8 cents under, a variation of 14.9 cents.

Fat+2 basis (the factor 2 added to the reading of the Babcock test) paid 6.2 cents over and 4.1 cents under, a variation of 10.3 cents.

Straight fat basis (the fat test only) paid 5.8 cents over and 3.5 cents under, a variation of 9.3 cents.

Fat + calculated casein basis (the Babcock test with a sum added as recommended by Prof. Van Slyke) paid 5.7 cents over and 3.1 cents under, a variation of 8.8 cents, the latter being the nearest to the actual cheese made.

The work was continued in 1915 when the patrons of the Finch Dairy Station were divided into two groups. The high testing milk was put into one vat and the low testing milk into another and the cheese made as carefully as possible, our object being to make a comparison between making the cheese in the large vats and the work of 1914 when the milk from the individual patrons was used. I am pleased to say there is very little difference in the result. The variations from the large vats are not quite so great as in the small vats.

The following table shows the value of 100 pounds of milk containing different percentages of fat and casein from the actual cheese made in 1915 and five different methods of paying for cheese milk:

VALUE OF MILK FOR CHEESEMAKING—CHEESE AT 15 CENTS PER POUND.

% Fat in Milk.	% Casein in Milk.	Lbs. Cheese per 100 lbs. Milk.	Value of 100 lbs. of Milk. Actual Cheese Made.	Fat and Casein Basis.	Fat Basis.	Fat + 2 Basis.	Fat + Calculated Basis.	Pooling Basis.	Difference between Cheese made and Pooling Basis.
			$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	
3.40	2.30	8.95	1 34	1 36	1 31	1 34	1 32	1 41	- 7 cts.
3.50	2.00	9.02	1 35	1 31	1 35	1 36	1 35	1 41	- 6 "
3.50	2.20	9.19	1 38	1 36	1 35	1 36	1 35	1 41	- 3 "
3.60	2.10	9.00	1 35	1 36	1 38	1 39	1 38	1 41	- 6 "
3.70	2.20	9.39	1 41	1 41	1 42	1 41	1 42	1 41	— 0 "
3.70	2.30	9.73	1 46	1 43	1 42	1 41	1 42	1 41	— 5 "
3.70	2.35	9.64	1 45	1 44	1 42	1 41	1 42	1 41	— 4 "
3.80	2.00	9.57	1 43	1 39	1 46	1 44	1 45	1 41	— 2 "
4.00	2.30	9.83	1 47	1 50	1 54	1 49	1 51	1 41	— 6 "
4.10	2.10	10.17	1 52	1 48	1 58	1 51	1 54	1 41	—11 "

SUMMARY OF THE TWO YEARS' WORK.—The pounds of cheese per 100 pounds of milk increases as the per cent. of fat increases in the milk, although not always in the same proportion.

The pounds of cheese per pound of fat tends to decrease as the fat in the milk increases.

The pounds of cheese per pound of fat and casein tends to increase as the per cent. of fat increases in the milk.

The surprising thing about this work is that dividing the money according to the fat and casein tests, does not get any nearer to the actual cheese made from the milk than some of the other methods of payment, and it would appear as if there is not much to be gained by testing the milk for casein. We may, therefore, consider only the other four methods.

In making the cheese in the small vats in 1914 the fat plus calculated casein basis of payment came the nearest to the actual cheese made, straight fat, second, fat plus 2, third, and pooling, fourth. In 1915 when the cheese were made in the large vats, we find again that the fat plus calculated casein basis of payment came the nearest to the actual cheese made, fat plus 2, second, straight fat, third, and pooling, fourth.

In view of these figures and the discussions, addresses and articles written on this subject, I think we factory men and patrons must admit that in continuing to distribute the money among cheese factory patrons at a uniform rate per 100 pounds of milk, we are deliberately choosing that which is wrong and unfair. May we ask, are there good reasons for not adopting the quality basis of payment for cheese milk? One of the first difficulties we meet is the lack of qualified men in our factories to do the testing, which is one of the most regrettable things we have in our dairy industry; yet if the trade demanded men capable of doing the testing, I believe the cheesemakers would qualify. Another point: in Canada at the present time there is a divided opinion as to the proper method of paying cheese factory patrons. I am firmly of the opinion that if our dairy authorities would get together on this subject and advocate some one system of paying for milk, at our cheese factories, the cheesemakers, factory proprietors and patrons would adopt it within a very short time. I am not here to-day to advocate any one system of paying for cheese milk, because I believe under the present circumstances that should be decided by a conference of dairymen, but I am here to say that paying for cheese milk at a uniform rate per 100 pounds is decidedly wrong and unfair, and I am also prepared to say that there are three other methods of paying for cheese milk that are infinitely more accurate and just. I, for one, am willing to have the best method decided in conference and then go out and advocate it over the whole of Canada. I trust the figures I have submitted will help to bring into use an accurate and just system of paying for milk at the cheese factories in Canada at an early date.

George A. Putnam, Superintendent of Dairy Department, Toronto: The subject that I am called upon to lead in the discussion of is a very distasteful one to me, because we have been discussing the problem for a good many years—about twenty-five years I think—and have accomplished little. We have talked about the injustice of pooling the milk, and have suggested ways and means whereby this injustice could be corrected. Very, very few factories are paying according to the quality basis. It appears to me that we had better quit discussing and recommending unless we can recommend something definite and secure action. The men who are looked upon as dairy authorities should get together and decide upon some definite action, then let every person go out and preach the one system and see if something will not result. The difference between any one of the recommended methods and the actual returns from the making of the cheese as indicated by Mr. Barr is not great, and you would do well to choose any of these in preference to the pooling system. After we have done that then we should undertake an educational campaign. I am not sure but what it would be a good thing for the

Powers that Be, I mean the Ministers in charge of the different departments in the Dominion Government and the Provincial Government, to give specific instructions to the dairy specialists that they must get together and come to some definite conclusion regarding this matter. After they have done that they will have the necessary ammunition with which to carry on the fight successfully. Until that time arrives you might just as well quit discussing and recommending this and that and the other thing. I would be pleased to have some of the men who are thoroughly familiar with the practical side of the question take it up and make some definite recommendation at this Convention. (Applause.)

A lengthy discussion took place between Prof. Dean and Mr. Barr as to the relative merits of paying for cheese milk on the straight fat basis and the fat plus 2 basis, reference being made repeatedly to the figures on the chart used by Mr. Barr.

Prof. Dean, continuing the discussion, said: I will point out to you that Dr. Babcock who was the first man to recommend the fat basis has gone back on it. I can point out to you in figures over his own statement that he has gone back on it. If they can show me that there is a better method than the fat-casein method I am willing to accept it. When men like Dr. Babcock have gone back on their statements as to the fat basis we should not adopt it. Fat and casein are the two things in milk which determine its value for cheesemaking. What I said at the Dairy Conference was that no system can be right which does not take into consideration these two elements in the milk, and you cannot settle the thing until you settle it right. Fat never has been and cannot be a fair measure, because it does not take into consideration the casein, and that is my point.

CASEIN-FAT, CANADIAN RENNET AND CHEESE COLOR AND HAND SEPARATOR INVESTIGATIONS.

Prof. H. H. Dean, O.A.C., Guelph.

I. Milk Casein-Fat in Relation to Cheese Manufacture.

It may be of interest at this time to briefly review the question of the milk fat and casein problem as related to cheese manufacture and methods of paying patrons of cheeseries. Previous to 1890, the year when the Babcock milk-fat test was given to the public in America, and the Gerber test was introduced in Europe, all milk for cheesemaking was assumed to be of equal value for this purpose, consequently milk at cheese factories was paid for on the basis of weight delivered. After 1890 a "fat" wave passed over the cheese districts of the United States and Canada. It was advised that milk for cheesemaking should be paid for on the basis of fat content, and it was argued that milk-fat was the determining factor in milk for cheesemaking. A large number of factories adopted this plan. However, some dissatisfaction with this system appeared, for various reasons, chief of which was, it was found that the yield of cheese was not in direct proportion to the fat in the milk, consequently the man who delivered rich or high-testing milk, received more money than he was entitled to on the basis of cheese produced, which seemed to be a fair and logical basis. if this could be ascertained in a practicable manner.

For twenty years (1890 to 1910) the controversy was carried on between what may be called the "Fat school," and the "Casein-fat school." In July 1910, the Wisconsin Experiment Station, which had been the leader of the "Fat School," published Bulletin No. 197, entitled "Methods of Paying for Milk at Cheese

Factories," in which the authors, Babcock, Farrington, and Hart, abandoned the "fat" position formerly taken by the Wisconsin Station. They say in this bulletin, "The value of milk for cheesemaking should be based upon the content of both fat and casein—an allowance of equal values for fat and casein is a just method of payment."

The chief teachers in the "fat-school" having tendered their resignations, the "school" began to show signs of breaking up, and one by one the teachers and pupils started to "crawl under the barn," or to fight a "rear-guard" action. A few pop-guns continue to be fired, loaded with "Butter-fat" balls, but most of these fall in the whey tank, doing no harm except to make a smell, which is suggestive of something dead.

Before there were any practicable casein tests, the head of the Dairy Department at the Ontario Agricultural College, Guelph, advised the adoption of what is known as the "per cent-fat+2" method of dividing money among patrons of cheese factories. We shall not take time to give reasons or results, but simply say that where this system has been fairly tried it has given satisfaction in most cases. It would be too much to expect any system to please everyone or meet all cases, but the underlying principle is correct, namely that the factor two, added to the percentage of fat in the milk, fairly represents the *available* fat and casein in normal milks for cheesemaking purposes, therefore is a fairly sound basis for apportioning money among those who have contributed milk for cheese made and sold during any given time at a cheese factory.

Since this system was introduced practicable factory methods of milk casein determination have been worked out, among which may be mentioned the Hart and Walker Casein tests and the Combined Casein-fat test. During the season 1915, in the Cheese Branch of the Dairy Department, Ontario Agricultural College, seventy-six tests were made of factory milks, ranging from 3 to 3.5 per cent. fat and 1.8 to 2.2 per cent. casein. The average percentages of Babcock fat and Hart casein tests was 5.285; that of the casein-fat tests 5.287. In no case was there a greater difference than two-tenths of one per cent. in the results.

Six Years Tests of Casein in Milks Delivered at O.A.C.

During the past six years each vat of milk used in experimental and investigational cheese work has been tested for casein and fat. We shall not take the time to record the variations and averages of the fat contents of this milk, but the following table shows the highest, lowest, and average casein tests by methods from April to October for the years 1909 to 1915 inclusive:

——	April.	May.	June.	July.	Aug.	Sept.	Oct.
Highest per cent. casein......	2.8	2.7	2.7	2.5	3,0	3.1	3.1
Lowest " "	1.9	1,8	1.8	1.6	1.8	1.9	2.2
Average per cent. casein..	2.2	2.2	2.2	2.0	2.2	2.4	2.6

If we average the monthly averages for the six years we get 2.25 as the "grand" average percentage of casein in the milks as delivered at the Ontario Agricultural College for cheese manufacture in these six years. These results are from the following number of tests made in each of the seven cheese months for six years:

April, 63; May, 109; June, 176; July, 124; Aug., 123; Sept., 88; Oct.. 21; total 704 tests.

Casein in Ontario Factory Milks.

Some of you will remember that during the years 1911 and 1912 the Ontario Agricultural College sent a representative to factories in both Western and Eastern Ontario to test for casein and fat in factory milks. Six factories were visited in Western Ontario and four in Eastern Ontario during 1911; also six factories in Western Ontario, 1912, and six in Eastern Ontario that year.

The results of testing about 1,000 patrons' milk and making about 15,000 casein tests in the two years were:

Per Cent. Casein in Factory Milks.

——	Highest.	Lowest.	Average.
Western Ontario, 1911	2.9	1.6	2.26
" " 1912	3.1	1.6	2.21
Eastern Ontario, 1911	2.7	1.6	2.35
" " 1912	2.6	1.6	2.08

Average Western and Eastern Ontario, two seasons 2.22.

If we compare this average with the average of six years tests for casein at the Ontario Agricultural College we find they agree quite closely, 2.22 and 2.25.

The extreme variations in percentages of casein in all tests are from 1.6 to 3.1 in Ontario Agricultural College milks and 1.6 to 2.9 in factory milks.

Individual and Breed Tests for Casein.

From May 1st, 1908, to Nov. 15th, 1911, the milk of three representative cows of each of three breeds, Ayrshire, Holstein and Jersey, were tested for casein. The extreme variations in casein percentages of individual cows was from 1.6 to 4.8—the high test being just before the cow dried up and when her fat test was 6.6 per cent. This cow's milk (Holstein) ordinarily tested about 3.5 per cent. fat and 2.2 per cent. casein.

Averaging the whole period of these tests we get percentages of casein and fat for the cows of these three breeds as follows:

——	Average %	
	Casein.	Fat.
Ayrshires	2.60	4.01
Holsteins	2.26	3.39
Jerseys	2.69	4.79

Casein Fat Cheese Investigations, 1915.

A brief summary of the work done in 1915 on this question shows that milk testing an average of 3.35 per cent. fat and 2.13 per cent. casein produced 89.76 lbs. cheese per 1,000 lbs. milk when one month old. Milks testing an average of 3.23 per cent. fat and 2.06 per cent. casein averaged 87.56 lbs. cheese per 1,000 lbs. milk—a decrease of 2.2 lbs. cheese per 1,000.

The lots made from the higher testing milk produced slightly less cheese per pound of both fat and casein in the milk; contained higher percentages of fat and moisture in the cheese; and scored slightly lower in quality.

II. Canadian Rennet and Color for Cheesemaking.

It is of great importance under present abnormal conditions in world trade that the Canadian cheese industry shall have all the agents used in the manufacture of cheese, home-made or home-grown. A great industry like this ought not to be dependent on foreign countries for essential ingredients. The fact is that almost the whole of our rennet supplies come from foreign nations, chiefly the United States and indirectly from Europe.

During the season of 1915 we had planned to undertake some investigations on Canadian sources of rennet and methods of rennet manufacture. About the time (April) when we were ready to begin the work, a Toronto firm wrote saying they were experimenting on methods of making rennet and color supplies for cheesemaking, and desired to know if we would test their goods. We agreed to do so and early in the season we tested two brands of rennet furnished by this firm and two lots of cheese coloring. As it took some time before we could note the full effects of these tests, and as the firm assured us they were continuing the work we did not take up the matter of rennet manufacture at the dairy as originally intended.

Without going into the details of these tests of Canadian rennet and color as supplied by the Toronto firm, we may say that the first lot of rennet tested was entirely satisfactory in every way, but they reported that it was too expensive to manufacture and sell at the price then quoted for rennet extract. The other lot tested was weaker requiring double the quantity as used of a standard extract, and consequently there was slow coagulation, excessive loss of fat in the whey and less cheese produced—2.2 lbs. less from 460 lbs. milk, or about 4¼ lbs. less per 1,000 lbs. milk.

The quality of the cheese was satisfactory in both cases.

The first lot of coloring tried was in powder form. The directions were to dissolve the powder in water and then add the solution to the milk. This coloring tinted the milk and curd but gradually faded as the process of making advanced until the green cheese were only slightly colored, and at the end of a month the color had entirely disappeared leaving a white cheese but no bad effects on quality of the cheese.

The second lot, also in powder form, was dissolved in ether as per directions. This coloring would not mix with the milk satisfactorily and the color entirely disappeared in the whey. The worst feature of this lot was that the cheese had a very objectionable flavor, apparently due to the color substance or the ether—in fact the cheese were unsalable.

III. Investigations with Hand Separators on the Effects of Speed, Feed and Temperature of Milk.

The machines used for this work are those in our Farm Dairy, loaned, as a rule, by the manufacturers for educational purposes. The list comprises the following makes: Ankner-Holth, De Laval, Empire, Massey-Harris, Melotte, Premier, Simplex, Standard, Superior, Tubular, and United States. The rated capacity of the machines tested varies from 350 to 850 lbs. milk per hour. The work was carried on once or twice a week throughout the season, taking two or three machines a day on one of the points under investigation and using whatever milk was available for the purpose, but none of it more than twenty-four hours old. The percentages of fat in the whole milk varied from 3.4 to 3.8 and averaged 3.57 for the speed tests; from 3.0 to 3.9 and averaged 3.4 for the feed tests; from 3 to 3.7, averaging 3.4 per cent. fat for the temperature work.

The "normal" speed was that marked on the handle of the spearator by the manufacturer. The variations from this were six revolutions per minute above and six below normal, determined as accurately as possible with a metronome.

The variations in feed were got by having the supply-can full, one-half full, and one-quarter full, tap open, full in all cases. Variations in feed might have been got by varying the degree at which the tap was open, but this would not correspond with farm work.

The variations in temperature of the whole milk were 75°, 85° and 95°F., but in all the other work the temperature of the milk when put into the supply-can was 100°F.

Fifty pounds of whole milk was used for each test or run.

One of the chief practical difficulties in carrying out the work was to properly regulate the water used for wetting, and skim milk for flushing the bowl. Some of the irregularities in results may be accounted for by those factors, which are difficult to control.

The results may be summarized briefly under the following seven heads as regards effects of Speed, Feed, and Temperature of Whole Milk at the time of separating:—

—	Speed Variations— 6 above and 6 below normal	Feed Variations	Temp. Whole Milk 75°, 85° and 95°F.
1. Capacity of machine	No effect in most cases......	No effect until ¼ feed, then decreased cap. 5 to 18 lbs. per hr.	No effect
2. Per cent fat in cream	Increased speed 6 rev., increased % fat in cream 2 to 10 percent. Decreased speed, lessened % fat 2–8 %	Decreased feed, tendency to increase % fat in cream	Increase temp. tendency to increase % fat in cream
3. Per cent fat in skim-milk	No effect within limits stated,	No effect within limits stated	No effect within limits stated
4. Lbs. cream.	Increased speed tends to decrease No. lbs. cream and decreased speed to increase No. lbs.	Decreased feed, less No. lbs. cream	Variations in temp. gave varying results in lbs. of cream, but it is probable that the water or skim-milk used for flushing is an important factor here
5. Lbs, skim-milk	Increased speed tends to increase No. lbs. skim-milk	Decreased feed little or no effect on No. lbs. skim-milk	Tem. little or no effect on lbs. skim-milk
6. Temperature cream	Little effect with tendency for high speed to lower temperature of cream	Temp. cream 90° to 98°, lower temp. with ¼ feed	Temp. cream 1° to 5° lower than whole milk and 1° to 10° lower than skim-milk
7. Temperature skim-milk	Little effect, with tendency for low speed to give higher temp. skim-milk and high speed a lower temperature	Lower temp. with ¼ feed, 95°–99°F.	75° wh. m.=72° to 75° sk.m. 85° " =80° " 84° " 95° " =84° " 95° "

The foregoing are to be regarded as preliminary tests, and some of these results may be considerably modified in future work. We also expect to enlarge the scope of these investigations in the future.

Mr. Myrick: I now take great pleasure in introducing the new President, Mr. James Bristow. Before I leave the chair I want to express my gratitude to the Board of Directors, the Secretary, and the Members of this Association for the kindly courtesy they have always extended to me during my term of office as President of this Association. I also desire to extend my thanks to the citizens of St. Mary's, who have done so much to contribute to the success of this convention. I do not think Mr. Bristow needs any introduction to the dairymen who are present at this meeting. Mr. Bristow is well-known to all the dairymen as a manufacturer, an instructor, and dealer in dairy products. He has also been an efficient and helpful member of the Board of Directors for some time. I now take pleasure in asking him to take charge of the meeting.

James Bristow, President-elect: I assure you that I feel it quite an honor to be elected president of the Dairymen's Association of Western Ontario. I have been attending these conventions for a number of years, and have tried to do what I could to help the work along. I will try to do my best for you in the important position to which you have elected me, and I trust that my efforts will meet with your approval. I will not take up the time of the meeting further, as we have several addresses on the programme.

CREAM GRADING FROM THE PROPRIETOR'S STANDPOINT.

John H. Scott, Exeter.

The subject that I am asked to discuss this afternoon is "The Grading of Cream from the Proprietor's Standpoint." When our secretary wrote and asked me if I would take up this subject at the convention, I replied that I was not in a position to do so, because I have not done any work on cream grading, and had not given it the study that other men had, and I therefore declined to give a paper on that subject; but I consented to take part in the discussion. He asked me if I would open the subject by giving some of the obstacles that I saw in the way regarding cream grading from the proprietor's standpoint. Possibly they are not obstacles, but they have appealed to me as obstacles. We all agree that dairy products should be graded and sold on their merits, there is no question about that, there is not a man in the room who would not agree that that is the proper principle on which we should be paid and pay for all our dairy products. It is a fact that one of the poor features in our cheese factory work has been the paying for milk regardless of quality. The farmer who is taking the best care of his milk and putting it into the cheese factory in the very best condition gets no more for that milk than the man who gets it past the weigh stand by the skin of his teeth. That has been an obstacle in the way of success in the cheese business for all time. We find, in connection with our dairy butter trade, that in the average town the man who makes "axle grease" gets as much for it as the man who makes a choice article. We have come to the point where the subject of grading cream is prominently before the creamery men as never before.

Take one section of the country that I know of, where on seven miles of road there are nine creameries getting cream from the farmers on that road: What are we going to do about grading in a case like that? Some of these creameries are shipping cream to the city, and I have been told here to-day that most of these creameries are using the pipette for testing cream. I know that these men know better than that, but by using the pipette in preference to the scales they can increase the price of their butter fat trom two to three or four cents per pound. They want rich cream, they want cream that will test over 30 per cent., because they do not want to pay for skim milk, and they can increase the price of their fat by using the pipette. Supposing a creamery is using the scales in competition with them, the farmer supposes the business is all done on the same basis, and if one is paying two cents more than the other he will send his cream to the one who pays the highest price. Supposing I started to grade cream in a section like that. I will give a farmer sending second grade cream two cents per pound less than the farmer sending first grade cream; what does he do? He will immediately go where he can get the high price for butter fat. That is one objection, and I cannot understand how we can operate the grading system under such conditions. We know that some of the cream that is shipped stands on the platform until the foam comes over the top with the heat of the sun. Some of the creameries are grading the cream, but the patrons do not know it. I am thoroughly in favor of the grading system if it can be put on a proper basis. I would not like to sit down this afternoon without making some suggestion for improvement. The only suggestion that occurs to me is that the Department send representatives right up into the cream gathering sections of the country where it is impossible to use individual cans, because we have to cover so much territory, and the grading has to be done by the haulers or by taking samples in bottles. These systems do not appeal to me as being practical. I would suggest that the Department should take over a creamery in one of these sections. If it is worth the bother, it will bring more money to the farmer and more business to the creamery. If it is a success it will be a paying proposition, and, if it is not a success, who is better able to lose the money than the Government.

CREAM GRADING.

Mack Robertson, Belleville.

I consider it a privilege and an honor to speak here to-day, not only because it is the meeting of the great Western Dairymen's Association, but because St. Mary's is almost my home town.

Cream grading has been a topic of discussion among creamerymen of Ontario for some time, but at the present date it has never advanced further than discussion. However, the question itself will not down. If it will not down, then there must be a reason for it is continually reappearing. What are those reasons? Poor cream: poor butter. No dairyman would concern himself with poor cream so long as the butter was good, but unfortunately where the cream is poor the butter is poor also. If you expect the butter to be right you must have good cream. We know that we have lots of poor cream: too much. One can of poor cream is one can too much. How did we drift into the production of so much poor cream? How are we going to remedy it?

We creamerymen are being blamed for this poor cream. We are told that "The goblins will get you if you don't watch out." The goblins in this case do not come from dark corners of dark rooms, but rather they come from Alberta, New Brunswick, Nova Scotia, Quebec and Saskatchewan.

The creamery business has grown up from a very humble beginning to one of vast importance in this Province. In the earlier days, if there was any territory which was not progressive enough to support a cheese factory, someone said that a creamery would do there, and so a creamery was started. If a cheesemaker had not enough brains to operate a cheese factory successfully, he was told: "Young man, you have not enough brains to run a cheese factory, you had better operate a creamery," and so he went.

So we have the beginning of our creamery industry—the district that was too poor to successfully support a cheese factory; the maker who did not have brains enough to operate a cheese factory.

We are told that Alberta, New Brunswick, Nova Scotia, Quebec and Saskatchewan are grading cream, and making better butter than we are. Are creamerymen in these Provinces better or more capable than we are in Ontario? Are they more able? Where did these Provinces get their Dairy Commissioners and their creamerymen? Why, we in Ontario, trained these men, or at least most of them. MacDougall of New Brunswick, MacKay of Nova Scotia, Mitchell of Manitoba, Wilson of Saskatchewan, are all Ontario men. The creamerymen who are making this good butter, where did they come from? I will venture to say that seventy-five per cent. of them came from Ontario. Ontario men have shown in these far away Provinces what they can do when they have a chance. What is wrong in Ontario? Is the fault with the same class of men who do so well when they go to other Provinces? I say we creamerymen have not received a proper share of attention. Perhaps it is our own fault. Maybe it is that we are too modest.

We have a large creamery business on our hands, and it needs pruning. Who is to blame that it needs pruning? I believe I speak for the majority of our creamerymen when I say that we will shoulder half of the blame and half of the responsibility. We have none too savory kettle of fish. We will run a pole through the handle, and we creamery men will carry one end of the pole on our shoulders. We will ask the Department of Agriculture and its able and willing staff to carry the other end.

Are we going to grade and how? If we are going to grade, how many grades shall we have? To my mind, one rule for grading will no more apply from Windsor to Ottawa than would the same hat for all ladies in Ontario. Some creameries may find three, four, or five grades necessary. Others might have necessity for only two.

Simplicity is always a sign of efficiency. Especially is this true when the machine or system is to be directed by unskilled hands. Therefore, any system of cream grading should be simple. It should be one that could be easily applied by the creamerymen and more easily understood by the patron. Two grades in most cases are sufficient. I would call these "first" and "second grade."

"First grade" should include all cream from which first class butter can be manufactured. I would not care one iota whether it was sweet or sour, thick or thin, as long as a first-class article of butter can be manufactured out of any lot of cream. I would call that cream "first grade."

"Second grade" should include all cream from which first class butter cannot be made. Again I would not care whether it was sweet or sour, thick or thin. You creamerymen know that plenty of perfectly sweet cream will not make first class butter. You also know that a slight amount of acid does not injure cream for buttermaking purposes.

In these two grades we have simplicity, which should mean efficiency.

Perhaps creamerymen should act in this matter on their own initiative. Personally I do not think they will. Perhaps we should have legislation. Personally I wonder if we will.

If we have legislation, I hope the oil test churn will be legislated into "Kingdom Come." It has done more to injure the quality of our cream than any other factor I know of. Why should I be required to have all my Babcock test bottles Government stamped, and yet other creamerymen can use a form of test that no Government official will uphold? Why should I be required to have all my scales inspected when other creamerymen measure cream with a stick? Why this difference? Is it the creamerymen's fault? Who is to blame?

Why has creamery butter improved so rapidly in the Western Provinces? It is because the Governments of those Provinces acted. When will our creamery butter improve? Will it be when the Ontario Government Acts? Education is a splendid thing. We do not, however, educate the hotel men of this Province to close the bars at eight o'clock.

In closing, I would say to my fellow creamerymen that our patrons will respect our business and ourselves if we are more particular about the raw material which we accept from them.

Mr. G. H. Barr: I know that in the Western Provinces the conditions are different to what they are in Ontario, but at the same time I do not think your difficulties are insurmountable. Let me give you a few figures of what they are doing in the other Provinces, and I do not want to boom these other Provinces. In Alberta last year 96 per cent. of the butter was made from graded cream, 59 per cent. of the butter graded "special"; only 7 per cent. graded "second grade." That is a pretty good record.

In Saskatchewan 98 per cent. of the butter was made from graded cream. One of the largest dealers in butter from British Columbia told me at Calgary that if the buttermakers in Alberta and Saskatchewan made as much improvement in 1916 as they had in 1915 they will control the British Columbia market. I do not know where you will see more progress made than in the Western Provinces. A few years ago Manitoba butter was the worst in the market, but last year 61 per cent. of the creamery butter made in Manitoba was made from graded cream. At the Manitoba Exhibition last year their butter scored equal with that from Alberta and Saskatchewan. This progress has been the result of grading the cream.

There is a very stringent law in Quebec, and if they are able to work it out all the cream in the Province will have to be graded and the farmers will be paid for it accordingly.

Some of the creameries in the Martitime Provinces commenced grading cream last summer. How long will it be before the Western market will be supplying the East with butter? That is a question that you have got to answer. Last year Alberta increased its product by 2,400,000 lbs., and Saskatchewan nearly a million pounds increase. Just as soon as they supply the western market their surplus butter will come east. Then you will be up against something that you have never been up against before, and that is *quality*, and your butter will have to be good enough to send to the Old Country market and compete against Danish butter.

I think the men in Ontario must get ready for that, because I believe it is coming. I believe the dairymen of Ontario are clever enough to take care of their own business. It is difficult to grade under some conditions, but these things will right themselves in a very short time. I hope the people of this Province will take these things up in a serious manner. The Commissioner for Dairying for Saskatchewan told me that all the cream in the Government Dairies is pasteurized, and, judging from the convention held at Calgary, I think all the cream in the Province will be pasteurized next year. They are bound to get the British Columbia trade, and, in order to get it, they have got to compete with New Zealand butter, and they are going to do it. That is the spirit of the West to-day. You can do as you like, but when you get up against the Western creamery men you will have to sit up and take notice. You must get the spirit of *quality* first and then you will get the butter, and you will never get it in any other way. I think grading will become more general in the Maritime Provinces, and it will make a big improvement in the butter down there.

Mr. Scott: I would like to ask Mr. Barr if the Local Legislatures in the Western Provinces gave the creameries any financial assistance in the early days of the grading system?

Mr. Barr: They did it in this way: they took charge of the grading for one year, just to find out how the grading of cream worked out. When they found that they had it on a sound basis, then they went around and showed the results of the work. For the first two or three years they had the strongest opposition. Now that they see the benefit of it they would not do anything else.

A Member: How frequently is that cream collected?

Mr. Barr: As far as I can learn, they collect it three times a week. At many of the creameries where they are paying a high price for it, it is delivered every day, but in most cases every other day. I saw beautiful cream that had been shipped in by train that was fit to go on any table in the land. They pay about 4c. more for this cream than for ordinary churning cream. The samples are taken at the farm the same as in Ontario. These samples are brought to the creamery and graded by the buttermaker. Where it is shipped in to a central point, it is graded from the can.

A Member: Does Mr. Barr consider that the conditions governing the production of cream in the West has some effect on the production of a better grade of cream than we can get in Ontario?

Mr. Barr: No, I do not think so; they are more scattered, and they have no better chance to take care of the cream than you have. Of course they have cooler nights, but you can get that by icing. There is just one thing they have out West that you have not got here; they have the demand for good quality out there. The British Columbia market will pay a good price for a good article.

A Member: Have they not legislation out there that creameries have to be a certain distance apart?

Mr. Barr: That is the Saskatchewan law. Nobody can build a creamery in Saskatchewan unless the Government approves of the plan. You can use a pipette in Alberta.

A Member: When the Babcock test was first introduced it was found that there was not a scale on the market fine enough to weigh the samples, but now they can be got at prices that any creamery man can afford to pay. Mr. Herns told me this morning that there were only 50 creameries using scales, and there are 125 in Western Ontario alone.

Mr. Fred Keyes: Mr. Scott mentioned that on a certain road there were so many creameries, and if you discard a certain farmer's cream he will take it somewhere else. If a man using scales is in opposition with a man who is using the pipette, he has no chance. If a man is sending cream testing 35 per cent. with the scales and it becomes sour it will only test 30 per cent. I say it is not fair to the man who is trying to use his patrons right. If it is right to test with the scales, then every creamery should be forced to test in that way. I think that if we creamery men would co-operate with the farmer and show him that if he sends us a good article of cream we will be able to pay him a higher price for it, then we will get that first class cream that we all desire so much.

THE CHAIRMAN: I think in order to make the grading of cream a success we will have to have some system of grading our butter, and we will have to sell it according to grade. As a dealer, if I could buy a carload of butter and be sure that every box in that car was right, I would be glad to pay the price. There is no use grading cream and then selling first and second grade butter at the same price. Our system is different to that of the Western Provinces. We have so many creameries in the print trade, it would be almost impossible to grade that butter. I think if we can get this system of grading on a proper basis that in time we will win out.

MR. FRANK HERNS: We have had one of the best discussions I have ever listened to at any one of our conventions on this very important point. You can easily understand that it is a simple matter to get on to the platform and talk if you have your facts at your finger ends, but it is another question to work out suggestions from a practical standpoint. Four years ago this agitation was started, and I think you will agree with me that we have reached the point where we are ready to take hold and do something. We have been talking for a long time, but it takes several years to talk before we can get the people thinking along a particular line strong enough to agree to do something. I had the privilege this summer of visiting the Western Provinces. I did not get out there at the time when they first began to grade cream, so that I am not as familiar with that question as I would like to be. One of the things that struck me particularly in the West was the fact that they were laying considerable stress on the question of grading butter as well as cream. Now we have thought that we ought to centre all our efforts on the grading of cream, and rightly so, but after talking with the creamery men and dealers in different parts of the Western Provinces, it would appear that there must be something a little more than grading of cream. In the West they are grading the butter. I know a little about it, and I was delighted with the method the graders adopted. From what I have heard I believe that some of the dealers are willing to meet us half-way on this question of paying for the butter on a quality basis. If we can get our dealers and creamery men to agree upon certain grades for butter, then the big question will be: who is going to pay for and do the actual grading of the butter? We do not want to take any steps until we are sure of our ground. If we start to do something that in a year or so from now will not work out, then we will be farther from our mark than when we began. We want to go carefully and be sure of our ground; I do not care if it takes three or four years before we get a satisfactory system, provided we get what we want in the end. In my paper that was read before the Eastern Dairymen's Convention, I suggested that experimental work might be carried on along the lines of grading cream during the summer, and, at the same time as the cream is graded, the butter made from this cream could also be graded, and in that way we would have an opportunity of judging results. There is no use of our establishing one grade of butter and the buyers another. Mr. Putnam told me before he went away that I might say to you that the Department were interested in this particular line of work and they would assist us in any way possible. I believe that during this summer we will be able, with your co-operation, to do something so that we can bring the matter before the convention next year. We might talk about this for the next twenty years and not accomplish very much, but if we can make a start we can then work up step by step, and if we can get the support of the buyers and the creamery men then I believe we will get something done. I thank you very much for the interest you have displayed in this very important question.

REPORT OF RESOLUTIONS COMMITTEE, 1916.

We have pleasure in submitting the following resolutions:

1. We, the members of this Association, desire to express our appreciation of the kindness of the Mayor and Council of St. Mary's in furnishing the free use of the Opera House for the Convention and the Town Hall for the Dairy Exhibition. We also wish to thank the citizens of St. Mary's for the very kind and hearty reception they have given us.

2. Whereas the excellent addresses given by the various speakers made the Convention successful and of much educational value we desire to express our appreciation of their efforts and extend to them our sincere thanks for their assistance.

3. The thanks of the members of this Association are hereby tendered to the Canadian Salt Co., of Windsor, Ont., through their general manager, Mr. E. G. Henderson, for the very handsome badges presented by their Company to this Association.

4. The thanks of the members of this Association are extended to the press for the excellent reports published by them of this Convention.

5. That the thanks of this Association are hereby tendered to the Heller & Merz Co., New York; C. Richardson Co., St. Mary's; R. M. Ballantyne, Ltd., Stratford; C. H. Slawson & Co., Ingersoll; The J. B. Ford Co., Wyandotte, Mich.; The Canadian Salt Co., Windsor; The Western Salt Co., Courtwright; The DeLaval Dairy Supply Co., Peterboro; The W. A. Drummond & Co., Toronto; The Wells Richardson & Co., Montreal; The Dominion Chemical Co., Syracuse, N.Y.; The Imperial Bank of Canada; Ryrie Bros., Toronto; for the special prizes donated for our Dairy Exhibition.

6. That as dairymen we are under great obligations to both the Ontario Department of Agriculture and the Federal Department of Agriculture for assistance rendered the dairy industry and we wish to express our sincere thanks and appreciation of the work done by these Agricultural Departments.

7. Resolved that the sincere best wishes of this Association is hereby extended to the Hon. Mr. Duff, Minister of Agriculture, for a speedy and complete recovery from his trying illness, and we trust that he may soon be able to resume his many public duties with his old time vigor.

8. That this Association is in accord with any action that may be taken by the Federal Department of Agriculture for the purpose of encouraging the recognition of a national standard for Canadian dairy products.

9. That this Association is in sympathy with any workable plan that may be devised and put in operation by the Provincial Department of Agriculture tending to encourage a grading system for creamery products; also the support of this organization may be counted upon to encourage any movement which has for its object the placing in the hands of milk and cream producers, official and efficient milk and cream cooling tanks at cost.

10. This Association is in sympathy with any action taken by the Federal Department of Agriculture that will insure legislation making the wholesale buying of milk and cream by measurement illegal.

Moved by Mr. Ballantyne and seconded by Mr. Scott, that the report of the Resolutions Committee be received and adopted. Carried.

ANNUAL CHEESE AND CREAMERY MEETING.

The Annual Cheese and Creamery Meeting was held at the Dairy School, Ontario Agricultural College, Guelph, on Wednesday, December 8th, 1915.

The Chairman, Mr. Robt. Myrick, President of the Dairymen's Association of Western Ontario, said that he was pleased to see so many present at this important meeting. The attendance showed the interest taken in the discussion of the subjects provided on the program. After Prof. Dean had welcomed the delegates to the school, question one was taken up for discussion.

Question 1.—To what extent are the patrons of (a) cheese factories (b) creameries, reponsible for any loss on quality?

The Chairman: I asked a patron who was responsible for loss on quality to which he replied, "We, as patrons, are responsible for the quality of the milk." The farmer producing the milk has the first chance to have it good. He can see that the stable and surroundings are in sanitary condition. In taking a cow census some years ago I saw many cases where there was little or no preparation for properly caring for the milk. There were a number of producers who have not yet supplied themselves with a properly constructed cooling tank in which to cool the milk.

Mr. James Bristow: The extent of the responsibility of creameries for any loss of the quality of the butter is a question that is open for a great deal of discussion. The maker has the right to reject any cream that is delivered at his creamery, from which he thinks he cannot manufacture a first class quality of butter. On the other hand, the patrons are responsible, as he has control of the quality of the cream right from the starting point, and the responsibility rests with him, in having the cream delivered to his creamery in the best condition possible. He should see that his cows get good feed and plenty of good water, and that all parts of his separator are kept thoroughly clean, which will enable him to take better care of his cream, and the richer it is the less bulk he has to look after, and will keep better than cream which is thin in butter fat. The buttermaker will also be able to get better results from that kind of cream. He should keep his cream cool from the time it is separated until delivery at the creamery. The cream should be delivered at the creamery every other day if possible, as there is no doubt a great deal of loss on the quality of butter is caused by infrequent delivery of the cream to the creamery. There are a number of patrons of the creameries who do not take enough interest in the quality of the cream they deliver so long as it is accepted by the maker, they think their responsibility ceases. Just how these conditions can be overcome is a question which will be brought up later.

Question 2.—"The best way to get all factory patrons to use a tank for cooling (a) milk for cheese factories (b) cream for creameries."

Mr. Frank Herns: I find it more difficult each year to decide upon questions for discussion at this meeting, and it requires considerable time and thought to provide subjects which will meet with your approval. We have tried, however, to work out a systematic series of subjects which deal with creamery and cheese factory problems as they come up for solution from year to year, reverting from time to time to those subjects which after a year or so become especially interesting through conditions which arise although a few years ago were of comparatively little prominence.

So far as I am aware there has not as yet been any concerted co-operative movement between the manufacturers of cooling tanks and the creamery and cheese factory proprietors to push the sale of these tanks among the producers. Cooling tanks of some kind are a necessity under most producing conditions, and especially is this true if at any time in the future cream grading should be adopted as a general practice. To my mind it would be a good plan for dairymen to decide upon some special kind of cooling tank to be known as "the official cream or milk cooling tanks." This would place the manufacturers in a position where they would have an idea of the kind of tank which would be best adapted for our conditions. I should be glad to know, through a resolution of this meeting, whether or not you would be in favor of supporting a movement along this line; that is, if the manufacturers of dairy machinery decided to place upon the market cooling tanks suitable for the cooling of milk and cream on the farm, would you as factory men be willing to give some assistance in placing these tanks among your patrons, or at least to bring the matter before your producers so that they would know that such tanks were to be obtained already constructed at reasonable cost. We know, of course, that many producers have built tanks after the plans set forth in our cheese factory and creamery circulars and no doubt many more will do so in the future, but it has been suggested that perhaps a greater number of producers would provide themselves with cooling tanks if these were on the market and they knew where to obtain them.

Question 3.—(*a*) *Should the dimensions of the* 56 *lb. butter box be changed?*
(*b*) *The standard weight for creamery butter "solids."*
(*c*) *Cooling cream.*

(*a*) Mr. J. B. Jackson: The dimensions of the present 56 lb. butter box is 12¼ in. by 12¼ in. by 11½ in. inside measurements. The dimensions of the one-pound print as generally cut by cutting machines is 2½ in. by 2½ in. by 4⅝ in., and by placing 12 prints in a tier, 3 prints one way and 2 the other a space of 12 by ⅛ in. is taken up. This leaves ⅛ in. for play and for boxes that are not exactly the right size, and in our experience this ⅛ in. play is not enough to allow the prints to be packed in these boxes rapidly and neatly. I would suggest that the 56 lb. box be made 12½ in. by 12½ in. by 11 in. This would give almost as many cubic inches in the box and would permit of the box being used for prints as well. The fact that 56 lb. boxes can only be used once for solids makes it necessary that it be used for some other purpose the second time. These second hand boxes can be purchased quite reasonably and would, I believe, be a considerable saving.

A Member: Our experience is that we would prefer to use the special boxes constructed for prints rather than to use the second hand 56 lb. boxes.

Prof. Dean: Would it not be a good plan if the 56 lb. box was changed to a 50 lb. box?

Mr. Herns: If all our butter solids were consumed locally a 50 lb. box for solids would, no doubt, be more convenient especially in calculation than the

56 lb. box. but the export trade still demands the 56 lb. box, as does also the interprovincial trade, no doubt for the above reason.

(*b*) MR. JAS. PICKETT: Speaking from my experience as a butter buyer the factorymen should put 56½ lbs. of butter in each box and I find when this is done with careful weighing on accurate scales that I never had any claims to collect for short weight. I consider that it is necessary to have a standard weight but it will be of no benefit to those who are careless in weighing and who use an inaccurate set of scales.

W. H. FORSTER: It is possible that much of the difficulties regarding weights of butter between the creameries and the buyers is due to carelessness in weighing by the buttermaker, in his hurry when particularly rushed with work and also due to the faulty conditions of the creamery scales. We would suggest in order to keep creamery scales in proper working order that when buying a new scale it would be wise to make special arrangements with the manufacturers to have all iron parts galvanized before assembling and to take the precaution of rubbing a little vaseline once a month on the pivot points of the scale, to prevent rusting, for creameries are usually saturated with moisture caused by steam and washing water so that the scales are bound to become damp and will rust unless some precaution is taken to prevent this rusting. Where an old pair of scales has become badly rusted we would recommend that you thoroughly scrape off all the rust. Then rub all metal parts well with vaseline.

Question 3.—(c) Cooling cream.

(*c*) MISS B. MILLER, O.A.C., Guelph: A few experiments were made this summer by taking cream from the separator and dividing it in two cans, placing one in a refrigerator and one in water with ice in it. Fresh cream was to be added to the cans from time to time. The acidity and temperature were to be noted and at the end of a week (or whatever number of days the cream was left) *the condition of the cream* was also to be taken into consideration.

It might be of interest to read the figures of two of the experiments and note the acidity and temperature from day to day.

The cream added ranged in temperature from 74 to 81 degrees but would average 78 degrees.

The following figures give the acidity and temperature of the cream *each morning.*

Refrigerator.		Cold Water.	
Acidity.	Temperature.	Acidity.	Temperature.
.15	51 degrees	.14	46 degrees
.2	53 "	.14	48 "
.27	50 "	.14	51 "
.41	54 "	.14	58 "
.49	57 "	.33	42 "
.53	54 "	.41	66 "

(Ice all melted and temperature up.)

The ice waggon came about ten o'clock in the forenoon. and the temperature of the water around the cream was soon lowered. the temperature of the cream some afternoons being down to 42 degrees.

The rapid cooling of the cream in the beginning was one of the chief advantages of the cold water.

In another experiment the acidity of the cream in the refrigerator was .42 while that in the cold water was .14 on the sixth day.

To sum the whole thing up in a few words would be to say that the cream in the cold water averaged lower in temperature, lower in acidity and had better flavor.

Question 4.—(*a*) *The importance of using sufficient rennet.*

A. E. Gracey: The question of using sufficient rennet to coagulate milk for cheddar cheesemaking is an important one. Rennet has been proven to have considerable power in the ripening process of cheese, therefore a sufficient quantity should be used to bring about this result at all times. In spring cheesemaking, more rennet ought to be used than later in the season, again, when milk is reserved in over-ripe condition. At no time should less than 3 ozs. of standard strength be used to coagulate one thousand lbs. of milk.

When insufficient rennet is used, too much time elapses between adding the rennet and coagulation; consequently the fat globules rise to the surface and imperfect coagulation is the result, with high fat loss in the whey. This effects the yield of cheese.

Perhaps a more serious objection to the use of little rennet, is the time lost in waiting for the cutting period, especially in the summer months when milk is working fast. This "lost time" could be used more effectively in cooking the curd to be ready for dipping time. If the acid is allowed to develop faster than the cooking, a soft curd at dipping is the result with disastrous effects—a poor cheese with poor yields.

This may be the cause of some of the coarse textured cheese we sometimes see in our factory curing rooms.

The European war has had its effect on rennet manufacturing by cutting off large quantities of the dried rennets usually imported from those countries at war, with the result that some of our rennet is not as strong as usual. One dealer going so far as to say that some of our standard rennets are 20 per cent. weaker this year in comparison with the year before.

As there is no prospect at present of cheaper rennet we would strongly advise our cheesemakers not to cut down the materials used in making but rather, if necessary, raise the price of manufacturing.

Question 4.—(*b*) *Turning the cheese in the hoops.*

R. A. Thompson: This is one of the weak points in connection with the manufacture of our cheese. While it may not seem to effect the quality very materially, I think you will get a closer textured cheese by turning them in the hoops in the morning.

Turning the cheese in the hoops certainly improves the appearance of the cheese which is the first thing that impresses a buyer and the first impression is a lasting one. Every manufacturer endeavors to have his product as attractive in appearance as possible which I consider is the best advertisement he can have. Cheese of a clean, tidy appearance is certainly worth more money than an unsightly lot and always gets the preference, and should be one of the best methods to promote a greater trade, home and foreign.

I would say turn the cheese in the hoops and eliminate the bad shouldered and shanty roofed cheese and not be satisfied until you are doing as well as the best. Have every cheese a fancy cheese. Command a good salary and then demand it. This is the way to get paid for doing good work.

Question 4.—(*c*) *Keeping rain water out of the milk.*

MR. GEO. TRAVIS: During the past season much rain has fallen of which more or less fell in milk cans containing milk that was not kept under cover, hence a certain amount of this mixture arrived at the cheese factories and caused trouble in different ways all through the process of cheesemaking. In time past regardless of the weather it has been customary among some to leave the lid off the can during the night thus exposing the milk to the elements. This was done to keep the milk from becoming tainted or spoiled and to allow it to cool naturally. But the practice of the above method should be discontinued for many reasons, some of which are:

1. The impossibility for the receiver to estimate the exact amount of water that should be deducted from each can on a rainy morning.

2. It would be unfair to make any reduction for rain water if the milk has been kept under cover. Should the weight be more in pure milk it would also be discouraging to continue to keep the rain water out.

3. Rain water hinders in making an accurate acid or rennet test as to the proper time for adding the rennet for coagulation.

4. Milk heavily diluted with water would not be in a proper condition for the action of the rennet to get a good coagulation. This being the case there must necessarily be a greater loss of fat in the whey than from pure milk.

Since milk is known to be an article of food which is very valuable and so susceptible to any taint caused by adulteration or otherwise, is it not time to provide proper milk houses in which to keep milk where it can be properly cared for, thus eliminating many of the troubles that we have had in the past?

Question 4.—(*d*) *Testing curds for milling.*

MR. T. F. BOYES: I believe that curds should be tested for milling, especially for the benefit of the younger makers and more especially when handling abnormal milk. While we know that many of the experienced makers are able to make fine cheese without testing yet the younger maker will find it difficult to do so.

In the earlier days of cheese making different systems of manufacturing were practised and different tests used for milling.

First System. After the whey was drawn from curd the curd was stirred a time then salted. No milling.

Second System. After whey was drawn curd was piled in a pan, matured, considerable amount of acid allowed to develop. Milled and salted. No particular test used for milling.

Third System. Curd was piled on racks matured and flinted then milled, aired and salted. Flinting was the test for milling.

Fourth System. This system was similar to the former only hot iron was used as a test for milling.

Up to this time each of the former systems and tests for milling made some fine cheese in the hands of some makers, but was not practical in the hands of the inexperienced men.

At the present time the acidimeter is the test used for milling which is by far the best test we have ever used because it is practical in the hands of all makers.

In using this test great care is necessary to be used in getting the sample. I would recommend getting it from directly under the curd.

Benefits derived from testing curds for milling:

1. It's a check on the dipping point.
2. A check on the proper time required for cooking curds.
3. A check on the cooking temperature.
4. A check on the amount of culture used.

It is also a great assistance in releasing makes from having odd batches of sweet cheese also odd batches of acidy cheese.

I am satisfied it is of the greatest benefit in assisting all makers to make a more uniform quality of cheese.

Question 5.—The Registration of Cream Buying Stations.

Mr. F. Herns: Several creameries have, during the past year, opened up cream buying stations, about 40 of these having been in business. The Dairy Act does not, at present, state that persons operating these cream buying stations must hold certificates of qualification to test milk or cream, but no doubt a section will be inserted shortly which will cover this point. The "Act," however, does cover the matter of registration and sanitation, that is, these cream buying stations must be registered with the Department of Agriculture before they can do business, and the sanitary conditions must comply with those laid down in the Dairy Act for cheese factories and creameries. All operators or owners of cream buying stations should apply to the Department of Agriculture at Toronto for registration upon notification of which our creamery inspectors will visit these places and report upon their condition, and if they are not in proper sanitary condition to be registered they must be put in such condition before registration can take place, otherwise they are liable to the same restrictions under which other dairy plants are placed.

Question 6.—The Pasteurization of Cream for Buttermaking is not General. Why?

Prof. H. H. Dean: The pasteurization of all cream from which butter is made is strongly agitated in the United States at the present time; partly as a result of a long-desired improved quality in American butter and partly as a result of the somewhat sensational articles recently published by a prominent New York paper, criticising present methods, and calling attention to the supposed dangers to public health in consuming butter made from raw cream. Three of the American states have asked, through their dairy organizations, that compulsory pasteurization of cream for buttermaking be enacted by the legislature of these states.

This agitation will likely spread to Canada in the near future, where this subject has been discussed for a number of years. Ontario buttermakers may as well prepare for pasteurization voluntarily, as it is sure to come in some form before long.

The objections commonly raised to pasteurization are:—

1. The cost. Tests made at the O.A. College indicate that the cost for fuel and water to pasteurize and cool the cream to make 100 lbs. butter was 3.2 cents.

According to U.S. Government tests, the cost of pasteurizing cream, including interest on investment, depreciation of machinery, labor, repairs, coal at five dollars per ton, water at fifty cents per 1,000 cubic feet, and ice at one dollar per ton, was per 100 gallons of cream, 45 cents; and per 100 lbs. fat in 30 per cent. cream, 18 cents. Estimating an "overrun" of 20 per cent., the cost per 100 lbs. butter would be fifteen cents.

Therefore the cost objection is not a valid one and is not a reasonable excuse for not pasteurizing.

2. Pasteurizing machines are too expensive and not satisfactory. This was probably true of the earlier types of machines, but it is not true to-day, as there are several makes now on the Canadian market that are satisfactory and can be purchased at a reasonable price, considering capacity and efficiency.

3. Heating and cooling capacities of the creamery were not sufficient. This can and ought to be remedied. Every creamery ought to have sufficient boiler capacity to do all work satisfactorily, and the water supply should be ample and cold enough to do the necessary cooling. Where this is not the case, a large supply of ice or mechanical refrigeration is needed.

4. The loss of fat in buttermilk is too great, thus reducing the "overrun," causing waste and increased cost of manufacture. This can be entirely overcome by having the cream delivered sweet or nearly so, and this condition of sweet cream delivered is advisable, if for no other reason, on the ground of making the conditions more favorable for a better quality of butter, which is very much needed in Western Ontario at the present time, where the quality is not so good, generally speaking, as it might be.

Cream grading, combined with pasteurization, will do much towards improving the quality of Ontario butter.

Question 7.—The 82½ per cent. Fat Standard for Butter.

Mr. J. F. Singleton: There are two federal laws in the country which define butter from a legal standpoint, viz., the Dairy Industry Act, which is administered by the Dairy and Cold Storage Branch of the Dominion Department of Agriculture, and the Adulteration Act, which is administered by the Inland Revenue Department.

The Dairy Industry Act requires that the fat of butter be genuine milk fat, and that the butter contain not over 16 per cent. of water. An Order-in-Council under date of November 3rd, 1910, passed under authority of the Adulteration Act, defines butter as:

"The clean, non-rancid product made by gathering in any manner of fat of fresh or ripened milk or cream into a mass, which also contains a small portion of the other milk constituents, with or without salt, and contains not less than eighty-two and five-tenths (82.5) per cent. milk fat, and not more than sixteen (16) per cent. of water. Butter may also contain added colouring matter of harmless character."

That is, a butter may contain not over 16 per cent. of water and be legal under the Dairy Industry Act. The same butter, if salted, will in all probability contain less than 82.5 per cent. fat and would be considered adulterated under the Adulteration Act.

The average casein content of butter is given by many authorities as 1 per cent. The salt content of our butter varies in different parts of the country. The west demands rather light salting, as compared with the average butter consumed in Ontario. Ontario butter will probably average over 2.5 per cent. of salt, and much of it will contain 3 per cent. of salt. Assuming that the average casein content of butter is 1 per cent. and that the average salt content is 2.5 per cent., if the legal maximum of water (16 per cent.) is incorporated, the fat content will be 80.5 per cent. While such butter is considered legal under the Dairy Industry Act, it is adulterated under the Adulteration Act, since the fat content is less than 82.5 per cent. In order to modify such butter to comply with the Adulteration Act (assuming that the casein content will remain at 1 per cent.) two courses are open to the buttermaker: First, the salt content may be reduced from 2.5 per cent. to .5 per cent., thereby increasing the fat from 80.5 per cent. to 82.5 per cent., which will give butter of the following composition:—

Water	16.0%
Salt	0.5%
Curd	1.0%
Fat	82.5%
	100.0%

Since our markets will not accept a butter of only .5 per cent. salt, this is not practicable.

The other course must be adopted, viz., reduce the water content to 14 per cent., giving a butter of the following composition:—

Water	14.0%
Salt	2.5%
Curd	1.0%
Fat	82.5%
	100.0%

If the salt is increased to 3 per cent., as many creameries are aiming for, the water content must be reduced to 13.5 per cent. to have butter which will comply with the 82.5 per cent. minimum fat standard.

Of 1,810 samples of butter tested for moisture by inspectors of the Dairy and Cold Storage Branch, all of which tested 16 per cent. and under, 662 samples contained 14.1 per cent. to 16 per cent. of water. That is, if the butter tested contained 3.5 per cent. of curd and salt, 36 per cent. of it was adulterated under the 82.5 per cent. minimum fat standard of the Adulteration Act.

Should our standards make allowance for any legitimate variations in composition, at the same time giving consumers what they demand? Since consumers demand 2.5 per cent. to 3.0 per cent. of salt in butter, does the minimum fat standard of 82.5 per cent. make allowance for the legitimate variations in composition? That is, is it practicable to keep the water content of butter down to 13.5 per cent. at all times? This must be done to comply with the 82.5 per cent. minimum fat standard if the butter contains 3 per cent. of salt and 1 per cent. of curd.

Since we have two standards, viz., a maximum water standard and a minimum fat standard, should these two be made to conform in such a way that they will not conflict? That is, should the minimum fat standard be such that the maximum legal water content may be secured in butter salted to suit our grade? If so, since the maximum water standard is the same in all butter-producing countries and cannot well be changed, what should the minimum fat standard be?

Mr. Mack Robertson: It appears to me that this is something that all creamerymen should interest themselves in. We have a law which says that we can incorporate 16 per cent. of moisture in our butter.

We have another law which says we cannot incorporate 16 per cent. of moisture —not in so many words, but it means the same thing. It is impossible to have 16 per cent. of moisture, 82½ per cent. of fat, and enough salt to please the consumer. In Eastern Ontario we find that the consumer demands from 3.5 to 4 per cent. of salt.

The writer is informed that Alberta butter, which scored the highest, kept the best, and resembled New Zealand butter, was one with a large per cent. of water. Other packages of butter out of the same churning which has less moisture, were poorer in flavor.

No legislation would be enforced that would compel our cheesemakers to make a poorer grade of cheese. Why should creamerymen be forced to make poorer butter? An eighty-two and one-half (82½) per cent. fat standards means less moisture. Less moisture means poorer butter. Poorer in both texture and flavor.

Creamerymen have their reputation at stake. I believe the great percentage of them are anxious to observe the law. No creameryman can afford to be hauled into court as a criminal. His reputation for honesty amongst those from whom he buys cream and to whom he sells butter is a business asset of inestimable value.

The law should be fair. If the moisture content is controlled by Government Inspectors and the salt content by the consumer, then there is no real need for a fat standard whatever.

Question 8.—What is the Best " Solution " in which to Keep the Rubber Parts of Milking Machines?

(For the discussion of this question see Professor Lund's paper on " How to Get Clean Milk with a Milking Machine." Report of the Convention of the Dairymen's Association of Western Ontario, held at St. Mary's, Jan. 12th and 13th, 1916.)

Question 9.—The Best Way to Get the Sediment " Disk " to the Patrons Who Do Not Deliver Their Own Milk.

Geo. M. McKenzie: In saying a few words in reference to the milk sediment test and the best way to reach the patrons where the milk is delivered on routes, it may be well to state that early in the season of 1914 when the sediment test was introduced to the Dairy Instructors by Mr. Frank Herns, the method adopted was to place the disks on cardboard and each disk was numbered to correspond with the patron's number on the milk book. The card was hung up in a place where the patron, by finding his number could see the amount of sediment or dirt in his milk. This worked out with good results where the patron delivered his own milk, but was really useless to the patron on routes. During the season of 1915 it was suggested to use the leaflets on the care of milk furnished by the Department instead of the cardboards, which worked out with fairly good results, but in many cases they were left in the factory owing to the fact that they were bulky and caused too much trouble, etc. I would suggest as a better plan to reach the patron on routes would be to use a card similar to a postcard with a few pointers, telling or explaining what the milk sediment test meant and the effect of dirty milk on the finished products, cheese or butter.

1. I would suggest the patron's name, also having the disc placed on one corner and stating:—

This is the amount of sediment or dirt from one pint of your milk delivered this morning.

Clean, sweet milk means more cheese of a higher standard. Good clean strainers are a necessity.

Clean milk has better keeping qualities than dirty milk. If necessary other suggestions can be added.

Mr. W. H. Forster: In taking sediment tests we follow the practice of making a duplicate test. One disk is placed on a sediment test card, allowed to dry, which cements it to the card, and the other disk we put into a sediment test book under the patron's name, having a page for each patron. We are thus able to have before us a record of all tests made of each patron's milk, and we find that whenever a patron visits our factory he is greatly interested in our sediment test book and makes a comparison between his own test and the test of his neighbor's. This is an incentive to produce clean milk in order to show a clean record. In order to get the sediment test to the patrons we place the sediment test card in an envelope, putting the patron's name and address on the envelope, and give this to the drawer to give to the patron, providing we feel reasonably sure that he will do so. If we have any doubts of the reliability of the drawer in this respect we mail the envelope to the patron. We believe this pays well, because we have gone to considerable trouble in making this test and we want to be sure that the patron gets the result, and thus our efforts are not wasted. We make constant use of the sediment test and find it valuable.

Mr. F. Herns: The instructors have not been using the milk sediment test for two seasons, and we find a great deal of interest among the patrons on this point. Where the patrons deliver their own milk it is an easy matter for them to see the result of the test, but where the milk is delivered on routes this is more difficult, and we would feel very much indebted to the factory men, and we are sure it would be in their own interests as well as that of the patrons who produce clean milk to co-operate and assist in getting these sediment tests before all the patrons. We hope next year to be able to work out a plan that will be satisfactory to all, and we will be glad to have your co-operation.

Question 11.—*In Grading Cream, What Should be the Standard for Grade* (*a*) *First,* (*b*) *Second,* (*c*) *Third,* (*d*) *What Difference in Price Should be Made Between Each Grade?*

Mr. D. McMillan: In setting a standard for cream grading I think the fat content should be considered, and for first grade cream would suggest the following standard: The cream must be sweet, of good, clean flavor, and contain not less than 30 per cent. fat. It may be true that a cream containing less than 30 per cent. fat will, if properly cared for, make as good butter, but as it is much more difficult to keep a thin cream sweet, we find very little of it arriving at the creameries in good condition, and we cannot get away from the fact that in order to make a first-class butter we must have sweet cream of good flavor to start with.

I also think it would be quite an easy matter for the patron to skim a cream containing not less than 30 per cent. fat, and if all patrons would do this the cream would arrive at the creamery in much better condition.

Mr. Neil McPhail: I take issue with grading cream of a good flavor when sweet higher than cream of a good flavor when sour, basing my objection on the fact that had the two lots of cream been graded at the farm the latter might be the better cream, but owing to the length of time taken to get it to the creamery, either by rail or hauler, it might, when received at the creamery, be sour.

This grading of cream opens up many difficulties, among which is the attitude of the patron to the creamery, and it seems to me that the grading ought to be done at the farm in order that the careful patron living a long way from the creamery should not be penalized because the creamery does not operate nearer to him.

To my mind the responsibilities of the patron ends when the hauler takes his cream or when it is shipped from the station. Why should the patron be charged with hot weather and mileage.

Mr. Mack Robertson: I do not altogether agree with Mr. Stratton's grading or ideas of grades. Too many grades are confusing.

I would suggest that first grade be cream of say between 30 and 35 per cent. fat or higher. Perfectly sweet and to which no fault could be found with the flavor.

Second grade cream would be designated as cream of fair flavor, slightly sour, and having a fat content of from 25 to 29 per cent.

All cream off in flavor, extremely sour, and low in fat content should be classed as third grade.

It is hard to lay down a rule that is always applicable. Some thin cream might be of very best quality as regards flavor and sweetness. Some 35 per cent. cream might be worse than third grade owing to some unusual condition.

The man who accepts the cream must have a broad standard of grading rules and a broad vision in applying them.

Question 12.—*How to Get the Money to Conduct an Advertising Campaign for Cheese and Butter?*

Prof. H. H. Dean: Briefly, three methods may be suggested:

1. Request a Government Grant for the purpose, such as has been done in the case of advertising Canadian fruit. While it is, no doubt, a sound principle that those who benefit should bear the cost of advertising their goods, it would seem that if a departure from this rule is made in one case there is no good reason why the Government should not do so for other branches of agriculture.

2. Place a tax on the cows or their products. While taxes are always unpopular, if the owners of dairy cows and the manufacturers of dairy products could be convinced that the money would be wisely spent and that they would likely receive great benefits in the form of increased demand and greater prices for their goods, they would be willing to pay a small tax for the purpose. Without going into details, as I am not an advertising expert, I would suggest a tax of one cent per cow for a period of five years, and that the manufacturers contribute an equal sum, which would furnish $50,000 per annum—a quarter of a million dollars in five years. This latter is the sum which the National Dairy Council of the United States proposes to spend annually on a similar project.

3. The third plan is to form a club which might be called the 100,000 Dairy Club, by which one hundred thousand men interested in the advancement of dairying in Canada would contribute fifty cents each annually for a period of five years, thus raising the estimated amount required to put the campaign on a sound basis and insure its continuation for a period long enough to obtain results.

Many details would have to be worked out, but the foregoing, in brief form, are suggestions whereby the Canadian consumer might be induced to spend less money for "booze," tobacco, candy, and other more or less harmful stuff, and more money for milk and its products, which are the cheapest and most wholesome goods the people can buy. The public does not sufficiently appreciate the food value of dairy products. The only way to convince people of this fact is to use "printer's ink," because the newspapers, and the agricultural and commercial press, have the ear of the public in a way that cannot be equalled by any other agency known at the present time. Everybody reads the newspaper and most people believe what they read in these publications. The press is able to hypnotise its readers, and, so long as this power is not abused, but used for legitimate purposes, it is a good thing. Up to the present, the dairy industry has taken little or no advantage of this method of creating a sympathetic public and an increased demand for their goods. In fact, if anything the tendency is for the newspapers to prejudice the public against an increase in the price of milk, butter, cheese, etc., and to create alarm in some cases. Jokes about "watering milk," "disease germs in butter," and "cheese strong enough to walk-up-out-of-the-cellar" are quite common. This should be met with counter attractions and exact statements as to food values, cleanliness of product, etc.

RESOLUTIONS.

1. Moved by W. G. Jackson, seconded by Mack Robertson, "That whereas the Ontario butter market requires about 3 per cent. of salt in butter, the average analysis shows about 1 per cent. of curd; the Dairy Industry Act and Adulteration Act both allow 16 per cent. of moisture. We believe, therefore, the fat standard for butter should be not more than 80 per cent. instead of 82½ per cent."

2. Moved by Mack Robertson, seconded by Geo. Cousins, "That the Ontario Dairy Act be amended in such a way that every person, who in the course of his business operates a milk or cream buying station and tests the milk or cream for fat for the purpose of paying the producers on such test, shall be required to hold a certificate of competency before being allowed to do such testing."

3. "That this meeting is in favor of any movement which will assist in putting into the hands of milk and cream producers cream cooling tanks, which tanks shall be approved by Ontario dairymen.."

The meeting then adjourned.

REPORT OF THE DAIRY SCHOOL, ONTARIO AGRICULTURAL COLLEGE, 1916.

Lecturers and Instructors, 1916.

H. H. Dean, B.S.A.	Professor of Dairy Husbandry.
R. Harcourt, B.S.A.	Professor of Dairy Chemistry.
A. L. Gibson	Lecturer of Dairy Chemistry.
D. H. Jones, B.S.A.	Professor of Dairy Bacteriology.
J. E. Simmons	Lecturer in Dairy Bacteriology.
T. J. McKinney	Instructor in Cheese Making.
W. H. Sproule	Instructor in Milk and Cream Testing.
G. Travis	Instructor Hand and Power Cream Separators; also in Boiler, Engine, Piping, Soldering, etc.
D. McMillan	Instructor in Ice Cream Making and Butter Making.
Miss Belle Millar	Instructress in Farm Butter Making and Farm Dairy, Soft and Fancy Cheese Making.
J. B. Smith	Instructor in Hand Separators and Milk Testing, Farm Dairy.

The total registration for all the Courses at the Dairy School in connection with the Ontario Agricultural College for the session of 1916, was eighty-five. A number of those taking the regular twelve weeks' course remained for one or other of the special week courses in Cow-Testing, Ice-Cream and Soft and Fancy Cheese Making.

The Soft and Fancy Cheese Course was a new feature in the Dairy School this year. There is a growing demand for fancy cream cheese, one pound Cheddars, Brick, etc. These are all made, and instructions given, in the Soft and Fancy Cheese Course. Miss Belle Millar, in charge of this branch of the Dairy, has developed this phase of dairying together with the manufacture of lactic buttermilk from skimmilk, Bacillus Bulgaricus buttermilk, and the making of a mild alcoholic drink from milk-all which promises very interesting and important results, especially in view of the fact that Ontario will be "dry" in the autumn of 1916. It is considered that something should be provided to take the place of the ordinary alcoholic drinks as mankind usually resents interference with privileges unless substitutes are provided. "Milk-beer" would seem suitable as a substitute for those accustomed to something stronger.

The Cow-Testing Course is one of the most popular dairy courses given, chiefly, I presume, because it fits men for testing cows officially and enables them to secure pleasant and profitable work during winter, when many cheese and buttermakers and a number of farmers' sons have more or less spare time. Quite a number also take this course in order to know how to test the cows in the home herd.

The manufacture of ice-cream as a side line in Creamery work is an important and growing phase of the dairy business.

The regular twelve weeks' course consists of a series of lectures and laboratory instructions on Dairying, Dairy Chemistry and Dairy Bacteriology. In addition, there are lectures on Veterinary Science, Mathematics, Book-keeping, Cold-storage and other allied dairy subjects, making a very complete course, considering the short time allotted. A two-year Course would be better.

The Class is divided into two parts—Factory and Farm Dairy. Both take the same lectures, but the practical work for the Farm Dairy Section is that most suited for the farm, while the Factory Class works with machinery used in a factory.

At the close of the term, twenty-seven students wrote on the factory course and seven on the Farm Dairy examinations. All but two in the Factory Class passed the tests.

Lack of room in the Dairy Buildings prevents the addition of other new lines of dairy instruction, such as Condensed Milk, Milk Powders, Homogenized Milks, Town and City Milk and Cream Trade, etc. With the present inadequate equipment, we are obliged to confine Dairy instruction largely to the more common and well-tried lines of dairying.

I wish to express appreciation of the excellent help given by the Dairy School Instructors and by the Demonstrators, Lecturers and Professors of the College Staff, more particularly those in the Chemical and Bacteriological Departments.

EASTERN DAIRY SCHOOL, KINGSTON, 1916.

OFFICERS AND STAFF.

Director.—Geo. A. Putnam, B.S.A. Toronto.
Superintendent.—L. A. Zufelt Kingston.

Staff of Lecturers and Instructors.

L. A. Zufelt	Dairy Lectures.
W. T. Connell, M.D.	Professor of Dairy Bacteriology.
W. O. Walker, M.A.	Professor of Dairy Chemistry.
J. H. Echlin	Instructor in Cheese Making.
W. G. Gardiner	Assistant in Cheese Making.
R. E. Elliott	Instructor in Butter Making.
S. S. Cheetham	Assistant in Butter Making.
J. Buro	Instructor in Separators.
Geo. H. Barker	Instructor in Milk Testing.
J. A. Craig	Engineer.
Ethel Lake	Office Assistant.

The attendance at the School for the session of 1916 was somewhat larger than the previous year, being as follows:

Eleven weeks' course for cheese and butter makers	62
One weeks' course for Eastern Dairy Instructors	21
Total	83

Of the total attendance of sixty-one students, twenty-one took the entire course and are qualifying for diplomas.

Very little change is made in the course of instruction from year to year except in so far as is necessary to keep in touch with improved methods.

For demonstration purposes, upwards of 75,000 lbs. of milk and 40,000 lbs. of cream were manufactured into cheese and butter respectively during the session.

The demand for supervisors for the "Record of Merit" still continues to grow, and may reach such proportions in the near future as to require special provisions for coping with the situation.

SUMMARY OF LAST YEAR'S CREAMERY OPERATIONS.

Total lbs. of butter made for the year ending December 31st, 1915	90,444
Total receipts received for sale of butter and cream	$29,825 69
Average selling price per lb. of butter	32.3c.
Average price paid patrons per lb. of fat	36.96c.

In order to set an example to the creameries of Ontario and demonstrate the fact that the average dairy farmer will respond to higher prices for a higher grade of cream, it was decided to introduce a system of cream grading this year whereby "those delivering a perfectly sweet, clean-flavored cream will receive a premium of 2c. per lb. of fat over those whose cream may be sour or slightly sour but otherwise of clean flavor. Any cream offered which cannot be placed in the first or second grades, the right is reserved to either accept at a fair valuation in accordance with its condition or reject entirely." This proposition was placed before the patrons of the Eastern Dairy School Creamery at the annual meeting and was unanimously adopted.