SESSIONAL PAPERS

VOL. XXXI.—PART V.

FIRST AND SECOND SESSIONS,

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OF THE

PROVINCE OF ONTARIO.

SESSIONS 1898-9.

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LIST OF SESSIONAL PAPERS.

ARRANGED APHABETICALLY.

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LIST OF SESSIONAL PAPERS.

Arranged in Numerical Order with their titles at full length; the dates when Ordered and when presented to the Legislature; the name of the Member who moved the same, and whether Ordered to be Printed or not.

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No. 1.. Return from the Records of the General Election to the Legislative Assembly in 1898, shewing: (1) The number of Votes polled for each Candidate in each Electoral District in which there was a contest. (2) The majority whereby each successful Candidate was returned. (3) The total number of Votes polled in each District. (4) The number of Votes remaining unpolled. (5) The number of names on the Voters' List in each District. (6) The population of each District as shown by the last Census. Presented to the Legislature, 3rd August 1898, and also :—Return from the Records since the General Election to the Legislative Assembly in 1898, shewing:—(1) The number of Votes polled for each Candidate in each Electoral District in which there was a contest. (2) The majority whereby each successful Candidate was returned. (3) The total number of Votes polled in each District. (4) The number of Votes remaining unpolled. (5) The number of names on the Voters' List in each District. (6) The population of each District as shown by the last Census. Presented to the Legislature, 1st February 1899. *Printed.*

No. 2.. Report of the Minister of Education for the year 1898, with the Statistics of 1897. Presented to the Legislature 3rd March, 1899. *Printed.*

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No. 3.. Public Accounts of the Province for the year 1898. Presented to the Legislature 8th February, 1899. *Printed.*

No. 4.. Estimates for the year 1899. Presented to the Legislature 8th February 1899. *Printed.* Estimates (supplementary) for the year 1899. Presented to the Legislature 30th March, 1899. *Printed.*

No. 5.. Report of the Commissioner of Crown Lands for the year 1898. Presented to the Legislature 22nd March, 1899. *Printed.*

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No. 6.. Report of the Department of Immigration for the year 1898. Presented to the Legislature 17th March, 1899. *Printed.*

No. 7.. Report of the Inspector of Division Courts for the year 1898. Presented to the Legislature 23rd February, 1899. *Printed.*

No. 8.. Report on the working of the Tavern and Shop Licenses Acts for the year 1898. Presented to the Legislature 15th February, 1899. *Printed.*

No. 9.. Report of the Commissioner of Public Works for the year 1898. Presented to the Legislature 23rd February, 1899. *Printed.*

No. 10.. Report of the Inspector of Insurance and Registrar of Friendly Societies for the year 1898. Presented to the Legislature 27th February, 1899. *Printed.*

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No. 12.. Report upon the Common Gaols, Prisons and Reformatories of the Province for the year ending 30th September, 1898. Presented to the Legislature 17th March, 1899. *Printed.*

No. 13.. Report upon the Houses of Refuge and Orphan and Magdalen Asylums of the Province for the year ending 30th September, 1898. Presented to the Legislature 29th March, 1899. *Printed.*

No. 14.. Report upon the Hospitals of the Province for the year ending the 30th September, 1898. Presented to the Legislature 27th March, 1899. *Printed.*

No. 15. Report upon the Institution for the Education of the Blind, Brantford, for the year ending 30th September, 1898. Presented to the Legislature 8th February, 1899. *Printed.*

No. 16.. Report upon the Institution for the Education of the Deaf and Dumb, Belleville, for the year ending 30th September, 1898. Presented to the Legislature 8th February, 1899. *Printed.*

No. 17.. Report of the Work under the Children's Protection Act for the year 1898. Presented to the Legislature 23rd February, 1899. *Printed.*

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No. 36. Analysis of Reports of Agricultural and Horticultural Societies of Ontario for the year 1897. Presented to the Legislature 22nd March, 1899. *Printed.*

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No. 39.. Report of the Board of Health for the year 1898. Presented to the Legislature 28th February, 1899. *Printed.*

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No. 40.. Report of the Financial Statements made by Loan Corporations for the year 1898. Presented to the Legislature 29th March, 1899 *Printed.*

No. 41.. Report of the Provincial Municipal Auditor for the year 1898. Presented to the Legislature 20th February, 1899. *Printed.*

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No. 43.. Copy of Order in Council approving of certain appointments on the Staff of Upper Canada College. Presented to the Legislature 10th August, 1898. *Not printed.*

No. 44.. Copy of Minutes of the Department of Education approving of certain Regulations. Presented to the Legislature 10th August, 1898. *Not printed.*

No. 45.. Copy of an Order in Council approving of Regulations governing the disposal of Water Powers. Presented to the Legislature, 19th August 1898. *Not printed.*

No. 46.. Copy of an Order in Council respecting the terms and conditions governing the lease of Corundum Lands. Presented to the Legislature 19th August, 1898. *Not printed.*

No. 47.. Copy of an Order in Council approving of Regulations for Mining Divisions. Presented to the Legislature, 24th August, 1898. *Not printed.*

No. 48... Copy of an Order in Council approving of certain amendments to the Regulations for Mining Divisions. Presented to the Legislature, 24th August, 1898. *Not printed.*

No. 49.. Copy of an Order in Council establishing the Michipicoten Mining Division. Presented to the Legislature, 24th August, 1898. *Not printed.*

No. 50.. Reports relating to Toronto University. Presented to the Legislature, 2nd March, 1899. *Printed.*

No. 51.. Report of the Librarian on the state of the Legislative Library. Presented to the Legislature, 2nd February, 1899. *Not printed.*

No. 52.. Report of the Inspector of the House of Refuge, County of Waterloo. Presented to the Legislature, 8th February, 1899. *Not printed.*

No. 53.. Copy of Order in Council respecting the payment of surplus Surrogate Court Fees to Judge Jamieson. Presented to the Legislature, 8th February, 1899. *Not printed.*

No. 54.. Copies of Orders in Council commuting Surrogate Court Fees of Judges Huges, Barron, Elliott, Doyle, Monck and Mosgrove. Presented to the Legislature, 8th February, 1899. *Not printed.*

No. 55.. Statement as to the disposal of the Sessional and Revised Statutes of Ontario. Presented to the Legislature, 8th February, 1899. *Not printed.*

No. 56.. Return to an Address to His Honour the Lieutenant-Governor of the tenth day of August, 1898, praying that he will cause to be laid before this House a Return of copies of all Orders in Council, correspondence and other documents relating to the deciding upon, and purchase of a site in the City of London for the proposed Normal School. Presented to the Legislature, 14th February, 1899. Mr. *Hodgens.* *Not printed.*

No. 57.. Return to an Order of the House of the seventeenth day of August, 1898, for a Return of copies of all correspondence and papers relating to, or connected with, the confinement of Hiram Augustus McCrea in the Asylums at Kingston amd Brockville, and his release therefrom. Presented to the Legislature, 17th February, 1899. Mr. *Beatty (Leeds.)* *Not printed.*

No. 58.. Copy of an Agreement between the Inspector of Prisons and Public Charities and the Independent Cordage Company of Ontario (Limited), respecting the manufacture of Rope at the Central Prison, Toronto. Presented to the Legislature, 20th February, 1899. *Not printed.*

No. 59.. Report of the Master of Titles for the year 1898. Presented to the Legislature, 23rd March, 1899. *Not printed.*

No. 60.. Report of the Principal of Upper Canada College for the year ending 30th June; 1898, and statements shewing receipts and disbursements for the same period. Presented to the Legislature, 23rd February, 1899. *Printed.*

No. 61.. Copy of Contract, between Her Majesty the Queen and the Riordan Paper Company, for the supply of printing paper required by the Government of the Province of Ontario. Presented to the Legislature, 23rd February, 1899. *Not printed.*

No. 62.. Return to an Order of the House of the seventeenth day of August, 1898, for a Return showing the number of saw-logs cut during the winter of 1897-1898 on the limits of the Georgian Bay and on Lakes Huron and Superior, which were driven to either of said lakes; the quantity cut in Provincial mills, and the quantity of exported uncut. Presented to the Legislature. 23rd February, 1899. Mr. *Beatty (Leeds.)* *Not printed.*

No. 63 . Return to an Order of the House of the twenty fourth day of August, 1898, for a Return of copies of all correspondence between any member of the Government or representative thereof, and any party or parties, respecting the purchase of any timber berth that may have been sold since March 1st. 1898. Presented to the Legislature, 28th February, 1899. Mr. *Wardell.* *Not printed.*

No. 64.. Return to an Order of the House of the twenty-second day of February, 1899, for a Return of copies of all correspondence between any member of the Government and the License Inspector for the County of Lincoln, and any other person or persons, referring to or respecting the alleged connection of the Inspector with the business of cigar manufacture. Presented to the Legislature, 28th February, 1899. Mr. *Jessop.* *Not printed.*

No. 65.. Return to an Order of the House of the seventeenth day of February, 1899, for a Return of copies of all papers and documents in relation to the proposed contract for public printing, including specifications, tenders and a comparative statement shewing the different tenders for each item of the specification and the estimate of quantities required. Also, the total estimated amount of each tender. Also, of copies of all correspondence, if any, between the Queen's Printer and the heads of Departments as to preparation of specifications for contract for public printing. Also, of all reports, if any, of expert printers as to details of said specifications and also of all other correspondence appertaining thereto, or to the letting of the contract or conditions required from the contractor. Presented to the Legislature, 3rd March, 1899. Mr. *Matheson.* *Not printed.*

No. 66.. Return to an Order of the House of the twenty-sixth day of February, 1897, for a Return giving the names of all High School Teachers who have received Specialists' Certificates since 1885 as the result of examinations. The names of such teachers who received Specialists' Certificates on any other ground, stating the year in which such certificate was granted, on what grounds, and the University standing of the recipient. Names of all applicants for such certificates who have been refused them, and on what grounds such refusal was based. Presented to the Legislature, 9th March, 1899. Mr. *Matheson*. *Printed.*

No. 67.. Return to an Order of the House of the twenty-seventh day of February 1899, for a Return of copies of all correspondence between the Government or any member thereof, and the Corporation of the Town of Lindsay, with reference to the appointment of a Police Magistrate and the salary to be paid him Also, copy of Order in Council appointing Police Magistrate at Lindsay. Presented to the Legislature, 9th March, 1899. Mr. *Fox*. *Not printed.*

No. 68.. Return to an Order of the House of the eighth day of March, 1899, for a Return of a copy of Miller's Report as to discovery of gold in the Township of Marmora, the same to be brought down during the present Session. Presented to the Legislature, 10th March, 1899. Mr. *McLaughlin*. *Not printed.*

No. 69.. Return to an Order of the House of the fifteenth day of December, 1897, for a Return of copies of all correspondence between the Minister of Education, or any official in the Department and Mr. Stewart of Glencoe, or any other person, in reference to the case of C. C. Grant of St. Thomas, who was charged with having obtained copies of the examination papers before the Matriculation Examination in 1896. Presented to the Legislature, 13th March, 1899. Mr. *Brower*. *Not printed.*

No. 70.. Return to an Order of the House of the sixth day of March, 1899, for a Return giving the number of circular letters, sent from the office of the Chief Game Warden, soliciting answers to a series of questions as to shooting deer while in the water. The names, addresses, occupations or professions of those to whom such circulars were addressed. Also, shewing the amount of money received from the sale of permits to kill deer during the season of 1898. Also, shewing balance left after paying salaries of Game Wardens, all expenses of offices and all moneys paid to or on behalf of Game and Fish Commissioners during the year 1898, in so far as the information is not contained in the Report of the Department. Presented to the Legislature, 21st March, 1899. Mr. *Pyne*. *Not printed.*

No. 71.. Return to an Order of the House of the sixth day of March, 1899, for a Return, giving the names, addresses, occupations or professions of all persons to whom permits were granted, during the year 1898 to collect birds, birds nests and eggs under provisions of the Act of 1889 for the protection of insectivorous and other birds. Also, of renewals and new permits which have been granted during the current year. Also, shewing number of convictions for violations of the Act during the year 1898, and specifying localities. Presented to the Legislature, 21st March, 1899. Mr. *Pyne*. *Not printed.*

No. 72.. Return to an Order of the House of the sixth day of March, 1899, for a Return, shewing all fees paid to Alfred Stunden, a constable of the Town of Bracebridge, in connection with the enforcement of the Game Laws of the Province. Presented to the Legislature, 21st March, 1899. Mr. *Reid (Addington.)* *Not printed.*

No. 73.. Report of the Clerk of Forestry for the year 1898. Presented to the Legislature, 25th March, 1899. *Printed.*

No. 74.. Copy of Agreement between Her Majesty the Queen and the Sturgeon Falls Pulp Company, Limited. Presented to the Legislature, 25th March, 1899. *Printed.*

No. 75.. Return shewing the Fees and Emoluments of the Registrars of Deeds of the Province for the year 1898, with which are contrasted receipts of the same nature in the years 1896 and 1897. Presented to the Legislature, 27th March, 1899. *Not printed.*

No. 76.. Return to an Order of the House of the eighth day of March, 1899, for a Return, shewing the number of Police Magistrates in Ontario, their names, residences, dates of appointment and territory over which they have jurisdiction, and shewing as well their respective salaries. Presented to the Legislature, 27th March, 1899. Mr. *Fox.* *Not printed.*

No. 77.. Return to an Order of the House of the ninth day of March, 1899, for a Return shewing the number of cases entered in the County Court of the County of Ontario for the past five years; the amount of money collected through the Sheriff during the same period and shewing as well the number of cases entered in the Division Court of the same County during the past five years, and the amount of money collected in the Court during the same period. Also, shewing the number of cases that went to trial in each Court respectively. Together with a statement of the number of cases heard or tried in the County Judges Criminal Court, the number of days in which the County Judge was engaged in revising voter's lists, in attending board of audit criminal justice accounts, the selection of jurors, and in the performance of duties under the Overholding Tenants Act and in the performance of other duties imposed upon him by law during the said period Presented to the Legislature, 27th March, 1899. Mr. *Hoyle* and *Attorney-General.* *Not printed.*

No. 78.. Correspondence and general information in respect of the application for grants of public money in aid of the construction of certain portions of the Central Counties Railway, the Central Ontario Railway, the Haliburton, Whitney and Mattawa Railway, the Irondale, Bancroft and Ottawa Railway, the James' Bay Railway, the Ontario, Belmont and Northern Railway, the Ontario and Rainy River Railway, and the Ontario, Hudson's Bay and Western Railway. Presented to the Legislature, 29th March, 1899. *Printed.*

No. 79.. Report of the Secretary and Registrar of the Province for the year 1898. Presented to the Legislature, 29th March, 1899. *Printed.*

No. 80..	Report on the operations of the Ontario Gold Concessions, Limited. Presented to the Legislature, 29th March, 1899. *Printed.*
No. 81..	Report of the Attorney-General upon the indebtedness of the Townships of Dunwich and Aldborough in respect of certain drainage works. Presented to the Legislature, 31st March, 1899. *Not printed.*

TWENTY-FOURTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

1898.

(*PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.*

PRINTED BY ORDER OF

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1899.

TWENTY-FOURTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

FOR THE YEAR 1898.

GUELPH, January 2nd, 1899.

To the Honorable JOHN DRYDEN,

Minister of Agriculture:

SIR,—I have the honor to transmit herewith the Twenty-fourth Annual Report of the Ontario Agricultural College and Experimental Farm.

In this report the work of the year 1898 has been briefly reviewed under the following heads:

I have the honor to be, Sir,

Your obedient servant,

JAMES MILLS,

President.

THE ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM, GUELPH, ONT.

HON. JOHN DRYDEN, Toronto, Ont.,
Minister of Agriculture.

JAMES MILLS, M.A., LL.D	President
A. E. SHUTTLEWORTH, B.A.Sc., Ph.D.	Professor of Chemistry
H. H. DEAN, B.S.A.	Professor of Dairy Husbandry
J. HUGO REED, V.S.	Professor of Veterinary Science
J. B. REYNOLDS, B.A.	Professor of Physics and Lecturer in English
WM. RENNIE	Farm Superintendent
C. A. ZAVITZ., B.S.A.	Experimentalist
WM. LOCHHEAD, B.A., M.S.	Professor of Biology and Geology
G. E. DAY, B.S.A.	Professor of Agriculture
H. L. HUTT, B.S.A.	Professor of Horticulture
F. C. HARRISON, B.S.A. (who has charge of Library)	Professor of Bacteriology
R. HARCOURT, B.S.A.	Assistant Chemist
M. W. DOHERTY, B.S.A., M.A.	Assistant in Biology.
I. N. BECKSTEDT	Assistant Resident Master
W. MCCALLUM, B.S.A.	Fellow in Biology
A. T. WIANCKO, B.S.A.	Assistant Librarian
L. G. JARVIS	Manager and Directer in Poultry Department
R. F. HOLTERMANN	Lecturer in Apiculture
CAPTAIN WALTER CLARKE	Instructor in Drill and Gymnastics
W. O. STEWART, M.D	Physician
G. A. PUTNAM	Stenographer
A. MCCALLUM	Bursar

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PART I.

REPORT OF THE PRESIDENT.

The Ontario Agricultural College and Experimental Farm reports another prosperous session. The work of the year just ended has been done without a jar, and substantial progress has been made in the different departments It may be said, in a word, that the institution is gaining the confidence of the farming community, and doing much valuable work for the Province as a whole—stemming the tide from country to city; preparing young men for agricultural pursuits; conducting experiments for farmers, fruit growers, and dairymen; publishing the results of work done from year to year; assisting at Farmers' Institutes and other public meetings; and contributing in various ways, directly and indirectly, to the dignity and success of farming as an occupation.

Attendance of Students.

The attendance of students during the past year has been the largest in the history of the College. Every bed has been occupied, and several students have had to lodge outside. The total number on the roll in 1898 was 333—223 in the regular course and 110 in the dairy course. Of those in the regular course, 87 per cent. are from Ontario, 7¼ per cent. from other provinces of the Dominion, and 5¾ per cent. from other countries.

Ages and Religious Denominations.

The ages of students in the regular course last year varied from sixteen to thirty-one years, averaging twenty years. The dairy students were somewhat older.

The religious denominations were as follows: in the regular course,—76 Methodists, 75 Presbyterians, 39 Episcopalians, 14 Baptists, 6 Roman Catholics, 3 Friends, 3 Brethren, 2 Congregationalists, 2 Christadelphians, 1 Lutheran, and 1 Christian Church; and in the dairy course,—41 Presbyterians, 37 Methodists, 18 Episcopalians, 10 Baptists, 3 Roman Catholics, and 1 Congregationalist.

Counties Represented.

The students at the College in 1898 represented 41 counties and 4 districts,—18 from the county of Wellington, 9 from Simcoe, 8 from Huron, 7 each from Dundas, Lincoln, Middlesex, Wentworth, and York, 6 each from Lambton, Northumberland, and Oxford, and smaller numbers from other counties.

Analysis of College Roll (*General Course*).

(1) From Ontario.

Algoma	1	Middlesex	7
Brant	4	Norfolk	2
Bruce	1	Northumberland	6
Carleton	4	Ontario	5
Dufferin	3	Oxford	6
Dundas	7	Parry Sound	3
Durham	2	Peel	1
Elgin	2	Perth	5
Frontenac	3	Peterboro'	4
Glengarry	2	Prescott	

ANALYSIS OF COLLEGE ROLL.—*Continued.*

Grenville	1	Prince Edward	3
Grey	3	Renfrew	1
Haldimand	4	Russell	3
Halton	3	Simcoe	9
Hastings	4	Stormont	2
Huron	8	Victoria	3
Kent	2	Waterloo	5
Lambton	6	Welland	5
Lanark	2	Wellington	18
Leeds	3	Wentworth	7
Lennox	2	York	7
Lincoln	7	Toronto	13
Manitoulin Island	2		
Muskoka	1		194

(2) FROM OTHER PROVINCES OF THE DOMINION.

Manitoba	2	Prince Edward Island	1
Northwest Territories	1	Quebec	6
New Brunswick	2		
Nova Scotia	4		16

(3) FROM OTHER COUNTRIES.

Bermuda	1	Jamaica	1
England	8	Asia Minor	1
Scotland	1		
United States	1		13

Total in general course 223

COUNTY STUDENTS.

By an Act of the Legislature, each county council in the Province has power to send one student free of tuition. Of those on the roll in 1898, 61 were nominated by county councils, and as a consequence were exempted from the payment of tuition fees. The counties and districts which exercised the power of nomination last year (42 in number) were the following: Algoma, Brant, Bruce, Carleton, Dufferin, Dundas, Durham, Elgin, Glengarry, Grenville, Grey, Haldimand, Halton, Hastings, Huron, Kent, Lambton, Lanark, Leeds, Lennox, Lincoln, Middlesex, Muskoka, Norfolk, Northumberland, Ontario, Oxford, Parry Sound, Peterboro, Peel, Perth, Prescott, Prince Edward, Renfrew, Simcoe, Stormont, Victoria, Waterloo, Welland, Wellington, Wentworth, and York.

MORE ROOM NEEDED

Increase in dormitory accommodation is needed, and should be provided as soon as the Government can spare the money required for certain alterations and the erection of two new buildings, one for a physical laboratory and the other to embrace the library, the reading-room, and a medium-sized hall for the weekly meetings of the College Literary Society and the annual meetings of the Experimental Union, which of late years has met in the Experimental Museum, but cannot do so hereafter, because the new cases for exhibiting the best varieties of grain, corn, grasses, etc., will henceforth occupy all the available space in said museum.

If a new library building were erected outside, and a wing 40 by 47 extended back from the south end of the main College building, sufficient increase in dormitory accommodation could be provided. That portion of the main building now occupied by the library could be changed into dormitories, and the two upper stories of the proposed addition could be used for the same purpose, the lower storey being required for a Physical Laboratory for practical work in general and soil physics.

Soil Physics.

When so much depends upon the crops grown from year to year, there can be no question as to the importance of a very thorough and persistent study of the soil in its relation to heat, moisture, and fertility, as affected by humus, tillage operations, etc. It used to be thought that a chemical analysis of a soil, showing its various constituents, was all that was necessary; but it was at length shown by experiment that land might contain all the constituents of plant food in due proportion, and still be unproductive, owing to a lack of moisture, or a sodden condition due to a deficiency of vegetable matter in the soil, or the fact that the ingredients of the soil had not been worked over and exposed to the frost and atmosphere in such a way as to make them available for plant food. Hence the importance of studying the physical condition of the soil—the results of underdraining, the effects of various tillage operations on the retention of moisture for the use of plants, and the power which humus, or vegetable matter, has to retain heat and water in the soil. These and many other important problems come under the head of Soil Physics.

Our Professor of Physics, J. B. Reynolds, B.A., has commenced a series of investigations under this head, and will push the work along as fast as he can, consistently with the large amount of teaching which is required of him. Last year he found by actual tests on plots in the College Experimental Grounds, that soil which was kept open by stirring the surface as often as was necessary to prevent a crust from forming, contained 37 per cent more moisture in the first two feet, measured from the surface, during the month of July, than the same kind of soil in an adjoining plot, the surface of which was not disturbed. Hence the value of stirring the earth around trees and shrubs in dry weather, and the need for frequent cultivation of corn, roots, potatoes, etc., during the summer months.

Biology and Geology.

After twenty years of faithful service in the College, J. Hoyes Panton, M.A., F.G.S., Professor of Biology and Geology, died on the 2nd February last. No one could serve an institution more faithfully and conscientiously than Professor Panton served the Ontario Agricultural College. He was a man of rare integrity and devotion to duty—a good scholar, a hard-worker, a clear and impressive lecturer; and he possessed exceptional skill in simplifying and popularizing the facts and teachings of science for farmers and others who had not received a scientific training. His death was a great loss to the College.

As Professor Panton's illness began in August, 1897, we had to arrange as best we could for the work of the department from October, 1897, to June, 1898. Most of the advanced work was done by F. C. Harrison, Bacteriologist; the entomology was taken by H. L. Hutt, Horticulturist; some classes in botany and zoology were taught by J. C. Macdonald, Fellow in Biology; and most of the practical work in zoology was done by Dr. John McCrae, of the General Hospital, Toronto.

On the 15th September, Wm. Lochhead, B.A., M.S., of the London Collegiate Institute, a teacher well and favorably known throughout the Province, was appointed Professor of Biology and Geology, and M. W. Doherty, B.S.A., a graduate who took a post-graduate course and the degree of M.A. in Cornell University, was appointed Assistant in Biology.

The department is fairly well equipped, and good work is expected both for the students in attendance and for farmers and others who may want information about noxious weeds or troublsome insects.

Chemistry.

A. E Shuttleworth, B.A.Sc., Ph.D., Professor of Chemistry, has been in Germany for a year and seven months (May 15, 1897, to December 13, 1898), most of the time at Göttingen University, studying and doing laboratory work in agricultural chemistry, and one or two kindred branches. During his absence, he not only completed the work for a degree at Göttingen, but took a course of lectures at Halle, spent a short time in the University of Berlin, and visited the principal agricultural experiment stations in the German Empire. He sat under some of the ablest professors of chemistry in Europe, observed the latest methods of research and instruction, and is now qualified for first-class work in the Department of Chemistry.

During Dr. Shuttleworth's absence, R. Harcourt, B.S.A., Assistant Chemist, took charge of the work and proved himself a good executive officer and a very acceptable lecturer and demonstrator in chemistry. W. A. Kennedy, B.S.A., (employed and paid by Professor Shuttleworth), did most of the analytic work in the Station Laboratory, including the analysis of a large number of samples of butter and whey, a series of digestion experiments with Lucerne cut at different stages of growth, and a considerable amount of research to determine the manure value of the root residue of Lucerne and three varieties of clover,—Common Red, Mammoth Red, and Alsike Clover.

Veterinary Science.

The live stock of the institution suffered very little from disease last year. Hence there is not much of special interest to report under that head. The lectures and practical demonstrations in the Department of Veterinary Science were thorough and practical as usual.

Dairying.

The Dairy School opened on the fourth January and continued in session for three months. The number in attendance was 110, and the work of the session was quite satisfactory. A considerable proportion wrote for certificates; and most of those who did so were successful. Many of the best cheese-makers and butter-makers in the Province have taken a course at the school, and the demand for graduates is rapidly increasing.

During the remaining nine months of the year—April to December inclusive—the attention of the department was devoted to experimental work,—T. C. Rogers, instructor in butter-making, having been employed in the butter room, and R. W. Stratton, assistant instructor in cheese-making, in the cheese room. These men, under the supervision of Prof. Dean, did a large amount of work, with a view to answering some of the many questions which arise in the home dairies and factories of the Province.

One result of these experiments may be mentioned in passing, viz., that which relates to the methods of paying for milk at cheese factories. Three methods are followed in the factories of the Province: the quantity method (the weight of the milk alone being considered); the fat method; and the fat-and-casein method. The final result of a long and elaborate series of experiments carried on for a number of years at the College, is that *the fat-and-casein method*, or payment on the basis of the percentage of fat in the milk plus two per cent. for the casein, is the fairest; next to it is the fat method, based on the percentage of fat in the milk; and the most unfair of all is the quantity method, based on the weight of the milk. This last method is far from just. It takes large sums of money from patrons who furnish rich milk and gives it to those who furnish poor milk. A single example will show how unfair this method is: 300 lbs. of milk containg 4.2 per cent. of fat made 35 lbs. of cheese, while 300 lbs. of milk containing 3.2 per cent. of fat, or one per cent. less, made only 26½ lbs. of cheese, or a difference of 8½ lbs. of cheese on 300 lbs of milk. The difference on a season's make would be a very considerable sum. This method puts a large premium on poor milk, and cheats the man who sends good milk; and the better the milk, the more the sender is cheated.

For a full account of experiments in the Dairy Department, see Prof. Dean's report in Part VI. of this volume.

Experimental Feeding.

Stock-feeding is a very important branch of farming in this Province. Hence Mr. G. E. Day, our Professor of Agriculture, has been conducting experiments in the feeding of cattle, sheep, and swine. In cattle-feeding, he has been determining and comparing the net results from heavy, medium, and light rations of meal, fed with bulky food, such as cut hay and roots; and in all cases so far—in tests extending over two years—the heavy ration of meal has proved the least profitable. In pig-feeding, he has been comparing the different breeds, judged by the requirements of the ex-port bacon trade, and has been working along several lines to ascertain the cause or causes of softness in meat. He has already obtained results which involve suggestions as to what the causes are; but these results will have to be verified by further experiments, which are now in progress.

For an account of the experiments under this head, see Prof. Day's report in Part VII. of this volume.

Horticulture.

Of late years, more attention has been given to horticulture at the College than formerly. The orchard has been considerably enlarged, the small fruit plantation has been increased in size, and a great number of variety tests have been made. Last year, tests were made with 219 varieties of strawberries, fifteen of red raspberries, fifteen of black raspberries, nine of blackberries, thirteen of currants, thirteen of gooseberries, eleven of tomatoes, 270 of geraniums, and thirty of coleus. A faithful comparison of variety with variety was made by the head of the department, Mr. H. L. Hutt, Professor of Horticulture; and many valuable items of information were obtained.

A full account of the instruction and experiments in this department will be found in Prof. Hutt's report, Part VIII. of this volume.

Bacteriology.

Bacteriology, including the manufacture of tuberculin for distribution throughout the Province, has become a strong department of College work; and there seems to be practically no limit to the useful and interesting fields of investigation which open before the student in this comparatively new branch of scientific research. Last year, the demands for tuberculin were considerable, and the appeals for laboratory investigation on several lines were urgent; but the addition of a large part of Prof. Panton's work in botany and histology (animal and vegetable), to the regular class-room duties and laboratory demonstrations with students in the department, left the Bacteriologist very little time for original work.

An account of the work and instruction in this department will be found in Prof. Harrison's report, Part IX. of this volume.

Field Experiments.

The work of field experiments is enthusiastically carried on by C. A. Zavitz, the College Experimentalist: and, as regards the selection of seed; dates and methods of seeding; the growing of mixtures of grain; and the testing of varieties of cereals, potatoes, roots, clovers, grasses, etc.,—there is no place on this continent or in Europe where better, more extensive, or more valuable work is done than on the Experimental Grounds at the Ontario Agricultural College. The ordinary reader or observer does not realize the magnitude or importance of the work. In my last report, I stated that "in oats and barley alone, the varieties introduced and distributed by our experiment station have, within the past four or five years, paid to the Province a good deal more than the entire cost of the College for the last ten years;" and having since gone into the facts and figures, I do not hesitate to say that my statement was correct. We sent out cards of inquiry and received many replies, declaring that the *Siberian oats* and

Mandscheuri barley, for instance, (introduced and distributed by our Experimental Department), have benefited the farmers to the amount of thousands of dollars in neighborhood after neighborhood.

For a full account of the work under this head, see Mr. Zavitz's report, Part X. of this volume.

Farm Proper.

The work in the Farm Department has been carried on with the same vigor and success as for several years past. The methods, especially in the cultivation of the soil and the growing of crops, are such as we can commend to our students, and the results are very satisfactory. The stock kept on the farm is about the same as for some years past, while the average annual expenditure for feed purchased—bran, etc.—for the maintenance of stock in the three years, 1896-1898, is just one third of what it was from 1890 to 1892 inclusive, both being considered in relation to the average annual revenue of the farm for the periods mentioned; and the average net annual expenditure, after making due allowance for stock imported in '91 and '92, is about one-third in the three years ending 1898, of what it was in the three years ending 1892.

The chief point of interest in the Farm Department last year was the feeding of steers tied up in the usual way *versus* steers loose in box stalls. The lots were carefully selected, so as not to give one method any manifest advantage over the other. The food for both lots was the same, and the general treatment in every respect the same. The lot in the box-stalls did considerably better than those which were tied up; and two other lots fed about the end of the year gave similar results.

A brief account of last year's work in the department will be found in Mr. Rennie's Report, Part XI. of this volume.

Other Departments.

In the other departments, there is nothing of special interest to report. Mr. L. G. Jarvis, manager of the Poultry Department, conducted some experiments in cross-breeding and made a few tests with water-glass and other mixtures used for preserving eggs. Mr. R. F. Holtermann, Apriculturist, gave the first and second year students a course of lectures as usual, and did some experimental work in his apiary at Brantford. Accounts of the work done in these departments will be found in reports by Mr. Jarvis and Mr. Holtermann, Parts XII. and XIII. of this volume.

Governor-General's Prize.

We do not devote much time to military drill; but our students, under the direction of Captain Clarke, do well whatever they undertake in this line. Hence they have often won the cup offered by the Governor General for competition among the batteries of the Dominion. Last year they carried off the Earl of Aberdeen's prize with a lead of 40 points.

Excursionists to the College.

Of late years, a great number of farmers visit the College in the month of June. They come to inspect the different departments of the Institution, especially the experimental grounds, and, if possible, to learn something which will be of use to them on their own farms. The number which came last year was about 30,100.

Class-Room Work.

The class room work in the different departments has gone on as usual. Thirteen candidates wrote for the B.S.A. degree in the University of Toronto, and eleven of them were successful. A fair proportion of first and second year students gained a respectable standing in our College examinations ; but the percentage of failures is still very large, resulting in some cases from idleness, but in most instances from a lack of early training in the elementary branches of an English education.

Examiners.

The third year examinations were conducted as usual, by examiners, appointed by the Senate of the University ; and those of the first and second years by the professors and instructors of the College, with the assistance of Wm. Tytler, B A., of Guelph.

Bachelors of the Science of Agriculture.

The examinations for the degree of B.S.A. were held in the month of May, and the successful candidates received their degrees at the commencement exercises of the University in June. The list is as follows :

Beam, E	Black Creek, Welland, Ont.
Butler, W. E	Dereham Centre, Oxford, Ont.
Clark, G. H	Cainsville, Brant, Ont.
Craig, R. D	Guelph, Wellington, Ont.
Davis, A. N	Cayuga, Haldimand, Ont.
Elliott, W. J	Seaforth, Huron, Ont.
McCalla, G. B	St. Catharines, Lincoln, Ont.
Ross, H. R	Gilead, Hastings, Ont.
Ross, M. N	Warrington, England.
Ross, N. M	" "
Summerby, W. L	Russell, Russell, Ont.

Recipients of Associate Diplomas

Deike, H. V	Guelph, Wellington, Ont.
Grisdale, J. H	Russell, Russell, Ont.
Hammell, W. H	Beeton, Simcoe, Ont.
Harris, C. H	Rockwood, Wellington, Ont.
Hawke, A. H	Winnipeg, Manitoba.
Hollis, J. H	Shelby Bay, Bermuda.
Hopkins. A. G	Highfield, York, Ont.
Hume, H. H	Marvelville, Russell, Ont.
Hutt, W. N	Southend. Welland, Ont.
Jarvis, C	Guelph, Wellington, Ont.
Jarvis, T	" "
Kennedy, W. J	Vernon, Carleton, Ont.
Livingstone, J. M	Sarnia, Lambton, Ont.
*McLaurin, J. D	Vankleek Hill, Glengarry, Ont.
Mallory. F. R	Frankford, Hastings, Ont.
Marshall, F. R	Westbrook, Frontenac, Ont.
Murdoch, G. H	Bobcaygeon, Victoria, Ont.
Price, W. J	Marsville, Dufferin, Ont.
Raynor, M	Rose Hall, Prince Edward, Ont.
Robertson, M	Meaford. Grey, On.
Ross, D. A	Martintown, Glengarry, Ont.
Scott, W. C	Kingston. Frontenac, Ont.
Snider, C. H	Attercliffe, Lincoln, Ont.
Taylor, G. R	Harley, Brant, Ont.
Thomson, G. T	Blenheim, Kent, Ont.
†Tozeland, J. H	Killarney, Manitoba.
Wagg, A. J	Mindemoya, Manitoulin Island, Ont.
Westgate, H. P	Watford, Lambton, Ont.
Wilson, E. S	Dundas, Wentworth, Ont.
Zavitz, H. V	Coldstream, Middlesex, Ont.

* To take supplemental examination in Literature.
† " " Bee-Keeping.

First-Class Men.

The work of the College is divided into five departments ; and all candidates who get an aggregate of seventy-five per cent. of the marks allotted to the subjects in any department, are ranked as first-class men in that department. The following list contains the names of those who gained a first-class rank in the different departments at the examinations in 1897, arranged alphabetically:

First Year.

1. **Goble, F. W.**, Woodstock, Ont., in one department: Mathematics.
2. **Linklater, Wm.**, Stratford, Ont, in four departments: Agriculture, Natural Science, Veterinary Science, and Mathematics.
3. **Mortureux, C. E. M.**, Quebec, P.Q., in two departments: Natural Science and English.
4. **McMillan, E. J.**, New Haven, P.E.I., in four departments: Agriculture, Natural Science, Veterinary Science, and Mathematics.
5. **Robertson, J. A.**, Blantyre, Ont., in one department: Agriculture.

Second Year.

1. **Grisdale, J. H.**, Russell, Ont., in five departments. Agriculture, Natural Science, Veterinary Science, English, and Mathematics.
2. **Hopkins, A. G., V.S.**, Highfield, Ont., in two departments: Veterinary Science and Mathematics.
3. **Hume, H. H.**, Russell, Ont., in four departments: Agriculture, Natural Science, English, and Mathematics.
4. **Hutt, W. N.**, Southend, Ont., in one department: Natural Science.
5. **Kennedy, W. J.**, Vernon, Ont., in three departments: Agriculture, Natural Science, and Veterinary Science.
6. **Price, W. J.**, Marsville, Ont, in two departments: English and Mathematics.

Expense of the Institution.

The people of this country have become accustomed to large expenditures of money for the education of a small fraction of the population for the various professions. They think it is quite right to spend \$100,000 to \$150,000 a year in a university to fit young men for law, medicine, teaching, and preaching, but a great mistake to spend half that amount in an institution to fit equally able and intelligent young men for the public and private duties required of them in general farming, fruit growing, dairying, stock raising, etc., and to qualify some of them for teaching these subjects and the various sciences related thereto. Indeed, very few have anything like an adequate conception of what is meant by a properly equipped agricultural college. Most people think of it as merely a farm, which should be managed so as to pay all expenses.

The facts are, that a strong and efficient agricultural college is like an arts college or university, except in one or two particulars:

(1) The agricultural college in a province like Ontario is working for the education of that section of the community which represents about seven-tenths of the population, while the arts colleges are all working for the education of another section, which represents about one-tenth of the population.

(2) The Agricultural College has several heavy items of expense, in addition to all or nearly all the outlay necessary in an arts college—such, for instance, as a farm, buildings, implements, and live stock for practical instruction in agriculture; buildings, dairy cattle, and expensive appliances for instruction in milk-testing, butter-making, and cheese-making; orchard, garden, greenhouses, and special laboratory for instruction in horticulture; men, horses, and implements for field experiments; buildings, men, and animals for experiments in stock feeding, etc.,—all this in addition to the buildings, class-rooms, and laboratories required in an Arts College.

From this it is manifest that an ordinary Arts College or University should not cost the country so much as an equally well equipped Agricultural College.

The people of the United States, taking a broad, statesmanlike view of this question, are spending quite as much on their agricultural institutions as on their arts colleges and universities. Take the following as fair samples :

Agricultural College for the State of Wisconsin—

Annual expenditure, apart from erection of buildings......$60,000
Amount of salaries paid annually........................ 28,000

Instruction in English, mathamatics, and sciences being furnished free by the State University at the same place.

Agricultural and Mechanical College for the State of Iowa—

Annual expenditure, apart from buildings................100,000
Annual salary bill...................................... 50,000
Four of the principal buildings cost as follows : Main Building, 80,000 ; Agricultural College Hall, $45,000 ; Morrill Hall, $38,000 ; and Margaret Hall, $50,000—nearly all paid for by direct taxation.

Agricultural and Mechanical College for the State of Michigan—

Annual expenditure, apart from buildings................$108,812
Annual salary bill...................................... 42,426

This Institution has a large number of very expensive buildings.

Dean Henry, of the Wisconsin Agricultural College, writes that, "An Agricultural College, when properly run, is the most expensive of any kind of school that can be imagined. There must be plants and animals for illustrative purposes, and these are expensive to procure and expensive to care for and soon pass away. There is also a large amount of machinery and other illustrative material. I hope our legislators will soon see that Agricultural Colleges are expensive and that this expense must be provided for ; or else take the opposite course and abolish them altogether. We had better have good Institutions or none at all. The last three biennial legislatures of Minnesota have given their Agricultural College $150,000 for buildings ; and Bills are now in the legislature of that state providing $80,000 more for buildings and equipment for their Agricultural College,"—all this for an institution which was fairly well equipped eight or ten years ago.

I have honestly endeavored to keep down the expenses of the Ontario Agricultural College in every department, and have been altogether too illiberal in the matter of salaries. Our expenditure is only about half that of American agricultural colleges for similar work. Yet some stand aloof and say that the College costs too much. To all such, I would say that a good college cannot be maintained for less. In fact, we should have an immediate outlay of about $20,000 for buildings and an addition of nearly $3,000 to our annual maintenance expenditure.

Personally, I very much prefer to work in a strong, well-equipped, and well-manned college, and I am inclined to think that the Province of Ontario cannot afford to have an inferior institution to represent the great industry of agriculture in its various branches.

JAMES MILLS,
President.

O. A. C., Jan. 2, 1899.

FINANCIAL STATEMENT FOR 1898.

I. College Expenditure.

(a) College Maintenance.

1. *Salaries and wages*	$19,860 18
2. *Food—*	
Meat, fish, and fowl	4,834 03
Bread and biscuit	1,200 07
Groceries butter, and fruit	4,890 01
3. *Household expenses—*	
Laundry, soap, and cleaning	86 90
Women servants' wages	1,943 53
4. *Business Department—*	
Advertising, printing, postage, and stationery	1,071 05
5. *Miscellaneous—*	
Maintenance of chemical laboratory	494 86
" physical laboratory	204 20
" biological laboratory	240 58
" bacteriological laboratory	297 90
Library and reading-room—books, papers, and periodicals	742 69
Medals	64 50
School assessment	132 00
Unenumerated	601 74
	$36,664 24

(b) Maintenance and Repairs of Government Buildings.

Furniture and furnishings	$584 05	
Repairs and alterations	1,314 91	
Fuel	3,364 75	
Light	1,074 25	
Water	12 50	
Sewage disposal	381 26	
		6,731 72
		$43,395 96

College Revenue.

Fees	$2,106 95	
Balances on board accounts	6,048 93	
Gas used by students	47 00	
Chemicals	3 86	
Supplemental examinations	10 00	
Sale of tuberculin	45 68	
Sale of oil to other departments	24 00	
Sundries—bones, old iron, etc.	14 55	
Paid by F. C. Harrison for time of engineer and assistant fitting pipes at his house	21 30	
Contingencies—fines, breakage, etc.	149 01	
		8,471 28
		$34,924 68

II. Farm Expenditure.

(a) *Farm Proper.*

1. *Permanent improvements*—		
Fencing, new cement silo, etc		$609 29
2. *Farm maintenance*—		
Salary of Superintendent	$1,200 00	
Wages of foreman and men	2,930 25	
Purchase of live stock for feeding, etc	2,196 67	
Maintenance of stock	585 82	
Seed	130 06	
Binding twine	14 00	
Repairs and alterations (including blacksmithing)	373 28	
Furniture and furnishings	274 54	
Tools and implements	250 46	
Advertising, printing, postage, and stationery	147 43	
Fuel and light	4 32	
Contingencies	106 27	
		8,213 10
		$8,822 39

Cash Revenue of Farm Proper.

Sales of cattle—21 steers, 32,185 lbs., at $4.65	$1,496 60	
" " 15 steers, 20,800 lbs., at $4.90	1,019 20	
" " 1 bull	60 00	
" " 8 cows, $26 to $59 each	287 00	
" " 3 grade calves, $3 to $5 each	12 00	
" " 10 pure bred calves, sold by auction	560 45	
" pigs—3 pigs, 1,170 lbs., at $3 00	35 10	
" " 4 " 700 " $4.00	28 00	
" " 8 " 1,488 " $4.60	68 44	
" " 11 " 2,284 " $4.75	108 50	
" " 8 " 1,423 " $4.80	68 30	
" " 6 " 900 " $5.10	45 90	
" " 15 " 2,360 " $5 75	135 70	
" " 67 sold by auction	825 80	
" sheep—31 sheep, $5 to $15	318 30	
" wheat—277.40 bushels at 73c	202 69	
" " 218.33 " $1.00, and 66 bags at 25c., and 28 at 10c.	234 55	
" " 12 " $1.25	15 00	
" barley— 15 " 60c	9 00	
" " 209.36 " 65c.; 40 bags at 20c., and 38 at 10c.	148 09	
" " 2½ " 75c, and 1 bag at 20c	2 07	
" oats— 210 " 55c.; 39 bags at 20c., and 43 at 10c.	122 68	
" peas— 195.15 " 80c.; 42 bags at 20c., and 15 at 10c.	165 30	
" potatoes—18 " 30c.	5 40	
" milk—660 lbs., at 80c. per 100	5 28	
" " 1,104½ quarts at 4c	44 18	
" wool—261 lbs., (unwashed) at 13c	33 93	
" " 202 " " 12c	24 24	
" hide and skins—4 sheepskins	3 70	
" screenings—815 lbs., at $1.00 per 100	8 15	
Services of animals	207 50	
Sundries	44 55	
		6,345 60
Net expenditure of farm proper		$2,476 79

(b) *Experimental Plots and Feeding.*

1. *Permanent improvements*—Alterations in buildings, &c		$32 60
2. *Maintenance*—		
Salary of experimentalist	$1,500 00	
Foreman	386 68	
Teamsters	588 00	
Experimental feeder	360 00	
Wages of laborers	1,837 11	
		$4,671 79
Seeds	$356 56	
Manure and special fertilizers	149 80	
Stock for feeding	1,082 15	
Furnishing and repairs (including blacksmithing)	393 98	
Printing, postage, and stationery	99 83	
Tools and implements	183 95	
Feed and fodder	506 90	
Contingencies	159 04	
		$2,932 11
		$7,636 50

REVENUE.

Sales of sheep—2 sheep	$17 87	
" " 17 " 2,265 lbs. @ 5c	113 25	
" cattle—10 steers, 13,965 lbs. @ $4.25	593 50	
" " 1 steer, 1,300 lbs. @ $4.00	52 00	
" " 1 "	39 50	
" pigs—14 pigs, 2,142 lbs. @ $3.85	82 45	
" " 19 " 3,000 " $4.00	120 00	
" " 59 " 8,998½ " $4.25	382 43	
" " 2 " 279 " $4.50	12 55	
" " 4 " 686 " $4.90	33 60	
" " 1 " 185 " $5.00	9 25	
" " 9 " 1,517 " $5.35	81 15	
		1,537 55
Net expenditure under this head		$6,098 95

III. Dairy Department.

(a) *Experimental Dairy.*

Salary of buttermaker and instructor, nine months	$487 50
" cheesemaker, nine months	500 00
" engineer and assistant in experimental work	276 00
" cattleman and assistance in milking	465 40
Temporary assistance	50 77
Purchase of milk for experimental work	947 23
Purchase of cows	383 72
Feed and fodder	408 62
Furniture, furnishings, and repairs	1,015 68
Advertising, printing, postage, and stationery	63 54
Laboratory expenses—gas, chemicals, etc	71 83
Fuel and light	373 71
Contingencies	112 55
	$5,156 55

REVENUE.

Sales of butter,—3,875 lbs. @ 20c	$775 00	
" " 46 " 16c	7 36	
" " 115 " 15c	17 25	
" cheese,— 270½ " 6c	16 29	
" " 913 " 7c	63 91	
" " 1,349½ " 7½c	101 21	
" " 4,180 " 8c	334 40	
" " 874 " 8⅛c	71 01	
" " 25 " 8¼c	2 14	
" " 2,088½ " 8½c	177 52	
" " 1,139½ " 9c	102 55	
" milk,—5,610 lbs. @ 80c per 100	44 88	
" " 7,292 " 74c "	53 95	
" " 6,823 " 72c "	49 12	
" " 1,615 quarts @ 4c	64 60	
" skim and buttermilk,—1,800 lbs. @ 10c per 100	1 80	
" " 7,050 " 15c "	10 57	
" " 56 gals. buttermilk at 5c	2 80	
" cream,—167 quarts @ 15c	25 05	
" " 21 " 20c	4 20	
" cattle,—5 cows, 1 @ $25.00 and 4 @ $30.00	145 00	
" " 4 grade calves @ $1.50 to $9.00	17 00	
" " 5 pure bred calves @ $11.00 to $24.00	91 55	
Sundries	10 08	
		2,189 24
Net expenditure of Experimental Dairy		$2,967 31

(b) *Dairy School.*

Wages of instructors for 3 mos.	1,602 48
Engineer, for 3 mos	105 00
General helper	79 98
Services of boy and board of engineer	24 00
Cleaning, etc	16 00
Purchase of milk for use in School	4,420 00
Dairy appliances	448 27
Expenses of cheese and butter judges	2 35
" inspecting factories	18 75
Advertising, printing, postage, and stationery	160 60
Fuel and light	135 08
	7,012 5

REVENUE.

Sales of butter—11,883 lbs. at $18\frac{1}{2}$c. to 21c	2,369 19	
" cheese—16,927$\frac{3}{4}$ lbs. at 6c. to 9c	1,323 34	
" skim milk—3,180 lbs. at 15c. per 100	4 75	
" whey—season's make	25 00	
" cream—$3\frac{1}{2}$ quarts at 20c	70	
" sundries	5 00	
Registration fees	102 00	
		3,827 98
Net expenditure of Dairy School		$3,184 53

IV.—POULTRY DEPARTMENT.

Salary of manager		700 00
Temporary assistance		40 70
Purchase of stock		25 00
Feed, etc		168 24
Furnishings and repairs		191 90
Fuel and light		58 29
		1,184 13

REVENUE.

Sales of poultry—118 birds @ 25c. to $12.00 each	159 65	
" " $29\frac{1}{2}$ pairs dressed @ 60c to $1.00	21 62	
" eggs for setting—$44\frac{1}{2}$ settings @ $1.00 to $1.50	62 68	
" " for domestic use—$330\frac{1}{2}$ doz. @ 10c. to 25c	49 41	
		293 36
Net expenditure of Poultry Department		$890 77

V.—HORTICULTURAL DEPARTMENT.

1. *Permanent Improvements*—Paving drives, etc		97 85
2. *Maintenance*—		
Salary of foreman and head gardener	650 00	
" assistant gardener	528 00	
" assistant in greenhouses	380 00	
Wages of teamster and laborers	1,826 10	
Manure	105 01	
Trees, plants, bulbs, and seeds	302 31	
Tools, implements, furnishings, and repairs	394 37	
Fuel and light	605 05	
Contingencies	282 69	
		5,073 53
		5,171 38

REVENUE.

Sale of berries—$914\frac{1}{2}$ boxes @ 4c.	36 58	
" potatoes—20 bush. @ 25c.	5 00	
" tomatoes—2 " @ 50c.	1 00	
" " 2 " @ 45c.	1 35	
Sundries—Old iron, etc	4 86	
Paid by F. C. Harrison, for time of men and team grading piece of ground near his house	24 29	
		70 83
Net expenditure of Horticultural Department		5,096 55

NOTE.—The produce of the Horticultural Department is used in the College. We are not allowed to sell anything from the department, except a little now and then to officers of the Institution.

VI.—MECHANICAL DEPARTMENT.

Salary of foreman	700 00
" extra carpenter for erection of buildings, etc	700 00
Tools, etc	82 49
Fuel and light	11 10
	1,493 59

REVENUE.

Paid by F. C. Harrison for time of carpenter working on his house	172 13
Net expenditure of Mechanical Department	1,321 46

SUMMARY.

Total net expenditure in all departments.—College, Farm, etc. :—

I. College and Government Buildings	$34,924 68
II. Farm—	
1. Farm proper	2,476 79
2. Experimental plots and feeding	6,098 95
III. Dairy Department—	
1. Experimental Dairy	2,967 31
2. Dairy school	3,184 53
IV. Poultry Department	890 77
V. Horticultural Department—Garden, greenhouses, lawn, orchard, small-fruit and forest tree plantations, etc	5,096 55
VI. Mechanical Department	1,321 46
	$56,961 04

Unexpended balance on the year's operations in all departments, $1,912.96.

JAMES MILLS,
President.

PART II.

REPORT OF THE LECTURER IN

ENGLISH LITERATURE AND PHYSICS.

To the President of the Ontario Agricultural College :

SIR,—I have the honor to present herewith my report of the departments of English and Physics.

ENGLISH. The study of English literature has been continued under much the same conditions as formerly. The students who attend this College do not by any means lack in appreciation of literature. I do not find any difficulty in arousing interest in class-work in English Literature, or in inducing a close study of the authors prescribed. The works of the best English authors are well appreciated, and, in class and out, sometimes justly criticized. So far, matters are encouraging to the teacher. But the great weakness of many of the students is in composition. The cause is, undoubtedly, lack of practice and of proper instruction. In spelling, punctuation, vocabulary, and rules of grammar, many are very deficient. Within the short time at our disposal during the course here, it is impossible to give them the requisite knowledge and skill in the use of language; so some of them receive their diplomas with very meagre attainments in that most essential branch, English composition. It would perhaps seem an injustice to a good student, who has acquired considerable knowledge in the practical and scientific studies, to withhold from him a diploma from an Agricultural College on account of deficiency in English; but there is no doubt that many pass out from this College, accredited associates and graduates, who have no confidence in their own ability to write a passable article for an Agricultural journal. This is not as it should be, and I am doing my best to reduce this undesirable condition of things to a minimum. For the Preparatory and First Years, your assistant in the Residence is responsible in the matter of composition. I sometimes assign subjects for these classes, and require papers to be handed in or to be read in class; but it is with the second and third years that I have mainly to do. With the Second Year I follow the plan of weekly essays, on subjects assigned by myself, or occasionally left to themselves to choose. These essays are read carefully and marked closely during the week; then they are handed back and the errors discussed in a part of the lecture period. With the present second year I am able already to report a very noticeable advance in the general style and appearance of the weekly essays. For the present I have assigned a subject to cover three weeks; they are to write on either "The Fat Stock Show," or "The Experimental Union," both of which are soon to take place. The Third Year have considerable practice in Seminary work, writing of essays on subjects connected with their special departments. Besides this, in the English department they are assigned subjects for a small number of essays, with a month in which to prepare. The first essay for this year was on one of the following subjects: England in Egypt, the Chinese Question, and Cuba. These essays have been handed in, and a new subject assigned, namely, Elizabethan Literature. This amount of work is all that time, either of students or of teacher, will allow.

The additions to the Library in the department of English Literature have been judiciously selected. A very creditable collection of commentaries is now on hand. Shakespeare and Tennyson are especially well represented. These commentaries are of great value in teaching, and are extensively referred to by all the classes of students.

PHYSICS. The department of instruction in Physics continues to advance. We have now, I think, a good course in Mechanics, both in lectures and laboratory work. This is taken during the Fall Term, and includes a practical study of different systems of pulleys, the lever in various forms, the tread-power, a study of friction, and other questions in Statics and Mechanics. In outside work, measuring areas with the chain, and determining levels for draining and grading. A broad course in Soil Physics is given in the Winter Term, with laboratory work.

To the Third Year work a short course of lectures and observations in Meteorology has been added. This includes readings of the humidity, temperature, and barometric pressure at different periods of the day; changes in temperature that different soils undergo during the day when exposed to the sun's rays; a comparison of the ranges of temperature of air, water, and soils wet and dry, dark and light; and observations of weather, with a systematic method of taking notes upon the phenomena observed.

METEOROLOGY. Early in the summer I began making systematic observations in Meteorology. These observations have been carried on since about June the first. This Autumn I arranged with the Observatory at Toronto to keep the meteorological records at this station, and the Observatory sent some instruments to assist in these records. We have now a raingauge, maximum and minimum thermometers, wet and dry-bulb thermometers, and a hair hygrometer. The barmometer belonging to the department has recently been repaired and adjusted, and is now in first-class condition. At present, observations are taken three times a day, and recorded in a book kept for that purpose, monthly records being sent to the Observatory. Part of this work has been done by the specialists in the Third Year; and I intend them to continue the same until they have become sufficiently expert and accurate in taking observations. In addition to reading the instruments, observations of the weather are taken, such as the amount of blue or of cloud in the sky, mist, haze, time of rain or snow, and other weather phenomena. This course is useful, not only in establishing habits of observing those indications and changes in the weather, but also in making them familiar with the correct terms and methods of expressing the phenomena observed.

Below will be found the Humidity and Dew-point records for the five months, June to October, inclusive. It would perhaps not be amiss to explain these terms briefly. When the air is saturated with moisture, as during a rain or a mist, the humidity registers 100. The figures of the humidity column give the amount of vapor present in the air compared with the maximum amount at saturation. A reading of 50 means that the air contains only 50 per cent of its greatest possible vapor content. The dew-point is the temperature at which dew would deposit if the temperature were to fall to that point; that is, if the temperature at any time were 60, and the dew-point 46, then if the temperature should fall to 46, as it likely would before midnight, the air would be saturated with vapor, and some of the vapor would condense and be deposited as dew. The determination of due point may safely be used to forcast frosts, since the temperature seldom falls below the dew-point. When the dew-point is reached on any night, the condensation of vapor results in the liberation of large quantities of heat, thus keeping the temperature up so long as dew continues to fall. But if the dew-point at six o'clock, say, were 32, there is danger of frost, since the freezing point is reached before heat can be liberated by the condensation of water-vapor. There are various ways of determining the dew-point. A simple method is as follows: A bright tin or silver cup, a thermometer, and some ice and water, are required. After nearly filling the cup with water, ice should be added slowly, until the outside of the cup becomes clouded. The water inside the cup is then at the temperature of dew-point.

—		Dew-point.			Humidity.			R
		9 a.m.	2 p.m.	5 p.m.	9 a.m.	2 p.m.	5 p.m.	
		°	°	°	%	%	%	
June	Av.	47.5	47 5	49.	73 8		4.7	
	Max.	69.5	69.5	66.7	91.		99.	
	Min.	37.2	38.2	39.	49.		40.	3.36 inches.
July	Av.	55.	61.	57.	64.	49.7	52.	
	Max.	71.5	71.	71.	86.	89.	91.	
	Min	38 5	41.2	35 5	41.	26.	32.	1.33 inches.
August	Av.	60.1	55.6	55	85.8	57.3	56.5	
	Max.	68.5	69.	67.	100.	84.	100.	
	Min.	54.	47.	43.	77.	32.	36.	1.99 inches.
September	Av.	59.	64.5	60.	83 5	63.5	71.7	
	Max.	73.	73	73.	100	100	100.	
	Min	36.	39.	35.	59.	38.	36.	2.61 inches.
October	Av.	48 1	48.7	45.8	92.3	79 6	76 2	
	Max.	70	72.	71.	100	100.	100.	
	Min.	25 5	21.	21 5	70.	49.	41.	4.18 inches.

In the above table, the average of the dew-point and humidity readings is given for each month, at three periods of the day, 9 a.m., 2 p m., and 5 p.m. The maximum and minimum dew-point and humidity for each month, at each of the hours, are also given. On studying these figures, the following facts will be observed:

1. The dew-point, on the average, varies but little throughout the day, but is generally slightly higher at 2 p m. If the actual amount of moisture in the air remained the same, the dew-point would also be stationary. Any changes, therefore, will be explained in the next note, on humidity.

2 Generally, the humidity is lower at two p. m., that is, when the temperature for the day is highest. There are three causes affecting humidity, namely, evaporation of moisture from the surface of the ground, which takes place during the heat of the day, and of course increases the humidity; secondly, heating the air, by increasing the capacity of air for moisture, lowers the relative humidity; thirdly, some of the vapor present in the air, being lighter than the air itself, rises into the higher regions of the atmosphere, and thus lowers the humidity. Hence, there are two causes operating to lower the humidity of the air, and one to raise it; and as these forces are seldom, if ever, perfectly balanced, it will be seen that the humidity is constantly changing. Also, according as the evaporation of moisture from the ground is more or less rapid than the rising of the vapor into the higher regions, will the dew point rise or fall.

8. The average humidity for the month varies directly with the amount of rainfall, and inversely with the temperature. September and October being colder months, the air is more moist.

Determination of Soil Moisture.

Last year we began some experiments in the determination of soil moisture. This year, with better equipment, our work has been much more extended. To begin with, it was necessary to procure some convenient instrument for taking samples of soil from the field. A spade will do the work, but it has its disadvantages. After some inquiry among investigators along the same line, we adapted an instrument used at some of the

American Experiment Stations by the addition of a little invention of our own. The sampler we have used this season consists of a seamless brass tube one foot in length, and three-quarters of an inch in diameter, with a female thread cut at one end. To fit this, an iron shank about three feet long, with a similar thread outside was made. Through the top of the shank a wooden handle two feet long passed to serve as a lever in turning the instrument and boring into the soil. Into the other extremity of the brass tube were fixed two closely-fitting knives, about half an inch long, made of the hardest steel, and slightly curved so as to cut out a tube of soil somewhat smaller than the brass tube through which the soil passes. The instrument is forced into the earth by a combination of boring and downward pressure.

With this borer we can take samples to the depth of three feet or more. After boring to the depth of one foot, the borer is withdrawn, the brass tube with the moist soil is unscrewed from the shank and slipped into a tin case, which is labelled and immediately closed with a cork to prevent evaporation. Then a second brass tube is fitted to the shank, the instrument is shoved down the hole previously made and another foot of the soil below the former is sampled. It has been our practice this season to sample three depths of soil, extending to one foot, from one to two feet, and from two to three feet in depth, respectively. After all the samples for the day have been taken, they are carried to the laboratory, the soil removed from the tubes, weighed, dried, weighed again ; and by taking the difference of the two weighings the amount of water contained by the soil is determined. The percentage is reckoned by comparing this difference with the weight of the soil as it came from the field.

Samples were taken at intervals varying with the weather. When the weather remained uniformly fine, once in three days was found to be often enough. A sample was taken as soon as possible after a rain, and again in twenty-four hours, so as to determine the rates of percolation, transpiration and evaporation.

The Effect of Surface Cultivation on the Moisture of the Soil.

The experiments under this head were conducted on plots one rod square, situated side by side, under conditions exactly similar, with the exception of the difference in the surfaces. The surface of one was kept loose and fine,* while the other was not interfered with. Neither of them bore any crop, so that any difference must be due to the treatment of the surfaces. The experiment was carried on for three months, May, June and July. In May seventeen samples were taken, in June thirteen, and in July nine. In July the continued dry weather made it unnecessary to sample so often.

Below is a table giving the average per cent. of moisture for each of the three months.

—	May.			June.			July.		
Average temperature ..	54.3			60.			69.		
Total rainfall	2.02 inches			3.36 inches			1.33 inches		
Per cent. of moisture in the soil :	1st ft.	2nd ft.	3rd ft.	1st ft.	2nd ft.	3rd ft.	1st ft.	2nd ft.	3rd ft.
Plot "A" (loose) ...	18.6	19.9	17.7	18.3	20.1	17.4	16.7	18.8	17.4
Plot "B" (compact).	17.8	17.5	18.1	17.9	18.4	18.0	16.1	16.9	17.7

**Note.*—As the plot was only one rod square, it was cultivated with a hoe and rake—cut to a depth of about two inches with the hoe and then pulverized and loosened with the rake. On large areas, the work can be equally well done with a scuffler or cultivator.

By comparing plot A with plot B, the following differences may be noticed: Throughout the whole three months, the upper two feet below the mulched surface contained more water than that below the compact surface. For May, plot A contains in the upper two feet eighty-seven gallons of water per square rod more than plot B; that is, an equivalent for a rainfall of six-tenths of an inch, or three-tenths of the total rainfall for the month. For June a difference is observed, in favor again of plot A, of fifty-seven gallons per square rod, or an equivalent for four-tenths of an inch of rainfall, or about one-eighth of the total rainfall for the month. For July, there is a difference of sixty-eight gallons per square rod, which is three-eighths of the total rainfall, or about half an inch. These results are presented in brief form in table below.

—	May.	June.	July.
Per cent. of total rainfall	2.02 inches	3.36 inches	1.33 inches
Per cent. of total rainfall saved by surface cultivation.	$\frac{3}{10}$ or 30%	$\frac{1}{8}$ or $12\frac{1}{2}$%	$\frac{3}{8}$ or $37\frac{1}{2}$%

Hence we observe: The drier the weather, the greater is the beneficial effect of surface cultivation. This conclusion should not be overlooked. It declares that, in a comparatively wet month, such as June of this year, surface cultivation has less effect on the saving of moisture. The farmer need not be alarmed about this, since at such a time there is enough and to spare of moisture in the soil. The most important problem in cultivation is how to keep enough moisture during a dry season. The above results show plainly that in a dry season, surface cultivation can easily make all the difference between failure and a good crop. The right time to practice mulching, then, is particularly during a dry season, and, to repeat, the drier the weather the greater is the relative effect of this kind of labor.

A second point of importance in these results may be seen by comparing the figures in the first table. It will be observed that, while the two surface layers of the soil have more water when mulched, the third foot, without exception, has less. This shows that the excess of moisture in the upper two feet is due not only to the prevention of evaporation from the surface, but partly to another cause, namely, that the mulching of the surface, by keeping the soil under the mulch more moist, preserves its capillary power. It is well known that a dry and hard soil loses its capillary power, and it appears from these figures that the unmulched soil is less able to bring the water from below.

To sum up our results, the thirty-nine observations, extending over a period of three months, declare the following:

1. Surface cultivation conserves moisture; and the drier the weather, the greater is the relative effect.

2. Surface cultivation keeps the ground in better condition for lifting the water from below to the roots of plants.

Some Investigations in Dairy Physics.

Last year during the session of the Dairy School, my attention was called to some peculiarities in the theory of the separation of the cream from the serum by the deep-setting system. In order to arrive at some facts upon which to found correct explanations, I began some physical investigations with butter, cream, whole milk, and skim milk, with a view to determining two things, namely, the expansibility of the different constituents, and their relative rates of cooling and heating.

TABLE 1.—Showing the Rate of Expansion.

Temperature : C. / F.	10°–20° / 50°–68°	20°–40° / 68°–104°	10°–40° / 50°–104°
Water	.000152	.000297	....
Skim-milk	.000175	.000286	.000231
Whole milk	.000260	.000367	.000313
Cream	.000582	.000628	000605

The expansion co-efficients of the different products are given in Table 1. Taking the first reading of skim-milk, .000175 means that one cubic centimetre of milk at 10°C, if heated to 20°, would occupy 1.00175c.c., that is, $1 + (000175 \times 10)$. Some curious results are stated in this table. First, it is evident that the greater the amount of butter fat or other solids in the milk, the more uniform is the expansion. Cream has nearly the same rate of expansion at all temperatures. Pure water increases its rate of expansion quite rapidly with increase of temperature. A second and more important point in the results is in their relation to the separation of cream by the deep setting system. The rate of expansion or of contraction between the limits 68° to 50°F. is, for serum, .000175 ; for cream, 000582. The cream therefore contracts about three and a half times as fast as the serum within the limits of temperature usual for the deep-setting method. Hence, while the serum is always heavier than the cream, the latter very rapidly approaches the specific gravity of the former as they cool. They are therefore becoming more and more nearly equal in weight ; so that whatever is the cause of the more rapid separation by the cooling system, it cannot be due to an increase in the difference of specific gravity, since the opposite is the case. I am well aware that there is nothing new in this statement, since the usual explanations of the process of separation by cooling recognize the facts contained in the foregoing table. It may, however, be an advantage to those who are teaching the subject to have definite figures to use ; and I have not seen in the standard works on dairying any exact information on this point.

TABLE 2.—Showing the Rate of Cooling.

Excess of temperature.	54°C.	44°C.	34°C.	24°C.	14°C.
Butter	3.67	2.92	2.14	1.41	.87
Skim-milk	2.59	1.98	1.47	.905	.443
Cream	2 50	1.994	1.47	.95	.446
Whole milk	2 34	1.81	1.32	.890	.462

TABLE 3.—Showing Specific Heat.

Butter	.531
Cream	.841
Whole milk	.932
Skim-milk	.956

Table 2 and 3 deal with the specific heat of the same products, with the addition of pure butter fat. This specific heat was determined by two methods; first, by cooling. A test tube full of milk, cream, or butter, as the case might be, was heated to a high temperature, and then suspended in the air to cool, with a thermometer in it. The rate of cooling was observed, the time required to fall 10 degrees in temperature being chosen as the standard. In table 2, the upper horizontal line of figures denotes the differences between the temperature of the cooling body and that of the surrounding air, at the different stages of the experiment. The second horizontal line denotes the rate, that is, the number of degrees per minute, at which butter cools. At a difference of 54° C. between the butter and the surrounding air, butter cools at the rate of 3.67 degrees per minute.

Table 3 contains similar results, obtained by a different method, namely the method of mixtures. This consists simply in heating the substance under experiment, and then mixing with water. The weights and temperatures of all being observed, the specific heat of the substance can be calculated, water being taken as the standard. The two tables then should indicate the same results. A rapid rate of cooling is identical with a low specific heat, and *vice versa*. Both tables agree in stating that butter fat cools much more rapidly than serum, when they are separate from one another. This contradicts many of the text-books on the subject. But it is altogether likely that the theories put forth in text-books on Dairying are not always based on exact physical experiments, but are deduced from the obvious phenomena that present themselves frequently in dairy operations.

But while both methods agree so far as butter and serum are concerned, when considered separately, they do not agree in the case of the whole milk and cream. According to table 3, the specific heat is greater, the less is the amount of butter fat contained; but in table 2 whole milk and cream do not fall into their respective places. There is an anomaly here. What the explanation is, I cannot say. I simply present the facts. There is apparently something in the surroundings of the fat before it is separated from the serum which interferes with its heating and cooling, and prevents it from following the regular law of cooling which controls it when separated into the pure butter fat. To account for this anomaly, the theory of "envelopes" may have to be revived.

Needs of the Department.

Agricultural Physics has given evidence that it affords a fruitful ground for experimental research, without requiring previously an extensive scientific training. The difficulty of the Third Year thesis work hitherto has been, that it is impossible to give to the students of the Second Year the necessary knowledge required for original research. Fortunately I do not meet with that difficulty in the department of Physics. So far, I have been able to give in the Second Year a preliminary training quite sufficient for carrying on the thesis work of the Third Year. This year out of six students following the Agriculture specialty, three are doing their thesis work entirely in my department and under my direction, and a fourth has chosen a subject that requires to be done partly in this department. At present, our quarters are far too narrow to allow this work to be done to the best advantage. The department of Physics stands greatly in need of larger accommodation. There is required: 1. A laboratory for instruction and practical work in Mechanics and general Physics for the Second and Third Years. 2. A room for the analysis and examination of soils, and for Station work. 3. A room for experiments in Soil Moisture, Temperature, and Humidity, in relation to plant growth. 4. A larger class-room. The present room accommodates only forty students, while there are nearly sixty in the present First Year.

Up to the present, I have had recourse to assistance from students with occasional help from other sources. For the past season, Mr. Roland Craig proved to be a painstaking and capable assistant. I hope that, for the coming year, you will be able to establish a Fellowship in Physics. A Fellow, if appointed, would be engaged as follows: During vacation, assisting in station work and co-operative experiments; during the College session, assisting in laboratory instruction, carrying on such original work as is required of the department, and correcting essays and papers. It is well-known that too much of the last cannot be done.

Allow me to express my gratitude to you for your encouragement and co-operation in providing for the department under my charge. I hope that you will be enabled to make further provision as outlined above. So much has the scope of the department widened during the last two years, that the increased accommodation and the assistance are both essential to good work for the future.

Respectfully submitted,

J. B. REYNOLDS,

GUELPH, Dec. 31st, 1898.

Lecturer in English and Physics.

PART III.

REPORT OF THE

PROFESSOR OF BIOLOGY AND GEOLOGY.

To the President of the Ontario Agricultural College:

SIR,—Herewith is submitted for your consideration my first report as head of the department of Biology and Geology.

This report, in view of the circumstances of my appointment, must necessarily deal more with plans for the future than with work actually accomplished. The Assistant Biologist, M. W. Doherty, began his duties here simultaneously with my own, on September 1st; and since that time our attention has been chiefly given to preparation for the work of instruction. Flowering plants, insects, and fungi had to be procured for demonstration work in class, so that either Mr. Doherty or myself was almost constantly occupied during September in the work of collection.

Part of my time during September and October was devoted to correspondence relating to insects and plants, and although the number of correspondents is not so large as it was before the death of the late Prof. Panton, yet about a hundred letters were sent out during the year, many of which required considerable time for their preparation, owing to the large amount of information asked for. It is quite conceivable that the correspondence will resume its normal volume during the coming year, and require my attention at a time when my teaching duties will be sadly interfered with. I refer to the opening of spring, which is a very busy season for class-work.

INSTRUCTION. With reference to the instruction given the different years, in a general way the plan of previous years had been followed :—

Fall Term	*First Year.*—Botany. *Second Year.*—Botany and Entomology. *Third Year.*—Botany and Geology.
Winter Term	*First Year.*—Zoology and Geology. *Second Year.*—Biology. *Third Year.*—Botany and Geology (part of time).

The aim of the instruction given is to impart a good practical knowledge of the Elementary science subjects; hence laboratory work has been strongly emphasized, and is introduced at every stage of the work. Purely formal lectures have been almost done away with in the first two years, and but seldom given in the advanced work of the third year, then only in summarizing the knowledge which has been already obtained by the student in his practical work. Students trained to observe carefully and draw proper conclusions are in a good position to carry on life's work in any sphere in which they may be placed. The process of observation includes the three-fold processes of comparison, relation, and judgment, and these are virtually the requisites of the successful farmer, merchant, or statesman.

Besides the training of the observational powers of the students by this close contact with natural objects, whether they be flowering plant, fungus, insect, or rock structure, much attention is paid to their economic aspects.

At the conclusion of the two-year course the students will be in a position to identify correctly the common weeds, and to put into operation the best methods for their eradication; to determine the weed seeds which are commonly found in samples of clover, timothy, and other grains; to recognize the noxious insects which infest the farm, orchard, and garden, and to apply the proper remedies for their destruction.

The two objects always kept in mind in all Natural Science work at this College are: (1) the training of the power of observation, and (2) by means of this trained observational power so to control the amount of damage on a farm that the money value of the crops will be largely increased.

PLANT PHYSIOLOGY AND PATHOLOGY. The study of plant physiology has been made quite prominent. The principles governing the behaviour of plants under the influences of external stimuli, and their relation to soil, moisture, heat, light, and other conditions which are generally known as environment, are explained clearly to the second-year students, while the subject is given a wide range in the third year, when the student determines these principles and relations for himself in the laboratory and greenhouse.

Very satisfactory progress has been made in this direction, and it is to be hoped that every facility will be offered for the thorough study of problems relating to plant life, for a study of the normal life processes is the foundation for proper work on the treatment of plant diseases. I would suggest that an effort be made to introduce laboratory work in plant physiology in the Second Year. For this purpose an appropriation of $50 a year for two or three years for apparatus would be sufficient.

In the Third Year, plant pathology is studied after the course in physiology. Here the worker must not only study the effects of disease, but the causes which lead to the diseased condition. These causes are most frequently of a fungous nature, but sometimes purely physiological. These subjects are all so important that to give them due attention the time of a separate instructor would be required.

ENTOMOLOGY. This year a course in elementary Entomology was given to the Second Year, and a more advanced course to the Third-Year students. These were practical courses, consisting almost entirely of laboratory work and demonstrations in class-room by means of the electric lantern. The material at our disposal for this work is far too meagre for satisfactory work, but an effort will be made during the coming year to enlarge greatly the collection of eggs, larvæ, adults, and specimens of work done by the insects.

For another year it will be impossible to increase the courses in Entomology for want of time, but as soon as the Fourth Year is added several additional courses can, with advantage, be taken by the specialists in this line. The importance of Entomology is recognized now by nearly everybody; and in order to make the study of it of the greatest value, an insectary course should be organized, when the life-histories of the various pests can be worked out and remedies applied for their control.

LABORATORY ACCOMMODATION. The laboratory is neither convenient nor large enough. The class-room is not suited for demonstration work, as there is not sufficient light to enable the students to see minute parts distinctly. No doubt the proposed change will lighten the room and improve the conditions materially, yet the fact remains that more laboratory accommodation is urgently needed in the interests of biology. The annex is a very pleasant room, and is quite suitable for small divisions, and for histological and pathological work of the Third Year. The remainder of the present laboratory is very inconvenient as well as too small. An instructor ought to be able to see all his students at a glance, but in this case it is quite impossible to do so. A suggestion has been offered that the southern portion of the flat be extended even with the present annex—that the present south wall be torn down so as to form a large, commodious room directly south of the office and to the east of the present annex. Some such plan as this I urgently recommend for your consideration.

The recent additions to the equipment of the office and annex are much appreciated. The herbarium is very complete with 135 sliding shelves; already the many specimens which had been packed away in odd corners are being placed in their proper shelves and made accessible to the student who may wish to consult and study plants. The new book-case is large enough to hold all the reference books belonging to the department. An insect cupboard for the reception of insect cases is now in course of preparation, and an effort will be made to secure a good systematic and ecconomic collection of insects for both elementary and advanced work in Entomology.

HISTOLOGY. The department will be in a position next September to give instruction in the histology of both vegetable and animal tissues. It was not prepared to do the work this year, as you desired, for want of material, paraffine ovens, and other appliances, and Mr. Harrison kindly consented to continue the work of instruction for another year. In a department where histological methods are used in nearly all investigations it becomes a matter of importance that the investigators should be as familiar as possible with the best methods of histological research, and this can best be acquired by giving practical instruction to classes. The department will, therefore, make full arrangements during the coming summer to put up material in paraffin and collodion for class-work.

TEACHERS' BULLETINS. Many eminent agriculturists have the conviction that the best way to awaken a real interest in farm life is to instruct the children by means of natural objects. An attempt has been made by Cornell University to introduce nature study into the rural schools of New York State, and the result has been very gratifying to the teachers, pupils, and parents

"So far as the present outlook is concerned, it is, perhaps, not too much to say that many believe that the movement directed toward the young people of the rural communities, is the most important one which has developed in agriculture since the consummation of the Experimental Station idea." (Year Book, U. S. Dept. Ag., 1897, p. 284)

The present drawback to the adoption of such a plan in Ontario lies in the fact that the majority of teachers in rural schools are not sufficiently equipped for the work of instruction. To overcome this difficulty, leaflets might be prepared by this department, and issued to teachers to show how nature study may be presented to the pupils. These leaflets need not affect Agriculture directly, but topics might be dealt with which would vitally affect Agriculture indirectly. In a few years the teachers themselves would become, I venture to think, the most potent advocates of nature study, because their labors would be more pleasant. What pupils would not become interested in the observation of insects and plants under the direction of an enthusiastic teacher?

A FEW OF THE MOST NOXIOUS INSECTS, WEEDS, AND FUNGI.

Turnip Louse. Many enquiries have reached this department with regard to the Turnip Louse or Aphis (*Aphis brassicae*). This small insect was extremely troublesome this last fall on turnips and rape, and many complaints were made. The aphids are generally found in clusters on the lower surfaces of the leaves, but sometimes the upper surfaces are also attacked. On close observation many will be seen to be winged, especially in the autumn.

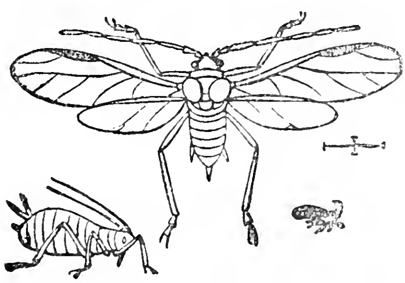


Fig. 1. Turnip Lice—Females wingless and male winged.

A powdery secretion covers the whole cluster of lice, as if dust had been sprinkled upon them. The lice are not easily disturbed, but move about very lazily when touched. They have no biting mouth parts, but are provided with sucking beaks which they insert into the green tissues of the leaf and suck up the nourishment.

Treatment for these lice over large fields is very difficult, from the fact that the pests are usually hidden on the under surface of the leaves. Kerosene emulsion has proved successful in small fields of cabbage and turnips. Much success has attended the method of late sowing and high manuring, so that growth is healthy and rapid. Aphids will usually have very little effect upon such healthy, vigorous plants.

Tent Caterpillars. The two Tent Caterpillars (*Clisiocampa Americana and C.* disstria) must be ranked among our most destructive insect pests. These are readily recognized by their peculiar egg clusters, and their tents, constructed in the forks of branches of the apple, cherry, and some forest trees. The eggs are laid in early summer, in ring like clusters on twigs, and remain in that position for the rest of the summer and winter. The larvæ, or caterpillars, appear early in spring, and attack the young buds and newly opened leaves. About June the larvæ leave the trees and build cocoons in sheltered places where they remain about three weeks.

The best way to combat these Tent Caterpillars is to destroy their tents when the larvæ are inside in early morning, and to crush the egg clusters during the winter. Of course Paris Green spray will kill the larvæ.

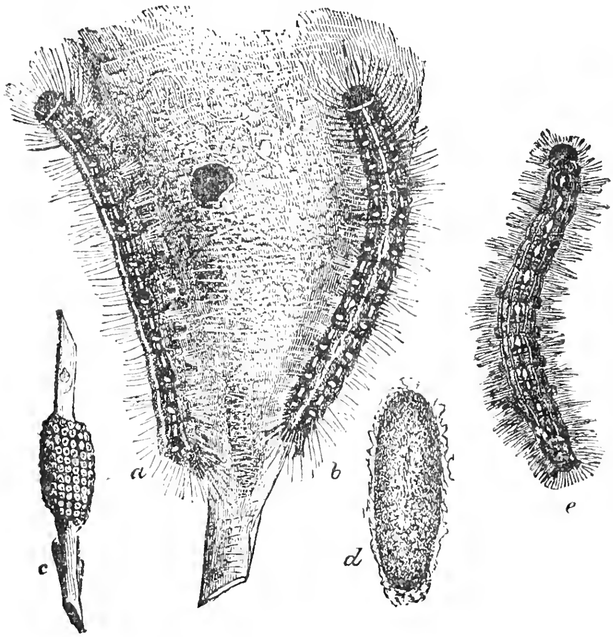


Fig. 2. Tent Caterpillar, showing rings of eggs at (*a*); caterpillars at (*b*); and cocoon at (*d*). (*e*) Forest Tent Caterpillar.

Larch Saw Fly. The Larch Saw Fly (*Nematus Erichsonii*) still continues its devastations in our tamarac forests. Unfortunately very little aid can be extended to the infested regions, but in small areas the use of Paris Green spray has been beneficial.

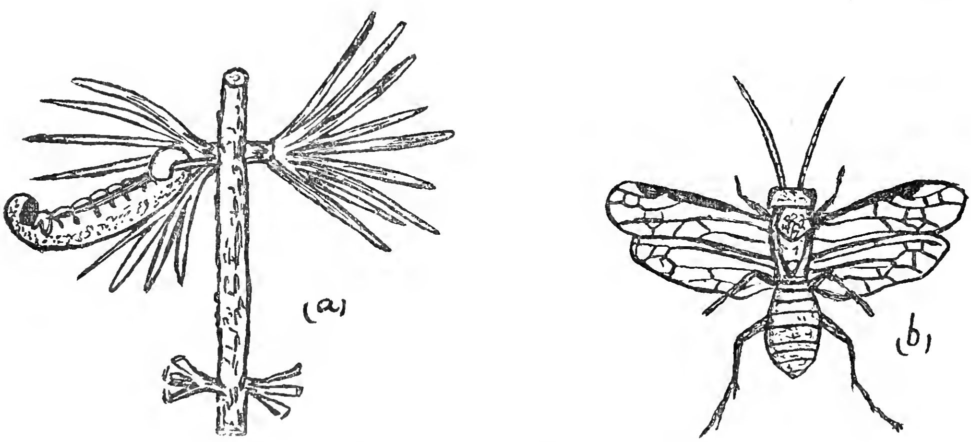


Fig. 3. Larch Saw-Fly—(*a*) Caterpillar; (*b*) Adult Saw-Fly.

Jarring young shade trees has had good results, as the larvæ cannot climb trees. Probably parasites are our best friends, and we must look to them to keep the Saw Fly in check in our great swamps. Another favorable feature is the great vitality of the tamarac, which often quickly revives after complete defoliation.

Lecanium. In some districts the locust hedges have been severely attacked by a scale insect, a species of Lecanium, which is an oval, brown insect about one-fifth of an inch long, and one-eighth of an inch broad. The scale is the body of the insect itself, in this respect differing from the San José, the Oyster Shell, or the Scurfy Bark Lice, which protect their bodies with an armor or scale. The old, dead, brown scales remain on the branches during fall and winter, and are quite conspicuous objects. When broken into nothing but dust-like remains of egg-shells can be seen. The young escape from the eggs about July and make their way to the leaves, where their small size and color render them very inconspicuous. They secrete honey-dew which forms a suitable medium for the growth of a sooty-black fungus. In late summer or early autumn the immature forms migrate to the branches before the leaves fall, where they hibernate. In spring their growth is very rapid, so that they are mature in May, when the females are as large as the old scales, but are soft and yellowish. The eggs are laid under the body of the female, and there is but one brood each year. The adult males are winged, and appear in June, their scales being much smaller and flatter than those of the female. Prof. Slingerland, State Entomologist of New York State, recommends that infested trees or shrubs be sprayed with Kerosene Emulsion once after the leaves fall in the autumn, and at least twice in the spring before the buds open.

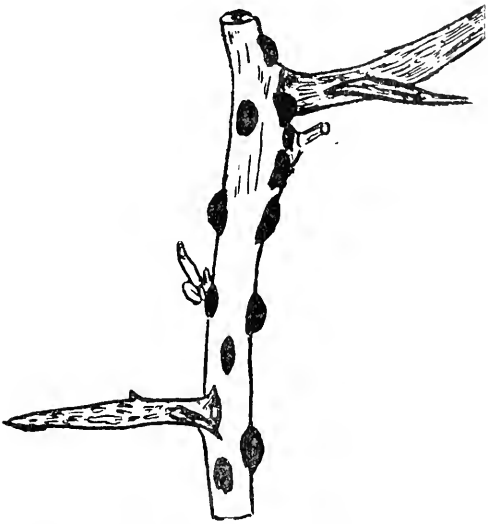


Fig. 4. Lecanium on Locust-hedge showing old, mature scales of Females.

Bindweed. Another bad weed is the Bindweed (*Convolvulus Arvensis*) which is spreading rapidly wherever it has obtained a foothold. It resembles a morning-glory in habit, and may either run or climb. The flowers are not numerous, but are quite large, being over an inch in diameter. The roots are perennial, composed of long, white threads, small portions of which are capable of budding and reproducing the plant, so that careless cultivation only tends to spread the pest. The chief methods of propagation are the dispersal of seeds in hay and other crops, the breaking off of roots by the plow and carrying these to different parts of the field. Many methods have been tried to eradicate this pest, but with little success. Continuous shallow surface cultivation, it is contended by some, will eventually stamp it out. Some recommend the application of dilute sulphuric acid, or coal oil, or carbolic acid, while others maintain that thick seeding crops, which tend to smother it, will keep it in check.

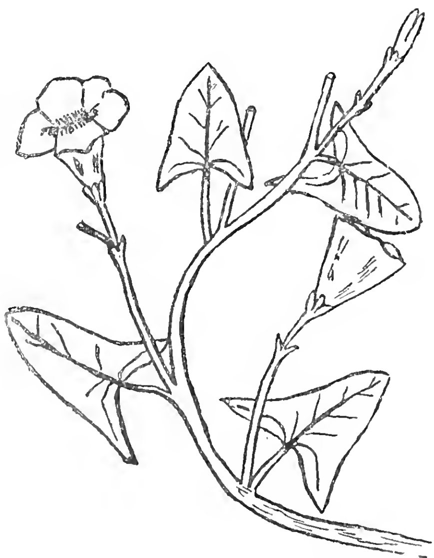


Fig. 5. Bindweed—Showing leaves and flowers.

Rib-Grass. One of the worst weeds of the past season was Rib Grass, sometimes known as Ripple Grass, or Black Plantain, or English Plantain (*Plantago Lanceolata*). This weed has evidently been introduced into Canada from Europe in grass or clover seed.

It has a perennial root and consequently is hard to deal with. Grass lawns are suffering heavily, and as soon as dry weather sets in, the Rib-Grass forges ahead of the grasses. It is a stemless weed, very conspicuous during July and August in dry lawns which are not mown frequently.

Fig. 6. Rib-Grass—(*a*) Showing lanceolate leaves and spikes of flowers; (*b*) A single flower from spike.

The time of flowering ranges from June to October; the flowers are small and whitish, arranged in a spike which rises to a height of ten or twelve inches. The only methods for controlling this weed are constant spudding in lawns, and the use of clean clover and grass seeds.

Fungi. Mr. Doherty has, at my request, prepared the following notes on the Apple Scab and the Peach Leaf Curl, both of which were very destructive during the past season:

Apple Scab (*Fusicladium dendriticum*)—Fckl.

This fungus attacks the fruit and leaves of the apple, and is the cause of the black or blackish scabby appearance so familiar to orchardists. It first makes its appearance upon the apple as small olive-green patches, which later become black and spread until a number run into one another to form a large disfigurement. The side of the apple most seriously affected fails to develop fully as a result of the fungus appropriating its nourishment. In this manner a large percentage of the apples are rendered unsaleable, or at least of little market value. The annual loss sustained by the farmers and fruit growers of the Province is difficult to compute, but it is safe to say that 60 per cent. of the apple and pear crops are destroyed by this fungus and a closely related species *Fusicladium pyrinum*, or Pear Scab. Some varieties appear to be more susceptible to injury from the scab than others. The Fameuse, or Snow Apple, for instance, is as a rule seriously injured, while the Rhode Island Greening is comparatively free from attacks of this fungus. Of pears, the Flemish Beauty appears to be the most susceptible.

The same parasite that causes the scab on the fruit also affects the leaves and new growth of the tree. Diseased leaves are unable to perform their normal functions, assimilation is restricted, and the vitality of the whole tree is impaired, thus not only diminishing the present crop but injuring the prospect for future ones as well.

The life history of the fungus has not been well determined, but it is now believed that infection takes place much earlier in the season than was formerly supposed; it is probable that the disease obtains a foothold before the petals fall from the tree.

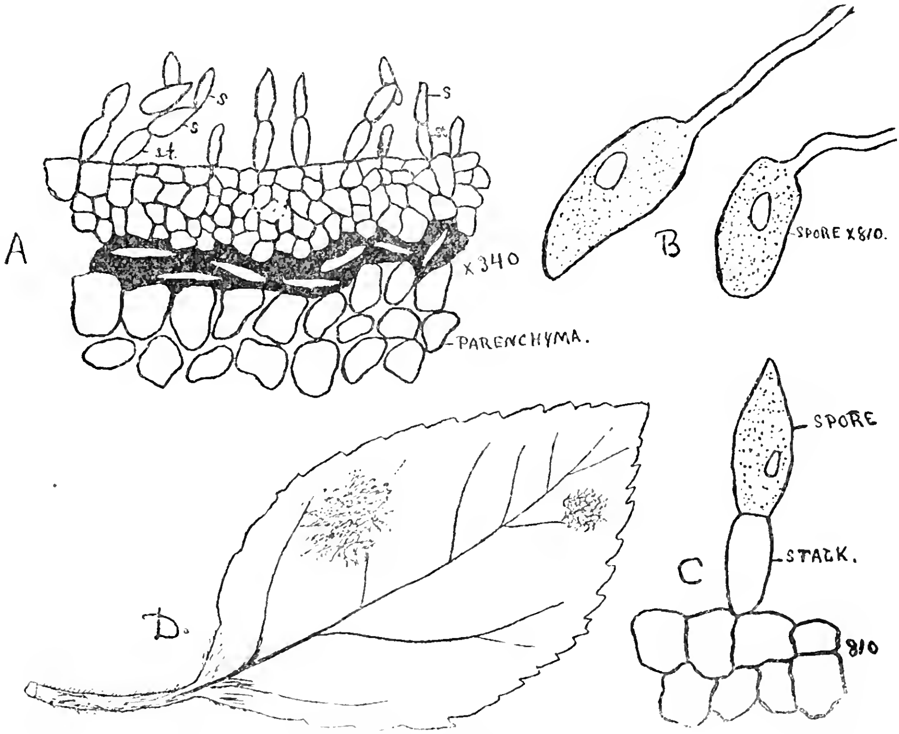


Fig. 7. A.—Section of apple, showing spores *S* and stalks *St* on surface of apple. B.—Germinating spores. D.—Leaf affected with apple scab.

Under the microscope, sections of the fruit or leaves show that the dark velvety growth on the surface is the fruiting part of the fungus, the vegetative portion of which is more deeply seated. The spores are variable in size and form, being sometimes almost perfectly egg shaped, and sometimes larger toward the free end than below. (See Fig. 7-A). In the most characteristic form they are nearly oval in general outline, but rather pointed at the free end. Nearly all are one-celled, but occasionally one is found with a cross partition, making it two-celled.

They germinate by sending out a slender tube (Fig. 7-B). The manner in which this tube gains entrance into the tissues of the fruit is not known. When this is found out, the great susceptibility of certain varieties to attacks of this disease may be explained. The vegetative mycelium, or thread-like tubes of the fungus does not penetrate the tissues of the fruit to any great extent, but forms a layer of pseudo-parenchyma ex ternal to the soft cells (parenchyma) of the apple. This pseudo-parenchyma bears the stalks (conidiophores) and the spores. (See Fig. 7-A). These spores become detached from the stalks on which they are borne and, if circumstances prove favorable, propagate the disease throughout the year. Winter spores are produced on the fallen leaves in perithecia. The perithecia contain asci, each of which contains eight spores.

Treatment. The treatment is preventive, and in cases where the fungus has once penetrated the plant tissues, there is no efficient remedy for it. The application of a fungicide as soon as the flowers open is perhaps the most effective application of the entire treatment and should receive careful attention.

It is usually advisable to spray an insecticide along with the fungicide in order to reduce the expense and labor. As soon as the fruit is formed, the codling moth lays its eggs in the calyx end of the apple. The worms which develop from these eggs eat their way into the apple and make it wormy. As soon as the fruit begins to hang down, little benefit can result from the application of Paris Green. So Paris Green should be sprayed with the second application of the Bordeaux mixture.

Experiments conducted under the direction of the Minister of Agriculture throughout this province during the past two or three years prove conclusively that it is possible, by the application of fungicides, to keep this disease well under control, and in some cases to cause its almost total disappearance. Of the various fungicides two will here receive consideration, viz., Bordeaux mixture and carbonate of copper solution. Although the latter has probably given better results in experiments, the former is more popular with fruit growers in general.

Carbonate of Copper Solution. A solution according to the following formula is found convenient and effective: One ounce of carbonate of copper dissolved in one quart of aqua-ammonia (strength 22 Baumè), diluted with twenty-five gallons of water. A large tree will need about two gallons for a thorough spraying, and a smaller one one and one-half gallons.

Preparation. Keep the ammonia in a glass vessel tightly corked. In buying carbonate of copper, order the precipitated form. Add the carbonate of copper to the ammonia at the rate of one ounce to a quart of ammonia. When ready to spray, add this solution to water at the rate of one quart to twenty-five gallons. At least three applicantions should be made, and some recommend as many as seven if the season is unusually wet. The first should be made as soon as the trees are in bloom, the second when the fruit is well formed, and the third ten days after the second.

Never add Paris Green or London Purple when spraying with carbonate of copper as injury to the foliage is sure to follow. If it is desired to spray with Paris Green for the codling moth, do so the day following the second application of the fungicide.

Bordeaux Mixture. On many grounds this is preferable to the carbonate of copper; it is somewhat cheaper, does not injure the foliage when applied with Paris Green, and is not so easily washed off.

Preparation. Dissolve five pounds of the copper sulphate crystals in four or five gallons of warm water in a clean tub or barrel; slake four pounds of lime and add water until a thin white wash is produced. Strain this into the copper solution and add water up to forty gallons. For the Scale, spray at least three times, as with carbonate of copper. With the second application, Paris Green for the Codling moth may be added at the rate of one pound to forty gallons of the fungicide.—M. W. D.

Peach Leaf Curl. (*Exoascus deformans*).

This fungous disease, which attacks the twigs and leaves of the peach, is commonly spoken of as the "leaf curl." It affects the leaves more than the twigs. It causes only a slight enlargement of the twig, while it involves the leaf in a series of irregular folds with the edges drawn toward each other. The affected portions of the leaf become pale green, parts being more or less strongly tinted with red and yellow. Fig. 8 represents the leaves of the peach as they appear when diseased by Exoascus. Fig. 9 A, young twig, *b*, Leaf diseased—exact size. The parenchymatous, or soft tissue of the affected leaves, is stimulated to an abnormal growth, causing the leaf to bulge out on one side. The first crop of leaves usually falls, and is generally followed by a second. Frequently the tree fails to develop a crop of fruit. In cases where the fruit falls after setting, the cause is to be found, not in the direct attack of the fungus, but in a lack of nourishment due to the fall of the leaves and to the diseased tissues of the twigs. The "Curl" is most troublesome in seasons when the weather, during the two or three weeks following the putting out of the leaves, is cold and wet. After the disease has run its course, and new

FIG. 8.

leaves have developed, there is seldom any further attack, provided the weather is dry and warm. But the second growth of leaves so exhausts the tree that the succeeding year's crop is light, if any. The mycelium is perennial. It passes the winter months in the tissue of the leaf buds, and in the spring grows out with the developing leaves. In this way the disease is perpetuated from year to year.

The disease spreads, no doubt, chiefly through the agency of affected buds used in "budding" young seedlings in the nursery. Spores are developed in asci on both surfaces of the leaves. The number of spores in each ascus varies from four to eight.

Remedies. To secure good results from any treatment, it is well to head back the branches in the spring, carefully removing any that were injured by the "curl" the previous year, lest the mycelium, which is perennial, might spread in the new leaves when they appear.

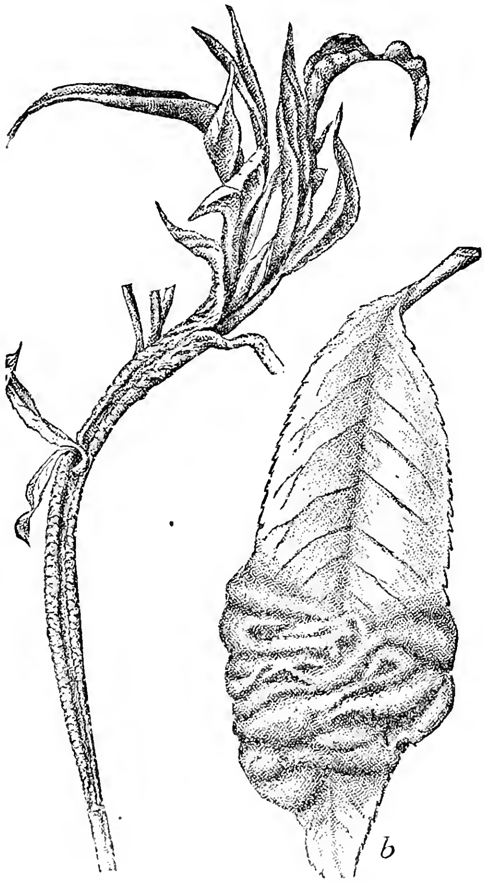


Fig. 9

With proper pruning and spraying of fungicides it is possible to hold this disease in check. Apply Bordeaux mixture—the first application just before the buds, the second as soon as the trees are out of bloom, and the third, about ten days or two weeks after the second. With each application of the Bordeaux mixture Paris green should be used for the curculio, at the rate of one pound to 300 gallons of the mixture. If the weather is wet, a more frequent use of the fungicide may be necessary, and an additional application can often be made with profit.—M. W. D.

All of which is respectfully submitted.

WILLIAM LOCHHEAD,

Professor of Biology and Geology.

Guelph, Dec. 31, 1898.

PART IV.

THE REPORT OF

THE DEPARTMENT OF CHEMISTRY.

To the President of the Ontorio Agricultural College :

SIR,—Owing to Prof. Shuttleworth's continued absence in Germany, it again becomes my duty to report upon the work of the Chemical Department.

Besides the regular class-room and laboratory work with the students of the College, we have, during the summer, devoted considerable time to the study of the composition and digestibility of lucerne as affected by maturity. This work was commenced two years ago and partially reported upon last year. We feel that we have now reached some definite conclusions regarding the feeding value of this fodder. In co-operation with the Experimental Department a commencement has been made in an endeavor to determine the comparative manurial value of the crop residues of several varieties of clover and lucerne. In addition to this, a great deal of miscellaneous work has been done for other departments of the institution and for farmers throughout the country. In all this work, W. A. Kennedy, B.S.A., who has been assisting with the work of the department in Prof. Shuttleworth's absence, has heartily co-operated. Most of the analytical work herein reported has been done by him.

TEACHING. As the number of students increases, and the various courses of study are extended, the teaching both in the class-room and in the laboratories becomes heavier. Last year, in addition to the work of former years, the first year men were given lectures in Chemistry until the middle of June instead of only till Easter as formerly. The third year specialists in Agriculture and Horticulture received a short course of lectures dealing with the chemistry of the various insecticides and fungicides in use, together with practical work in their preparation in the laboratory. The specialists in Dairying were given lectures on the chemistry of milk and its products. In the laboratory they received instructions in methods of analysis of milk, butter and cheese, and spent considerable time in practising the detection of adulterations in milk and its various products.

WORK FOR OTHER DEPARTMENTS.

Dairy Department. Last year, at Prof. Dean's request, we analyzed a number of samples of whey with a view to determining at what stage in the process of the manufacture of cheese the casein is lost; also, whether more casein is lost in whey from rich milk than in that from poor milk, and at what stage or stages it is lost. This work was continued during the summer of 1898, the casein in twenty samples of whey being determined at four different stages in the process of the manufacture of the cheese, viz., before dipping, after dipping, after milling, and after salting. The Dairy Department was also carrying on some experiments to test the effect of different methods of churning and salting butter. Co-operating with them in this work, we made a complete analysis of seventy-four samples of butter, the results of which, together with those of the whey, will be found in the report of the Professor of Dairying.

Apiarian Department. For sometime past, the bee-keepers have been agitating for the exclusion of thin and unripe honey from the market. Mr. Holtermann, director of the committee on co-operative experiments in apiculture of the Experimental Union, has been endeavoring to arrive at some standard of quality. At his request we determined the specific gravity of forty odd samples of honey, the results of which will appear in Mr. Holtermann's section of the report of the Experimental Union.

Experimental Department. Under the direction of Mr. Zavitz, Director of Co-operative Experiments in Agriculture, in connection with the Experimental Union of this College, there is made annually an experiment to test the value of nitrate of soda, superphosphate, and potash on certain crops; and, at Mr. Zavitz's request, we analyzed samples of the three different manures sent out this spring with the following results:

Sodium Nitrate	Moisture	1.86	per cent.
	Ammonia (NH_3)	18.60	"
Muriate of Potash	Moisture	1.36	"
	Potash (K_2O)	49.68	"
Superphosphate	Moisture	2.28	"
	Total Phosphoric Acid (P_2O_5)	35.19	"
	Water Soluble (P_2O_5)	30.34	"

For a number of years, Mr. Zavitz has been experimenting with nitrate of soda, potash, superphosphate, various mixtures of these, wood ashes, and farmyard manure on the potato crop. For six years in succession, two mixed fertilizers have given the best average results. These we have found to have the following composition:

Percentage composition of the two fertilizers giving the best results on potatoes.

——	Moisture.	Ammonia. NH_3	Potash. K_2O	Total Phosphoric Acid P_2O_5	Water Soluble Phosphoric Acid P_2O_5
No. I	15.22	4.05	5.05	12.65	9.37
No. II	7.78	4.89	5.83	12.51	8.37

Of these two fertilizers No. I. has given the best average results.

In determining the relative amount of hull on different varieties of oats, the experimentalist had the hulls removed from one hundred grains of each of ninty-one varieties; and at his request we analyzed the mixture of hulls; also the mixture of grains from which the hulls had been removed. The results are as given below:

Percentage composition of hulls and hulless grains of oats figured to dry matter.

——	Crude Protein.	Crude Fat.	Nitrogen Free Extract.	Crude Fibre.	Ash.
Hulls	2.318	.200	56.400	36.253	4 829
Hulless grains	16.643	6.125	72.193	2.769	2.269

During the past summer the Experimental Department has done considerable work in determining the relative amounts of the crop residue of three varieties of clover and lucerne. The roots, as taken from the soil, were handed over to the Chemical Department for analysis. After it had been dried, and the soil clinging to the small roots had been removed as completely as possible, a sample was taken for the determination of nitrogen, and the remainder was burned to an ash. The following table gives the percentages of potash, phosphoric acid, and lime in the ash; also the percentages of these constituents and nitrogen in the dry roots and tops. For the weights of the various crop residues, and for particulars regarding the date and manner of digging the roots, see the report of the Experimentalist.

Percentage composition of the ash of common red, mammoth red, and alsike clover and lucerne; also, per cent. of nitrogen and ash constituents in the dry roots and tops.

Dug from date of seeding.	In the ash.			In the dry roots and tops.			
	Potash. K_2O.	Phosphoric Acid. P_2O_5.	Lime. CaO.	Nitrogen. N.	Potash. K_2O.	Phosphoric Acid. P_2O_5.	Lime. CaO.
Two months.							
Red clover (whole plant)	5.41	2.53	7.53	2.25	.88	.41	1.22
Mammoth red "	4.18	3.27	12.77	2.79	.73	.57	2.24
Alsike "	4.24	2.26	7.40	3.16	1.32	.71	2.31
Lucerne "	11.80	4.08	12.35	2.82	3.08	1.06	3.22
Five months.							
Red clover tops	5.16	3.12	13.41	3.09	1.01	.61	2.65
" roots, 1st 6 inches	4.90	3.78	6 07	2.33	.94	.72	1.17
" " 2nd "	3.13	3.61	4 66	2.01	.53	.61	.79
Mammoth red tops	6.73	3.88	20 59	2.71	.57	.63	3.22
" roots, 1st 6 inches	3.93	3.08	5.43	2.42	.81	.63	1.12
" " 2nd "	2.84	2.32	5.70	1.90	.57	.47	1.15
Alsike tops	2.99	1.94	6.52	3.38	.79	.51	1.72
" roots, 1st 6 inches	3.68	2.84	4.50	2.68	.89	.69	1.09
" " 2nd "	1.49	1.38	3.60	1.78	.47	.45	1.14
Lucerne tops	7.74	3.47	17.81	3.12	.91	.41	2.10
" roots, 1st 6 inches	6.91	2.02	6.42	2.33	.70	.20	.65
" " 2nd "	6.77	3.66	5.50	2.17	.59	.32	.48
Fourteen months.							
Red clover tops	10.56	4.20	21.88	1.51	.98	.39	2.03
" roots, 1st 6 inches	3.43	2.06	7.16	2.22	.92	.55	1.91
Mammoth red tops	9.33	4.52	18.48	1.67	.70	.34	1.39
" roots, 1st 6 inches	8.19	2.14	8.35	1.87	1.14	.30	1.17
Alsike tops	11.60	4.42	18.03	1.93	1.20	.46	1.86
" roots, 1st 6 inches	2.99	2.01	5.65	2.07	.61	.41	1.16
Lucerne tops	14 24	5 43	19 03	2.41	1.45	.55	1.94
" roots, 1st 6 inches	8.19	5.64	8.66	2.38	.74	.51	.79
" " 2nd "	3.73	3.80	3.49	1.91	.39	.59	.36
Seventeen months.							
Red clover tops	4.56	2.58	12.15	2.59	.42	.21	1.69
" roots, 1st 6 inches	3.97	2.59	6.58	2 32	.70	.45	1.15
" " 2nd "	2.88	2.25	5.40	2.08	.47	.37	.89
Mammoth tops	7.62	2.58	14.48	2.48	1.07	.36	1.92
" roots, 1st 6 inches	3.29	1.32	3.33	2.27	1.04	.41	1.05
" " 2nd "	4.09	2.48	4 21	1.63	.56	.34	.58
Alsike tops	5.33	3.44	15.15	3.18	1.03	.66	2.92
" roots, 1st 6 inches	5.04	4.72	5.93	2.74	.51	.47	.60
" " 2nd "	* No	sample.		1.98	No	sample.	
Lucerne tops	10.36	4 00	15.64	2.78	1.07	.41	1.61
" roots, 1st 6 inches	7.99	6 66	7.14	1.64	.66	.55	.59
" " 2nd "	7.22	9.67	6.72	1.58	.41	.55	.38
" " 3rd "	4.05	4.74	4.58	1.59	.43	.51	.48
" " 4th "	2.75	3.14	4.86	1.58	.42	.48	.75

* The sample was too small to obtain enough ashes for analysis.

Water Analysis.

During this last summer there has been an increased demand for the analysis of water used for household purposes. It appears that there is great need for work of this nature; for, out of the thirteen samples analyzed, only one could be called a good drinking water. In most cases, there was evidence of sewage contamination, caused, no doubt, by soakage from the barnyard or from privies, which are too frequently found close to the wells. Recognizing the importance of good, pure water to the individual and the fact that, in many cases, farmers and others are using water wholly unfit for drinking purposes, we wish to announce that we will examine, both bacteriologically and chemically, waters sent us, provided the following conditions are complied with. The sender must pay all express charges and must take the sample according to the directions given below; for unless great care is taken in the sampling of the water, no faith can be placed in the results of the examination.

Mr. Harrison, bacteriologist, will make the bacteriological examination, and we jointly give the following directions for the taking of the sample:

Container. A bottle of not less than one-half gallon capacity is to be used, preferably one with a glass stopper. If there is no glass stopper, the bottle must be fitted with a *new* cork.

Preparation. The bottle must be thoroughly cleaned, all foreign substances removed, and scalded out with boiling hot water and then allowed to drain until cool.

Taking of Sample. If the sample is to be taken from a well, the water must be pumped out for about five minutes, or long enough to empty all pump connections before the sample is taken; if, from a tap, the water must be allowed to run to waste for ten minutes, or long enough to empty all local laterals, before sampling. Water standing in the pipes in a house is under very favorable conditions for the multiplication of bacteria. If, therefore, the precaution of running off the water be not taken, a very erroneous conclusion as to the number of bacteria present, may be drawn. If the sample is to be taken from a lake or stream, it must be taken some distance from shore, the sampling vessel being plunged a foot and a half below the surface, to avoid the surface scum. Samples are not to be taken immediately after a storm. From wherever the sample is taken, the bottle must be rinsed out several times with the water to be analyzed. The bottle must not be filled quite full, a small space must be left for the expansion of the water. Cork, and tie a piece of cloth over the neck to keep the cork in place. Do not use sealing wax.

Packing. If the weather is warm, pack the bottle in ice. During the winter, sawdust may be used. The water should arrive at the laboratory at, as nearly as possible, the same temperature as when the sample was taken.

Notification. Send notice by mail stating by what express company you are sending the water, and the date of the shipment. Also give as fully as possible the history of the well or source of the water, and remarks on the sanitary surroundings.

Note. On application a suitable bottle, properly prepared, will be sent to the applicant.

Fertilizing Constituents in Sludge.

In July we analyzed two samples of sludge from the Sewage Interception Works, Hamilton. The sludge from which the samples were taken had been prepared somewhat differently, both in the precipitation and in the drying. In one case, the drying was done by evaporation and in the other by means of pressure; both were comparatively free from odor. Farmers in the neighborhood were beginning to use the sludge as a manure and were desirous of knowing its true manurial value. The following is the percentage composition of the samples sent to us:

Name of sample.	Moisture.	Phosphoric Acid P_2O_5.	Potash K_2O.	Ammonia NH_3.	Ammonia figured as sodium nitrate.
Per Cent.					
Evaporated	3.78	.22	.16	1.28	6.40
Compressed	5.05	.95	.86	1.00	5.00
Pounds per ton of substance.					
Evaporated	....	4.4	3.2	25.6	128.0
Compressed	....	19.0	17.2	20.0	100.0

Later a sample was sent which contained nitrogen equivalent to 15 per cent. of sodium nitrate.

Samples of sugar beets were sent in for analysis by the Owen Sound Sugar Manufacturing Co., The Bothwell Dairy Co., and by Dr. Comfort, North Pelham. The eight lots received from the Owen Sound Sugar Manufacturing Co. were made up of beets of about a pound to a pound and a half in weight, grown well in the ground. They were very similar in composition to those analyzed for the same company last year; the average per cent. of sugar in this year's lot being 14.5, while that of last year was 14 8. Some of the other samples sent showed a fair per cent. of sugar, but in most cases the beets were too large and were grown with a half or more of the beet out of the ground, consequently the per cent. of sugar was very low.

A few samples of marl were examined; and one sample of a peculiar soil was analyzed, which, however, is not of sufficient importance to report here.

Composition of Lucerne as Affected by Maturity.

Last year we commenced a study of the composition of lucerne as affected by maturity. The object of the work was to determine at what stage in its growth lucerne should be cut to yield the maximum amount of digestible food. Following very closely the plan as outlined in last year's report, this work has been continued throughout the past season. The first and second crops of this year's growth were cut at three different stages of maturity, which, although a little earlier, corresponded very closely with those of last year. The first cuttings were made when the buds were well formed; the second, two weeks later, when the blossoms were about one-third out; and, the third, another two weeks later, when the plant had passed the full blooming stage. The three cuttings of each crop were from the same plot as those of last year, but they were made from a larger area, each cutting being from one-thirtieth of an acre. The treatment of these different cuttings was exactly similar to that of last year. The following table gives the weight of the various cuttings of the second crop of 1897 and of the first and second crops of 1898, calculated to the yield per acre:

Yield per acre in green state, as hay, and figured to dry matter.

——	Green state.	As hay.	Dry matter.
Second crop, 1897.	lbs.	lbs.	lbs.
First cutting	17,100	3,761	3,197
Second "	15,400	4,493	3,819
Third "	11,500	3,902	3,317
First crop, 1898.			
First cutting	18,000	3,582	3,045
Second "	19,050	5,001	4,251
Third "	17,550	4,581	3,894
Second crop, 1898.			
First cutting	7,125	2,234	1,899
Second "	9,090	2,947	2,505
Third "	8,040	2,604	2,214

Very little rain fell during the growing period of the second crop of 1898, which, no doubt, accounts for the much smaller yield than that obtained from the second crop of 1897. In every case but one, the largest yield in green state, as hay, and as dry matter, was obtained from the second cutting, which, it will be noticed, was made when the plants were about one-third in blossom. It is quite possible that the weight of the crop would have increased for a few days longer; but it is evident that by the time the plant reaches full bloom or a little beyond, there is a marked decrease, which can be at least partially accounted for by the large number of leaves which had fallen off previous to the third cutting. Not only was the yield less in the third cutting, but the percentages of the most valuable food constituents had also decreased. This is shown in the following table :

Percentage composition of lucerne harvested at different dates.

	In fresh material.							In water-free material.					
	Water.	Ash.	Crude protein.	Crude fibre.	Nitrogen-free extract.	Crude fat.	Amides.	Ash.	Crude protein.	Crude fibre.	Nitrogen-free extract.	Crude fat.	Amides.
Second crop, 1897.													
First cutting ..	81.31	1.60	3.76	5.32	7.08	0.93	0.70	8.54	20.12	28.47	37.88	4.99	3.73
Second " ..	75.20	1.75	3.86	7.83	10.64	0.72	1.12	7.09	15.54	31.57	42.90	2.89	4.52
Third " ..	71.17	1.79	3.97	11.67	10.83	0.57	0.83	6.23	13.79	40.46	37.54	1.99	2.88
First crop, 1898.													
First cutting ..	83.08	1.65	3.46	5.07	6.07	0.67	0.84	9.73	20.45	29.98	35.90	3.93	4.94
Second " ..	77.68	1.52	3.24	7.29	9.30	0.96	0.79	6 92	14.72	33.16	40.84	4.36	3.59
Third " ..	77.81	1.58	3.01	8.15	8.75	0.70	0.78	7.12	13.59	36.75	39.44	3.15	3.53
Second crop, 1898.													
First cutting ..	73.68	1.98	4.41	6.87	12.07	0.99	1.15	7.52	16.77	26.10	45.84	3.77	4.39
Second " ..	72.43	2.13	4.50	8.67	11.36	0.90	1.26	7.73	16.32	31.46	41.21	3.28	4.62
Third " ..	72.40	2.12	3.95	9.88	10.91	0.74	0.98	7.68	14.30	35.81	39.52	2.69	3.56
Average of above.													
First cutting ..	79.36	1.74	3.88	5.75	8.41	0.86	0.90	8.59	19.11	28.18	38.89	4.23	4.35
Second " ..	75.10	1.80	3.86	7.93	10.45	0.86	1.06	7.24	15 52	32.06	41.67	3.51	4.24
Third " ..	73.79	1.83	3.64	9.90	10.17	0.67	0.86	7.01	13.89	37.67	38.82	2.61	3.32
Averages of some American analyses of first and second crops cut at similar stages of maturity.													
Buds forming ..	81.53	2.15	3.41	5.09	7.27	0.57	0.75	11.63	18.46	27.56	39 36	3.06	4.09
Medium bloom .	78.48	2.06	3.32	7.23	8.41	0 52	0.48	9.60	15.44	33.58	39.08	2.40	2.23
Full bloom	74.50	2.12	3.35	9.60	10.03	0.49	0.47	8.35	13.12	37.64	39.36	1.94	1.86

Explanation of terms : *Ash* is the part of the fodder which remains unconsumed by burning to whiteness at the lowest possible red heat. It is essential to the formation of bone. *Crude protein* is the muscle-formers collectively, which includes both the albuminoids and amides. As protein is the most expensive part of a cattle food, a large amount of it in a fodder is desirable. *Amides* appear to be an immature form of albuminoids, and are not capable of performing all the functions of the latter. As a plant matures they are converted into albuminoids. *Crude fat* is that part which is soluble in ether, and consists of a mixture of oils, wax, coloring matters, etc. Linseed oil is a common constituent. *Crude fibre* is the woody portion of a fodder ; it is the part that is the most indigestible and therefore of the least value. *Nitrogen-free extract* is a mixture of substances commonly called carbohydrates. Starch and sugar are good examples.

It will be noticed that there is a marked similarity in the composition of the various cuttings of the different crops. The second crop of this season contained much less moisture than either of the other two crops reported, which accounts for the higher percentages of the various constituents in the fresh material. This is especially true of the first cutting. As stated before, the crop was grown during very dry weather. The average composition of the various cuttings of all the different crops used in work will be found in the table ; also, the averages of some American analyses of the first and second crops which had been cut at different stages of maturity very similar to our own. It is interesting to note the similarity in composition of these two sets of averages. It will be seen that there is a decrease in the percentage of water, and therefore in the succulency of the material as maturity approaches. Referring to the part of the table in which the composition is calculated to water-free substance, it will be seen that the percent of crude protein also decreases, and that the crude fibre increases very rapidly. Since the other constituents are fairly constant in composition, the decrease and increase of the protein and fibre respectively affect to a very large extent the value of a fodder. As the plant matures, then, its most valuable constituent is decreasing in percentage while the most worthless part is increasing very rapidly. This would naturally lead one to the conclusion that the earlier the crop is cut the better it is for use as a fodder. It must not be forgotten, however, that up to a certain stage in the growth of a plant it increases in weight, and consequently while the percentage of crude protein decreases, the absolute amount may increase; also that, as maturity advances, the protein becomes more valuable as the amount of amides decreases. At the same time crude fibre is increasing both relatively and absolutely. This is shown very clearly in the following table:

Table showing the increase or decrease in the amounts of crude protein and crude fibre.

——	Total dry matter.	Percentage of crude protein.	Absolute amount of crude protein.	Percentage of crude fibre.	Absolute amount of crude fibre.
Second crop, 1897.	lbs.	%	%	%	%
First cutting	3,197	20.12	643.2	28.47	910.2
Second cutting	3,819	15.54	593.5	31.57	1,205.6
Third cutting	3,318	13.79	457.4	40.46	1,342.1
First crop, 1898.					
First cutting	3,045	20.45	622.7	29.98	912.9
Second cutting	4,251	14.72	625.7	33.16	1,409.6
Third cutting	3,894	13.59	529.2	36.75	1,431.4
Second crop, 1898.					
First cutting	1,899	16.77	318.5	26.10	495.6
Second cutting	2,505	16.32	409.3	31.46	788.1
Third cutting	2,214	14.30	236.6	35.81	792.8

It will be noticed that in two cases the absolute amount of crude protein increases with the second cutting, and that in one case it decreases slightly, but that in every instance there is a decrease with the third cutting. The absolute amount of crude fibre increases with each successive cutting, although the total dry matter shows a marked decrease in the third cutting. It is evident from the above figures that the second cutting of each crop yielded the largest amount of dry matter, and that here too, in two cases out of three, we obtained the largest amounts of crude protein. But the crude fibre has increased so rapidly that in order to decide whether the crop has actually increased in food value or not, it is necessary to determine the digestibility of the constituents of the various cuttings; for it is only the part of the food which is digested that has any nutritive value.

While the determination of the digestibility of the constituents of a fodder by an animal may seem to be comparatively simple, it is surrounded by many difficulties which make the work tedious, and tend to make the results somewhat uncertain. Consequently the work requires to be done a number of times before anything like reliable results can be obtained. We have now made, in all, seven tests with each of the three different cuttings.

The results of digestion experiments in Germany and in the United States warrant the general statement that all ruminants, such as cows, oxen, sheep and goats, digest practically the same amount of protein, fat, nitrogen-free extract and fibre from the same kind of food. Greater differences have been observed between individual animals in the same breed than between young and old animals, or between animals of different breeds. In general, horses digest less of the food constituent than do ruminants. This is especially true of the fibre and fat in coarse hays and grasses. It will be seen, therefore, that the digestibility of a fodder by a sheep can be taken as a tolerably correct measure of its digestibility by a cow or steer. In our work, sheep have been used, because they are much more easily experimented with than larger animals.

Last year but one sheep was fed on each of the cuttings of lucerne; this year the experiment was made in triplicate with three shearling wethers that followed through in succession the three different cuttings of each crop.

A digestion experiment is usually conducted as follows: Healthy animals in the prime of life are fed a weighed amount of food of known composition, and in such a way as to prevent any possible waste. The undigested residue, which forms the solid excrement of the animal, is received directly into an appropriate bag attached to the animal. The excrement is dried, weighed, and a representative sample ground and analyzed. From the weight of the fodder fed and its percentage composition, the weight of each constituent fed can be calculated. In like manner, from the weight of the dried excrement and its percentage composition, the weight of each constituent in the excrement can be determined. The difference between these two gives the amount of each nutrient which has been digested and resorbed during the passage of the food through the alimentary canal. The urine, containing solid bodies representing the waste of the animal organism, does not require to be analysed for the simple control of the digestive activities outlined above.

Lucerne digestion co-efficients, or pounds of each constituent digested per 100 lbs. fed :

—	—	Dry Matter.	Protein.	Fat.	Nitrogen-free Extract.	Fibre.
Second Crop, 1897 :						
First Cutting		60.6	78.9	71.5	70.6	37.1
Second Cutting		59 5	70.8	41.7	70.7	50.4
Third Cutting		49.9	67.7	48.9	61.7	36.4
First Crop, 1898 :						
First Cutting	Sheep No. I	58.4	72.6	52.5	68.9	45.0
	" " II	56.3	72.6	44.9	67.7	40.9
	" " III	56.1	67.8	35 3	70.3	43.0
Second Cutting	" " I	54.4	69.2	67.8	68.4	35.0
	" " II	54.4	70.3	68 0	68.0	34.2
	" " III	56.1	75.1	71.1	67.5	37.3
Third Cutting	" " I	52.2	68.0	60.8	65.1	35.7
	" " II	51.9	69.8	60 8	63.9	35.7
	" " III	49.2	68 9	63.0	60.0	33.3
Second Crop, 1898 :						
First Cutting	" " I	60.5	74.4	43.7	76 7	37.0
	" " II	59.7	74.4	46.2	75.0	36.4
	" " III	58.7	73 4	47.2	73.5	34.3
Second Cutting	" " I	56.8	75.2	34 6	73 1	34.5
	" " II	55 3	74.2	29.5	71.0	35.4
	" " III	56.6	75 1	40.4	72.1	36.9
Third Cutting	" " I	52.2	64.0	14.7	67.2	42.2
	" " II*	....	....	....	....	....
	" " III	52.2	68.1	16.1	65.9	39.7

* Sheep was sick.

In this year's work, each animal was placed in a pen which was about four feet square. The manger was arranged on the outside of the pen, with stanchions on the inside in which the animal's head was placed while feeding, thus effectually preventing any loss by scattering. No more of the fodder was fed than the animal would eat up without a particle of waste. A rubber-lined bag for collecting the fæces was attached to the animal by means of a suitable harness. Each experiment lasted thirteen days and was divided into two parts. The first seven days were given to preliminary feeding so that all traces of previous food may be removed from the system; the next six days formed the experiment proper, during which the solid excrement was carefully collected, being removed from the bags twice a day and placed on the drying pan. The results of this work will be found in the foregoing table, which gives the number of pounds of each constituent digested for every 100 pounds fed. It has been thought unnecessary to place in tabular form the number of pounds of each constituent that was fed, or the number of pounds of each constituent that appeared in the solid excrement, but that for all practical purposes the figures showing the digestion co-efficients, or the percentage digestibility of the constituents of the fodder, would be sufficient.

It has been stated that individual animals vary in their power to digest a given fodder. This is illustrated in the preceding table, where it is shown that three sheep feeding from the same lot of fodder and under similar conditions differ somewhat in their power of digesting the constituents of a fodder. So many circumstances tend to cause a variation in the digestibility of any fodder that even when the average of a number of determinations is taken, it should not be considered absolutely correct, but be used more as a general guide in considering the digestibility of a fodder.

Each of the results in the following table represents the average of seven digestion experiments, one of which was conducted with the second crop of lucerne in 1897, three with the first crop of lucerne in 1898, and three with the second crop in 1898.

Digestion co-efficients.—Average of the several cuttings:

——	Dry Matter.	Crude Protein.	Crude Fat.	Nitrogen-free Extract.	Crude Fibre.
First Cutting.....	58.6	73.4	48.8	71.8	39.1
Second Cutting...	56.2	72.8	50.4	70.1	37.7
Third Cutting....	51.3	64.4	44.1	64.0	37.1

From the above figures it will be noticed that there is a gradual decrease in the digestibility of the hay as growth advances. The deterioration appears to be more rapid during the period between the second and third cuttings than during that between the first and second; or, in other words, there is a more rapid decrease in digestibility after the early blooming stage than previous to that. Apparently the younger the plant the richer it is in valuable constituents and the more digestible are these constituents. But, as has been pointed out, as the plant matures the absolute weight of these constituents increases. Therefore, when a crop is cut for hay, the object should be to cut at such a stage of maturity that the largest possible amount of the valuable constituents can be got without too great a decrease in digestibility; and it has been shown in every case that the largest yield per acre of dry matter was obtained at the time of the second cutting, or when the plants were about one-third in blossom. It has also been shown that after this period there is a more rapid decrease in digestibility. Hence, it would appear that this is about the time when there is the largest amount of digestible nutrients present. This is borne out by the table given below, which shows the amount of digestible matter in the several cuttings. In this calculation the average digestion co-efficients given in the preceding table have been used.

Table showing the amount of digestible matter, calculated to the yield per acre, of the several cuttings of the different crops:

	Dry matter.	Digestion co-efficient.	Digestible matter.
Second Crop, 1897.	Lbs.		Lbs.
First cutting	3,197	58.6	1,873
Second cutting	3,819	56.2	2,146
Third cutting	3,317	51.3	1,701
First Crop, 1898.			
First cutting	3,045	58.6	1,784
Second cutting	4,251	56.2	2,380
Third cutting	3,894	51.3	1,997
Second Crop, 1898.			
First cutting	1,899	58.6	1,112
Second cutting	2,505	56.2	1,407
Third cutting	2,214	51.3	1,135

The above figures show clearly that in our work the largest amount of digestible matter was obtained at the time of the second cutting, or when the growing crop was about one-third in blossom. As the different cuttings were made two weeks apart, it is possible that a larger amount of digestible matter would have been obtained a little earlier or a little later than the period mentioned. All that we can say is that, according to the results of our work, the crop should be cut when *about* one-third in blossom, to obtain the maximum amount of digestible matter.

There is a marked decrease in the digestible matter in the two weeks between the second and third cuttings. Taking an average of the three different crops, we find that this decrease amounts to 18.8 per cent., or very nearly one-fifth of the digestible matter of the second crop. The decrease in digestibility is so rapid that by the time the plant has passed the full blooming stage it appears to be unsafe to feed it in large quantities to any animal. During our digestion experimental work, we fed the three sheep for four weeks entirely on lucerne hay that was made after the plants had reached full bloom; and, at the end of the fourth week, one of the animals was taken sick with impaction of the third stomach, caused, no doubt, by the indigestible nature of the food eaten. With proper treatment, it quickly recovered and, with the other two sheep fed for four weeks longer on earlier cuttings of lucerne without any further trouble. Some ripened lucerne has been fed by the Farm department with serious results. In one case a valuable cow died of stoppage of the bowels. Post mortem examination showed that all passage had been stopped by a ball of indigestible fibre, which was supposed to have been formed from the lucerne eaten. Although we have not had sufficient experimental evidence to prove it conclusively, it seems that there is great danger in feeding large quantities of lucerne hay that has been made from the plant in advanced stages of maturity. Because of the rapid decrease in food value, also because of the rapidity with which the new crop comes on when the old one is removed, and because of the danger in allowing stock to eat the fodder when the plant becomes hard and woody, lucerne, whether in the pasture field or in the hay field, should not be allowed to stand later than the early blossoming stage.

It is instructive to compare the composition of lucerne hay with that of red clover and timothy, each crop being cut at the time when it apparently yields the maximum amount of digestible matter. This, for lucerne, was, according to our work, when the plants were about one-third in blossom; for red clover, when about one-third of the total number of blossom had turned brown; and, for timothy, when the first blossom had fallen. The following table gives the composition of the hays all figured to the same per cent. of moisture, and the calculated amounts of the several constituents digested per ton of hay fed :

Percentage Composition of Lucerne, Red Clover and Timothy Hay.

	Water.	Dry matter.	Crude portein.	Crude fat.	Nitrogen-free extract.	Crude fibre.	Ash.
Lucerne	15.00	85.00	13.20	2.98	35.42	27.25	6.15
Red clover	15.00	85.00	13.04	4.85	37.98	22.05	7.08
Timothy	15.00	85.00	4.70	2.83	42.42	30.00	5.05
Amounts digested per ton of hay fed.							
Lucerne	......	955.4	192 2	30 0	496.6	205.5	....
Red clover	....	974.9	160.3	69.8	540.1	195.4	....
Timothy	....	920.2	37.9	26.9	495.7	325.2	....

According to the above figures, the red clover hay contains the most digestible matter ; but one ton of lucerne hay contains very nearly one-fifth more digestible protien than the same weight of clover hay, and fully five times as much as a ton of timothy hay. The red, clover, however, contains the most digestible fat and nitrogen-free extract, while the timothy contains over one-third more digestible crude fibre than either of the other two hays named. The above figures, which have been calculated from the results of our last three years' work, are very similar to those calculated from the average of American analysis, excepting that, according to their results, there is less digestible fat than in our own. If, along with the above facts, it it remembered that lucerne usually gives larger returns per acre than either red clover or timothy, some idea may be formed of its value as a fodder crop.

The foregoing results lead us to the following general conclusions :

1. That lucerne deteriorates very rapidly both in percentage composition and in digestibility after the early blossoming stage.

2. That, in our experimental work, a much larger amount of digestible matter was obtained by cutting when the plants were about one-third in blossom than by cutting either two weeks earlier or two weeks later.

3. That, cut when about one-third in bloom, lucerne compares very favorably in nutritive value with red clover and timothy.

4. That there appears to be danger in feeding lucerne hay that has been made from the plant in advanced stages of maturity.

5. That, notwithstanding the rapidity with which lucerne deteriorates after passing the early blossoming stage, the fact that, when properly saved, it yields a large amount of nutritious food, makes it a most desirable addition to our list of fodders.

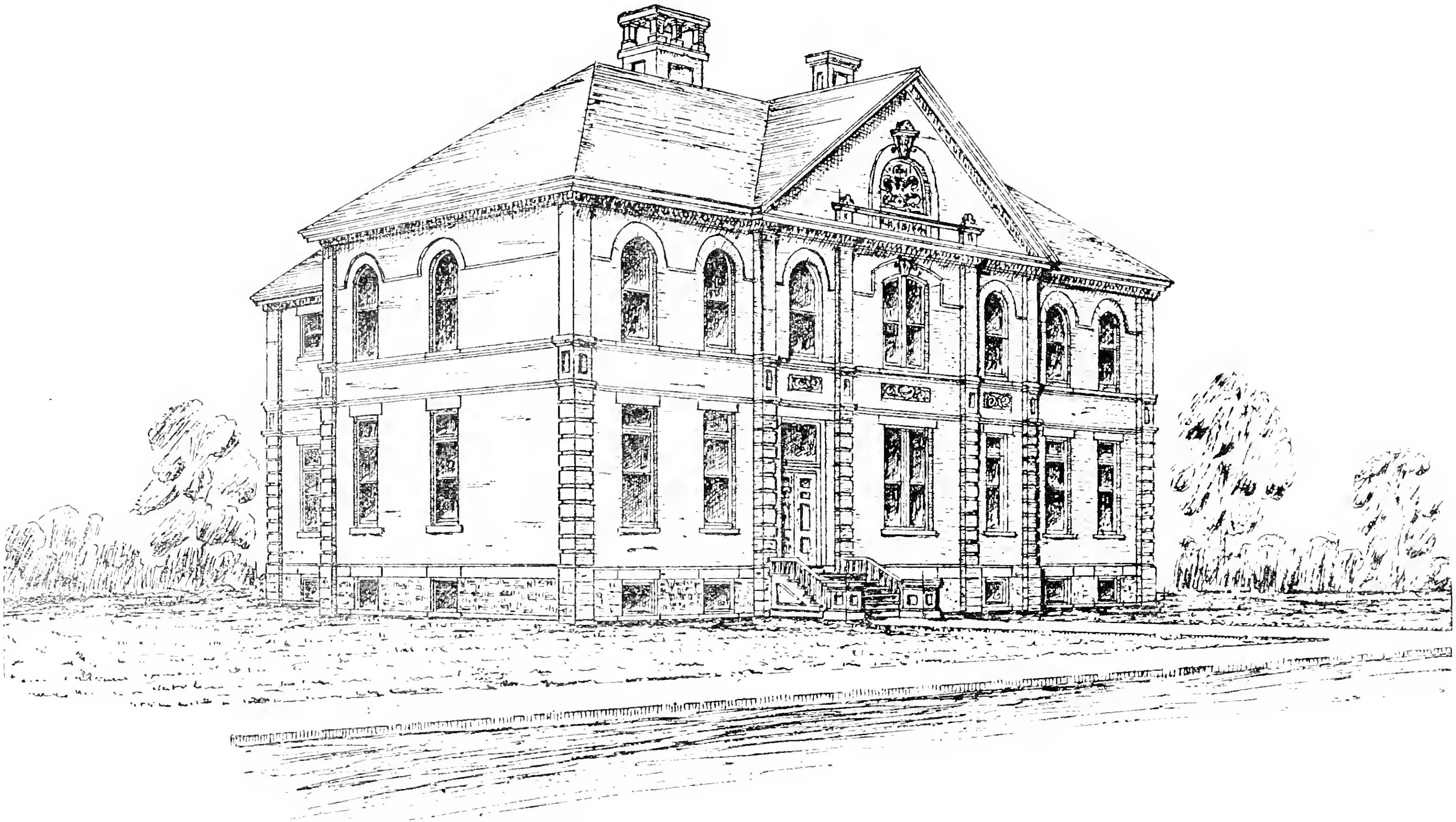
In this report of the work done on lucerne, no attempt has been made to treat of its value as a pasture crop or as a green fodder crop. Complaint has been made that cattle pastured on it show a tendency to bloat. Information is being gathered on this and other points, and a bulletin will be issued at an early date dealing with the whole question of lucerne.

In conclusion, I beg gratefully to acknowledge the co-operation of the Experimental department in our experimental work with lucerne.

Respectfully submitted,

R. HARCOURT,
Assistant Chemist.

December 31st, 1898.



Chemical Laboratory—Ontario Agricultural College, Guelph.

PART V.

REPORT OF THE

PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College :

SIR,—I beg herewith to submit my annual report for 1897.

WORK IN THE CLASS ROOM.

The class-room work has been much the same as in previous years, viz. : To the First year I delivered a course of lectures on veterinary anatomy, considering the bones, muscles, ligaments, joints, etc., the digestive, respiratory, urinary, generative, circulatory and nervous systems, and the organs of special sense. We have in the class room the skeleton of a horse, and during most lectures on anatomy I have also a living animal, and I endeavor to teach the subject by illustration and make it as plain and simple as possible. I also delivered a short course of lectures, known as practical stable lectures, in which we discussed the most approved plans of constructing stables as regards location, material used, size and kinds of stalls, floors and mangers, drainage, ventilation, etc.; also the care and feeding of horses, watering horses, care of harness, saddles, etc. In addition to the above, I gave a course of lectures on veterinary materia medica, considering the general actions of medicines upon the different systems, the different modes of administration, with the modifications of action according to the mode of administration ; and we considered separately the properties, actions, uses and doses of the principal medicines used in practice.

Second Year. To this class I delivered a course of lectures on disease and treatment, speaking of the causes, symptoms and treatment of the ordinary diseases to which the various domesticated animals are subject. I also gave a course in what we call Practical Horse, illustrating upon a living animal the manner of securing horses in order to preserve the operator from injury while engaged in such operations as stitching a wound, opening abscesses, cutting out tumors, removing warts, castrating, etc., etc., illustrating as well as possible, without actually performing the operations, the manner in which they are performed. In this course I point out the desirable and undesirable points of the different classes of horses in respect to size, conformation, action, manners, etc., and also teach the class how to examine a horse as to soundness. To this class I also delivered a course of lectures on veterinary obstetrics. In all cases I endeavor to make the points under discussion as simple and practical as possible. In speaking of diseases of bone, I show the class the condition the disease causes and compare it with a healthy bone (I have specimens of mostly all diseases of bone in the class room), point out and explain the alterations these diseases cause in the living animal, the symptoms which indicate their existence, and the manner of treatment ; and, when possible, I exhibit an animal affected with the disease under discussion.

Third Year. To this class I delivered a short course of lectures upon the points and characteristics of the various breeds and classes of horses.

To the special dairy class I gave a few lectures, speaking of the ordinary diseases of dairy cattle, with the causes, symptoms and treatment.

Besides class room work, I gave professional attention to the farm, experimental, garden and dairy stock, and I am pleased to be able to state that, while we have had considerable sickness, there have been few fatal cases. Below will be seen the particulars of the diseases which occurred during the year in the different kinds of stock.

Horses. We had several cases of acute indigestion, colic, influenza, laminitis, nasal gleet, eczema, lymphangitis, wounds, etc., all of which yielded to treatment and made good recoveries. We had a fatal case of paralysis in an old mare belonging to the gardener's department.

Cattle. We had three severe cases of parturient apoplexy (milk fever) in cows—all of which made perfect recoveries. There were several cases of impaction of the rumen, indigestion, fardel-bound, mammitis, pyæmia, paralysis, retention of the placenta, difficult parturition, bronchocele, obstruction of teats, etc., etc., all of which recovered. We had one fatal case of fardel-bound in a heifer of the dairy herd, and a fatal case of paralysis in an old dairy cow.

In May Mr. Rennie purchased a herd of steers for feeding He asked me to deborn them as an experiment, and was so well pleased with the result in making the animals more quiet and docile with each other, and consequently feeding better, that when he sold them and bought others for the same purpose he had them dehorned. I also dehorned a few of Mr. Day's experimental herd.

Sheep. We had a few deaths in lambs, caused by wool balls in the fourth stomach; one fatal case of grub in the head in a ewe, and one or two deaths from diseased liver. About the middle of June, the lambs were noticed to be troubled with tape worm, and we treated them as follows, with the result that we had no losses. The lambs were kept without food for about twelve hours, and then drenched with from two to four ounces each (according to size and age) of the following mixture: Sweet milk, sixteen parts, and oil of turpentine, one part, well shaken to ensure thorough mixing. In about a week, the treatment was repeated. This treatment proved as effectual as the pumpkin seed treatment formerly used in the flocks, and the mixture is much more easily prepared.

Swine. We had very little sickness and no losses among the pigs, except in quite young animals.

I have, Sir, the honor to be,

Your obedient servant,

J. H. REED,

GUELPH, Dec. 31st, 1898. *Professor of Veterinary Science.*

PART VI.

REPORT OF

PROFESSOR OF DAIRY HUSBANDRY.

To the President of the Ontario Agricultural College:

DEAR SIR,—I beg leave to submit my eighth annual report of the Dairy Department. I wish to acknowledge assistance given by the Farm department, the Chemical department, and the department of Bacteriology. To my assistants, Messrs. Rogers and Stratton, to the Dairy School staff, and to the gentlemen who have assisted from time to time in scoring cheese and butter for the dairy classes and for experimental purposes, my best thanks are also due.

DAIRY SCHOOL The session of 1898 was one of the best in the history of the School. There were 110 students registered during the term, of whom nineteen were ladies. The addition of a lady instructor to the staff proved a popular and wise move. The enthusiasm of Miss Rose, the lady instructor, and that of a number of the ladies in the class, gave new life to the whole institution. The extension of the course to twelve weeks was beneficial, as it gave more time for lectures and instruction.

The students of 1898 came from nearly all parts of Canada, from the United States, and from Great Britain. In spite of the wide range from which our students were collected, there was no jarring in the wheels of progress nor stop to the separation of the cream from the skim-milk in the can of knowledge.

The College students took about two weeks of practical work in the dairy school at the beginning of the term.

At the final examinations forty one men and six ladies wrote for certificates of standing, of whom thirty-seven men and all the ladies passed. Certificates were withheld from a number until they have had the necessary factory experience, as stated in the requirements of our circular. Home Dairy certificates were granted to the ladies who completed the full course.

The following are applying for diplomas this year : J. W. Fotheringham, Courtice, Ontario, (cheese) ; A. M. Wheaton, Dayton, N.S., (cheese and butter) ; G. W. Hill, Summerhill, Ont., (cheese) ; Wm. Hope, Palermo, Ont., (butter) ; F. W. Smith, Greenwood, Ont., (butter) ; G. W. Black, Chaska, Minn., U.S.A., (cheese and butter) ; J. W. Boyes, Leesboro', Ont., (cheese) ; J. A. Dangerfield, Maple Creek, N.W.T., (butter) ; S. Flack, Red Deer, Alberta, N.W.T., (butter). Miss B. Millar, Coleman, is applying for a professional Home Dairy certificate and is sending in the necessary monthly reports at the present time.

One of the graduates of the 1898 class writes as follows from Nova Scotia :

"I am sending you a photo of the creamery I have been manager of during the summer. The building is a new one. I superintended the putting in of the plant, and in that way I have had many opportunities of putting to practical use many of the ideas I got at the dairy school. I have never for a moment regretted my time spent during that course. The three months at your Dairy School changed my views about my work, for I saw at once how little I knew, and the chance of improving by study and practical work, and especially the advantage of becoming personally acquainted with men of experience."

The above is a fair sample of a number of letters received from ex-students, and shows how the efforts of lecturers and instructors are appreciated. It is doubtful if any money spent by the Department of Agriculture gives such direct returns as that spent in equipping and maintaining our dairy schools. It pays.

One of our lady graduates took charge of a large dairy near Toronto early in the season. Later she received an appointment as lady instructor in the Dairy School at Strathroy, but the persons owning the dairy were so well pleased with her work that they insisted on her coming back as soon as possible after the session at Strathroy. In the meantime another of our lady graduates is in charge of the Toronto dairy. This speaks well for the training given in our Home Dairy department. We are aiming to improve this department still more in 1899, and we ought to have fifty students in the Home Dairy alone. With 100 students taking the factory and special courses relating to the cheese factory and creamery and fifty students in the Home Dairy, we shall have reached a good standard.

To all the instructors and lecturers who have so ably assisted during the past six sessions in bringing the school to its present standard, I am indebted, and I wish to express my thanks for their hearty co-operation and good work.

EXPERIMENTS IN BUTTER-MAKING.

The experiments in butter-making began soon after the close of the Dairy School in March. Mr. T. C. Rogers had charge of the work during the year. The experiments relate to the following points: Aëration, pasteurization, cream-ripening, churning, moisture in butter, and composite samples for milk-testing. Mr. Rogers also takes charge of the dairy herd records, and gives instruction to College students in separating and setting milk, and in the making of butter during the Fall term. Mr. Stratton has taken charge of the records of food cost in the herd for the past three years, in addition to his duties as experimentalist in the cheese department.

Aeration of Milk for Buttermaking.

From April to August some 17 experiments were made by aerating a portion of the milk for making butter. The remaining part was made into butter without any aerating. A Lister cooler and aerator was used for the work. The results in the quality of the butter indicate that there was no advantage in aerating the milk—in fact that made from unaerated milk scored higher at both the first and second scorings. These results coincide with former experiments relating to this question, i.e., where we have *clean, pure milk.*

Kind of butter.	Scoring.	Flavor. (Max. 45.)	Grain. (Max. 25.)	Total points scored. (Max. 100.)
Made from aerated milk. 17 samples..............	1st score..	40.30	24.11	93.72
	2nd " ..	37.76	24.71	92.07
Average..................................	....	39 03	24.41	92.89
Butter made from milk not aerated. 17 samples....	1st score..	60 65	24.17	94.12
	2nd " ..	38 56	24 90	93.21
Average	....	39.60	24.53	93.66

The creaming co-efficient was practically the same from both the aërated and unaerated milk.

The average temperature of the milk before aerating was 88, 80°, of the air 57°, and of the milk after aerating 80°.

The cream from aerated milk *without cooling* was not so easily mixed with the milk again after standing over night as was the unaerated milk *which had been cooled.* Aëration and cooling are both necessary with ordinary milk, in order to preserve it in good condition for buttermaking in hot weather, but the cooling is very essential. Night's milk for creameries should be cooled to 60° or 65° before the following morning, and as soon as possible after being milked. The morning's milk should also be cooled whenever possible before it leaves the farm.

Pasteurizing Milk and Cream compared with Raw Cream.

During June, July, August and September 32 experiments were made to ascertain the value of pasteurizing milk and cream for buttermaking. A portion of the milk was pasteurized in a Reid pasteurizer; and during the latter part of the season the milk was heated in an ordinary 800 pound vat. The cream was pasteurized in a can placed in a tank of hot water.

Last year we said: "the pasteurizers on the market are too expensive and too complicated for the average creamery." Since that time several machines have been placed on the market which give satisfaction in a creamery.

Conclusions: There was very little difference in the quality of the butter made from the three methods, as shown by the scorings in the table. A difference of one point or less in the average of the scorings means very little difference in the quality of the butter, or in its market value. In the summer, when cows are on good pasture and the conditions are favorable for the production of clean, pure milk, it would seem that there is little advantage from pasteurizing either the whole milk or the cream. In the winter, when conditions are less favorable for the production of pure milk, we have found that the heating of the milk or the cream to a temperature of 160° and the using of pure starters, has been a great help in securing uniformly fine butter. As we develop the export trade, pasteurization is likely to be more important, because the heating of the milk or cream tends to give the quality of butter desired in the British markets.

Kind of cream.	Scoring.	Flavor. (Max. 45.)	Grain. (Max. 25.)	Total score. (Max. 100.)
Raw cream. 32 samples of butter	1st score	40.42	23.1	92 58
	2nd "	38.44	23.65	91.29
Average		39.43	23.37	91.93
Pasteurized cream	1st score	40.9	23.6	93.6
	2nd "	38.9	24.0	92.5
Average		39.9	23 8	93.05
Pasteurized milk	1st score	40.9	23.53	93 46
	2nd "	38.84	23.77	91.71
Average		39.87	23.65	92.58

Broad *vs.* Narrow Exposure of Cream Surface during Ripening.

The question has been asked whether it is better to have much of the cream or as little as possible exposed to the air during the ripening process. Generally speaking, the answer will depend upon the purity of the atmosphere to which the cream is exposed. If the air is impure the cream should be protected as much as possible from the air, but if the air is reasonably pure the results of our experiments, as shown in the table, indicate that there is little or no difference in the quality of the butter made from the two methods of ripening.

The experiments were made during April, May and August. There was little or no difference in the average time required to churn the cream, or in the loss of fat in the buttermilk.

Kind of cream.	Scoring.	Flavor. (Max. 45.)	Grain. (Max. 25.)	Total score. (Max. 100.)
Cream ripened with a broad surface exposed to the air. 13 samples	1st score..	41.40	23.54	93.94
	2nd " ..	38.60	24.17	92.19
Average	....	40.00	23.85	93.06
Cream ripened with a narrow surface exposed to the air	1st score..	41 51	23.84	94.68
	2nd " ..	39.07	24.15	92.52
Average	....	40.32	23.99	93.61

Cream ripened at Different Temperatures.

During August, September and October ten trials were made by ripening one lot of cream at about 60° and another lot of the same cream at from 70° to 75°. The cream was ripened to an average of about .65 per cent. of acidity. The average temperature for churning was 56° for the cream ripened at 60° and 53.5° for cream ripened at 70° to 75°. The time required for churning was 34.6 minutes for the first and 38 minutes for the second. The average percentage of fat in the buttermilk was .16 for cream ripened at 60° and .24 for cream ripened at the higher temperature. The scorings indicate very little difference in the quality of the butter.

Butter made from cream—	Scoring.	Flavor. (Max. 45.)	Grain. (Max. 25.)	Total score. (Max. 100.)
Ripened at about 60° F	1st score....	40 43	23.3	92 44
Ridened at 70° to 75° F	1st score....	40.55	23.78	93.44

Effect of Stirring Cream while Ripening.

From September 7th to the 23rd, ten trials were made to note the effects of stirring cream during the ripening process; 8,426 lbs. of milk were separated and the cream was equally divided each day. One-half was stirred during the ripening process and the

Kind of butter.	Scoring.	Flavor. (Max. 45.)	Grain. (Max. 25.)	Total score. (Max. 100.)
Made from cream stirred frequently while ripening.	1st score.	41.55	23.9	95.00
	2nd score.	39.3	23.6	92.50
Average	....	40.42	23.75	93.75
Made from cream not stirred while ripening	1st score.	41.11	23.77	93.88
	2nd score.	38.55	23.89	92.49
Average	....	39.83	23.83	93.16

other half was ripened without stirring. There were used 586 lbs. of cream in each lot, testing 25.2 per cent. of fat. The acidity of the cream averaged about .7 of a per cent. Both lots churned in about the same time—32 minutes. The table shows that there was little difference in the quality of the butter, what difference there is being in favor of stirring the cream while ripening.

Cream Ripened with Different Percentages of Starter.

From October 13th to November 9th, eleven trials were made to note the effect of varying percentages of starter used in the cream while ripening. A quantity of cream was equally divided, and into one-half was put from eight to ten per cent of good starter. To the other half there was added from sixteen to twenty-five per cent. of the same starter. The cream tested twenty-eight per cent. of fat. The buttermilk tested an average of .14 for the low per cent. of starter, and .18 for the higher amount of starter.

Kind of butter.	Scoring.	Flavor. (Max. 45.)	Grain. (Max. 25.)	Total score. (Max. 100.)
Made from cream ripened with 8 to 10 per cent. starter	1st score.	40.5	24.2	94.4
	2nd score.	41.5	24.8	95.2
Average	....	41.0	24.5	94.8
Made from cream ripened with 16 to 25 per cent. starter	1st score.	40.72	24.0	94.26
	2nd score.	41.45	24.82	94.81
Average	....	41.08	24.41	94.53

Although these lots of butter was scored by several different persons, the results when averaged show that in these cases there was little difference in the quality of the butter, as shown in the table.

Granular *vs.* Lump Butter.

Experiments were made in April and May to see the effects of churning butter into lumps, which was the practice formerly, as compared with keeping the butter in the granular form until salted—the modern practice. The table of scorings indicates that the butter in granular form scored slightly less in the average of first scorings and more in

Kind of butter.	Scoring.	Flavor. (Max. 45.)	Grain. (Max. 25.)	Total score. (Max. 100.)
		Av.	Av.	Av.
Buttermilk drawn off when the butter was gathered into fine granules	1st score.	40.0	23.7	92.7
	2nd score.	37.6	23.6	91.1
Average	....	38.8	23.65	91.9
Butter churned into large lumps before the buttermilk was drawn off	1st score.	40.66	23.55	93.31
	2nd score.	37.1	23.90	90.66
Average	....	38.88	23.72	91.98

the second scorings. This difference is probably caused by the larger proportion of buttermilk retained by the lump butter, giving it a higher flavor when first made, but causing it to lack in keeping quality.

Effect of Different Quantities of Salt on Butter.

Experiments were made by using from one-quarter to one ounce of salt per pound of butter. The results indicate that three-quarters of an ounce has given the best results, as shown by the table.

—	Flavor.	Grain.	Color.	Salt.	Finish.	Total.
	(45)	(25)	(15)	(10)	(5)	(100)
½ ounce of salt to 1 lb. of butter	40.14	22.3	13.3	9 7	5	90.44
1 " " "	40.71	22.43	14.30	9.57	5	92.01
¼ ounce of salt to 1 lb. of butter	40.00	23.00	14.75	8.5	5	91.25
¾ " " "	42.00	23.75	14.75	9.75	5	95.25

Moisture in Butter.

These are a continuation of last year's experiments. This year samples from our experimental churnings, as well as from our regular churnings, were sent to the chemical laboratory to be analysed. The table shows the results from the different methods of treating the milk, cream, and butter. By keeping the butter in small granular form, there was more moisture, less curd and less salt in the butter than by churning into large granules. The highest per cent. of moisture in the small granular butter was 13.7; the lowest, 11.8. The large granular butter contained 13.3 as the highest, and 11.6 as the lowest per cent. of moisture. The highest and lowest percentage of curd from each was 1.05 and 0.67 for small granules; 1.7 and 0.69 for large granules. The ash and salt ranged from 3.0 to 2.4 for small granules, and 4.9 to 3.1 for large granular butter.

No. of Samples Analyzed.	Butter made from.	Average percentage of			
		Moisture.	Fat.	Casein.	Ash & Salt.
2	Broad surface cream..................	11.664	84.501	.842	3.310
2	Narrow " "	12.892	....	....	....
7	Small granules	12.966	83.289	.833	2.941
7	Large "	12.414	82.839	1.009	3.745
12	Aerated milk	12.678	83.4[illegible]9	.913	2.980
11	Unaerated milk	12.702	83.323	.973	3.149
1	Washed with cold water...............	13.890	83.178	.527	2.405
1	" " warmer "	13.122	82.745	.6[illegible]4	3.499
12	Raw cream	12.594	82.972	.991	3.441
2	Pasteurized cream....................	12.296	83.942	1.082	2.679
10	" milk	12.287	83.750	.968	2.988
74	Ordinary and experimental cream......	12.655	83.209	.949	3.206

The percentage of moisture in the butter from raw cream and pasteurized milk and cream ranged from 11.3 in pasteurized milk, to 13.6 in raw cream; but the average is much the same in all. The range in casein or curdy matter was from .83 in raw cream, to 1.3 in raw cream, *i.e.*, the highest and the lowest percentage of curdy matter was found in the ordinary or raw cream butter. The average is much the same in butter made by all three methods.

Composite Samples Tested Weekly and Monthly.

Composite samples of milk were kept in the butter-room of the Dairy for a month at a time during four months, while at the same time similar samples were kept in the basement, sitting on the cement floor. Samples of whole milk were added daily, and one jar in each place was tested weekly. Another jar was tested at the end of two weeks, another at the end of three weeks, and another at the end of four weeks. The results, as shown by the table, indicate that the monthly samples gave the same test of fat as the average of four individual weeks, and the average of two two-weeks' samples. The test of the three-week samples also correspond with the average of the first three weeks of the weekly test in each month. The table also indicates that the tests were alike, whether kept in the butter-room, which was at a temperature of 60° to 84°, or kept in the basement cellar at a temperature of 55° to 70°.

Week Ending.	Tested Weekly.		Tested at the end of the Second Week.		Tested at the end of the Third Week.		Tested at the end of the Fourth Week.	
	Butter-Room.	Cellar Floor.	Butter-Room.	Cellar Floor.	Butter-Room.	Cellar Floor.	Butter-Room.	Cellar Floor.
April 21	2 9	3 0	....	....	....	....	....	....
" 28	3.8	3.8	3.2	3.2	....	....	....	....
May 5	3.7	3.7	....	....	3.4	3.4	....	....
" 12	3.55	3.6	3.5	3.4	....	....	3.4	3.4
First month's averages	3.49	3.5	3 35	3.3	3 4	3.4	3.4	3.4
May 19	3.8	3.8	....	....	....	....	....	....
" 26	3.8	3.8	3.8	3.8	....	....	....	....
June 2	3.9	3.9	....	....	3.85	3 8	....	....
" 9	3.6	3.6	3.75	3.8	....	....	3.75	3.8
Second month's averages	3.77	3.77	3.77	3.8	3.85	3.8	3.75	3.8
June 16	3.6	3.6	....	....	....	....	....	....
" 23	3.65	3 65	3.7	3.8	....	....	....	....
" 30	3.5	3.5	....	....	3.65	3.65	....	....
July 7	3.5	3.45	3.5	3.55	....	....	3.5	3.65
Third month's averages	3.56	3.55	3.6	3.67	3.65	3.65	3.5	3.65
July 22	3.5	3.55	....	....	....	....	....	....
" 29	3.65	3.65	3.4	3.4	....	....	....	....
August 6	3 5	3.4	....	....	3.5	3.5	....	....
" 13	3.5	3.5	3.5	3.5	....	....	3.5	3.45
Fourth month's averages	3.51	3.52	3.45	3.45	3.5	3.5	3.5	3.45
Averages for four months	3.59	3.58	3.54	3.55	....	....	3.54	3.57
Average of 3 tests each month	3.69	3.61	....	....	3.60	3.59	....	....

The samples were preserved with a mixture of potassium bichromate (7 parts) and carrosive sublimate (1 part). Geary's tablets were also tried with satisfactory results. One tablet will preserve a daily ounce sample for about seven days in hot weather. The tablets are more convenient than the powder. The first lot of the tablets became pulverized before we had them all used; the second lot are all right at the present time of writing.

EXPERIMENTS IN CHEESEMAKING.

The experiments in the Cheese Department were in charge of Mr. R. W. Stratton. The experiments relate to aeration of milk, relation of fat in milk to quantity and quality of cheese produced, temperature and rennet in setting milk, acid in dipping, temperature of curds at pressing, curing cheese at temperatures of about 60°, 65° and 70°.

A summary of five years' experiments relating to the fat in milk as a basis of milk valuation at cheese factories is also included.

Aerating Milk for Cheesemaking.

Date.	Temperature of atmosphere and milk.						Rennet test of		Remarks.
	Air at Night.	Milk.	Milk after Ærating.	Air in Morning.	Ærated Milk.	Unæra'ed Milk.	Ærated Milk.	Unærated Milk.	
July 21	72°	92°	82°	60°	65°	65°	14	5	Lister aerator used up to Sept. 28.
" 23	72°	90°	81°	72°	72°	72°	16	14	Both lots set in water, cooled to 75° and then taken out of water.
" 27	69°	90°	82°	....	65°	65°	27	26	Both lots set in water, cooled to 72°, and then taken out of water.
Sept. 28	56°	D 92°	85°	....	60°	60°	32	24	Both lots set in water, cooled to 71°, and then taken out of water.
	56°	F 86°	80°	....	60°	60°	32	24	Both lots set in water, cooled to 71°, and then taken out of water.
" 29	55°	F 89°	....	....	63° to 65°	63° to 65°	31	26	Pump aerator used up to Oct. 5.
" 30	66°	D 94°	....	....	73° to 74°	73° to 74°	16	14	
	66°	F 89°	....	....	73° to 74°	73° to 74°	16	14	
Oct. 4	63°	D 91°	85°	60°	66°	66°	26	26	Milk left outside after aerating.
	63°	F 87°	80°	60°	66°	66°	26	26	Milk left outside after aerating.
" 5	46°	D 90°	....	38°	60° to 61°	60° to 61°	31	27	Milk set inside after aerating.
	46°	F 81°	....	38°	60° to 61°	60° to 61°	31	27	Milk set inside after aerating.

D. Milk from College Dairy.

F. Milk from Farmers' Dairies.

After mixing the night's and morning's milk together, both of which had been aerated but not cooled, the rennet test of the aerated milk in the vat was usually from 2 to 8 seconds higher, or, in other words, the aerated milk was sweeter than the unaerated milk.

QUALITY OF THE CHEESE FROM AERATED AND UNAERATED MILK.

—	Average lbs. milk used.	Average per cent. fat in milk.	Average lbs. cheese from 300 lbs. milk.	Scoring.	Average flavor. (Max. 35.)	Average closeness. (Max. 20.)	Average texture. (Max. 20.)	Average total. (Max. 100.)
Aerated.	300	3.45	27.09	First	28.25	17.75	16.33	86.41
				Second	30 00	18 50	18.00	91.00
				Average	28.50	17.85	16.57	87 07
Unaerated	300	3.44	26 92	First	27.91	17.16	16.33	85 50
				Second	28 50	18 00	16.50	87 50
				Average	28 00	17.28	16.35	85.78

These are a continuation of the experiments made in 1897, except that this year we went to the farms of patrons and brought the night's milk to the College Dairy as soon as possible after it had been milked. (Last year we allowed the patrons to do the ærating.) The morning's milk was ærated after bringing it to the Dairy. Thirteen experiments were made during July, September and October. While the average scoring of the cheese made from ærated milk is slightly higher than that made from unærated milk, none of these cheese scored as they should have scored. In fact, some of the poorest cheese made during the year was made during these experiments. We hope to make a special study of the effects of æration during 1899. The question is in a most unsatisfactory state at the present time.

RELATION OF FAT IN MILK TO QUANTITY AND QUALITY OF CHEESE.

This is the fifth year that experiments relating to this question have been made. In addition to the report on the experiments for 1898, we have added a summary of our five years' work on this subject, as we indicated in the report for last year. The following is a summary for the past year :

1. The number of experiments made was 27, covering a period from April to November.

2. 300 lbs of milk were used in each vat, or 16,200 lbs. altogether.

3. The percentage of fat in the milk ranged from 2.9 to 4.3.

4. Both vats were ripened to the same degree before renneting.

5. About one per cent. of starter was used in each vat.

6. H (rich milk) curds were cooked to 100°, and the L (poor or medium milk) were cooked to 98°.

7. Both curds were given about one-eighth of an inch of acid before dipping.

8. The H curds mellowed more quickly than the L curds and were ready to salt in less time.

9. The H curds were salted ¼ lb. extra per 100 lb. curd.

10. The temperature for putting to press was 80° to 85° for both curds.

11. The curds were pressed about 20 hours.

12. The curing room ranged from 60° to 75°—average 66°.

13. All cheese were weighed and marked when taken from the hoops. They were weighed again at the end of one month.

14. The cheese were scored when about six weeks old by Messrs. A. F. MacLaren, G. J. Brill and A. T. Bell. The scale used was: flavor, 35; closeness, 20; even color, 15; texture, 20; finish, 10.

The tables give the details of the most important points by months:

RELATION OF FAT IN MILK TO QUANTITY AND QUALITY OF CHEESE.

Date.	Per cent. fat in milk.	Lbs. of fat in milk.	Lbs. of cheese. Green.	Lbs. of cheese. Cured.	Lbs. of milk for 1 lb. cheese. Green.	Lbs. of milk for 1 lb. cheese. Cured.	Lbs. cheese for 1 lb. fat in milk. Green	Lbs. cheese for 1 lb. fat in milk. Cured	Per cent. fat in whey.
April 28	3.80	11.40	31.00	29.50	....	....	......	2.58	.15
	3.20	9.60	25.75	24.50	....	....	......	2.55	.15
" 29	3.75	11.25	30.50	29.00	....	.... ..	......	2.57	.15
	3.30	9.90	26.25	24.75	....	....	......	2.50	.15
Average for rich milk	3.77	22.65	61.50	58.50	9.75	10.25	2.71	2.58	.15
Average for poor milk	3.25	19.50	52.00	49.25	11.53	12.18	2.66	2.52	.15
May 6	3.80	11.40	30.75	29.50	....	....	......	2.58	.20
	3.30	9.90	27.50	26.25	....	....	......	2.65	.15
" 11	4.00	12.00	30.25	28.75	....	....	.... .	2.39	.20
	3.00	9.00	27.50	26.00	....	....	.....	2.88	.15
" 19	4.10	12.30	30.25	29.00	... .	....	....	2.35	.20
	2.90	8.70	27.50	26.00	....	....	.....	2.98	.10
" 25	4.00	12.00	31.25	30.00	....	....	......	2.50	.25
	3.20	9.60	28.25	27.00	....	....	...	2.81	.15
" 31	4.30	12.90	31.75	30.50	....	....	.....	2.36	.28
	3.00	9.00	28.00	26.75	....	....	.. .	2.97	.12
Average for rich milk	4.04	60.60	154.25	147.75	9.72	10.15	2.54	2.43	.226
Average for poor milk	3.08	46.20	138.75	132.00	10.81	11.36	3.00	2.85	.134
June 7	4.10	12.30	32.50	31.25	....	....	.....	2.54	.20
	3.00	9.00	27.00	25.75	....	....	.....	2.86	.12
" 14	4.30	12.90	31.50	30.25	....	....	......	2.34	.20
	3.00	9.00	26.50	25.25	....	....	......	2.80	.15
" 21	3.90	11.70	31.00	30.25	....	....	.....	2.67	.20
	2.95	8.85	28.00	27.00	....	....	.... .	3.05	.15
" 29	4.00	12.00	30.00	29.00	....	....	....	2.41	.25
	3.10	9.30	26.50	25.25	....	....	......	2.71	.15
Average for rich milk	4.07	48.90	125.00	120.75	9.60	9.93	2.55	2.46	.12
Average for poor milk	3.01	36.15	108.00	103.25	11.11	11.62	2.93	2.85	.142
July 5	3.80	11.40	30.50	29.25	....	....	......	2.56	.15
	3.20	9.60	27.50	26.25	....	....	....	2.72	.15
" 19	4.00	12.00	30.25	29.00	....	....	.....	2.41	.20
	3.20	9.60	25.50	24.25	....	....	.....	2.52	.12
" 21	3.60	10.80	29.00	28.00	....	....	.....	2.59	.18
	3.00	9.00	25.50	24.75	....	....	...	2.75	.12
Average for rich milk	3.80	34.20	89.75	86.25	10.02	10.43	2.62	2.52	.176
Average for poor milk	3.13	28.20	78.50	75.25	11.46	11.96	2.78	2.66	.13

RELATION OF FAT IN MILK TO QUANTITY AND QUALITY OF CHEESE.—*Concluded.*

Date.	Per cent. fat in milk.	Lbs. fat in milk.	Lbs. of cheese.		Lbs. of milk for 1 lb. of cheese.		Lbs. cheese for 1 lb. fat in milk.		Per cent. fat in whey.
			Green.	Cured.	Green.	Cured.	Green	Cured	
August 3	3.70 2.90	11.10 8.70	28.50 25.00	27.75 24.25	....	....	....	2.50 2.78	.18 .15
" 9	3.90 3.10	11.70 9.30	29.25 26.75	28.50 26.00	....	....	....	2.43 2.79	.20 .15
" 16	4.10 3.00	12.30 9.00	31.00 28.00	29.75 26.75	....	....	....	2.41 2.97	.20 .12
" 30	4.00 3.00	12.00 9.00	31.75 27.00	30.50 25.75	....	....	....	2.54 2.86	.18 .15
Average for rich milk .... Average for poor milk	3.92 3.00	47.10 36.00	120.50 106.75	116.50 102.75	9.95 11.24	10.30 11.67	2.55 2.96	2.47 2.85	.19 .142
September 13	4.00 3.20	12.00 9.60	33.00 28.75	32.00 27.50	....	....	....	2.66 2.86	.20 .12
" 27	4.20 3.30	12.60 9.90	32.00 28.25	30.75 27.00	....	....	....	2.44 2.72	.20 .13
Average for rich milk .... Average for poor milk	4.10 3.25	24.60 19.50	65.00 57.00	62.75 54.50	9.23 10.52	9.56 11.00	2.64 2.92	2.55 2.79	.20 .125
October 4	4.20 3.20	12.60 9.60	32.75 27.00	31.50 25.50	....	....	....	2.50 2.65	.20 .15
" 8	4.00 3.30	12.00 9.90	31.25 28.75	29.75 27.50	....	....	....	2.47 2.77	.15 .15
" 11	4.30 3.30	12.90 9.90	34.00 28.25	32.25 26.50	....	....	....	2.50 2.67	.20 .12
" 18	4.30 3.20	12.90 9.60	35.25 27.50	33.50 26.00	....	....	....	2.59 2.70	.20 .15
" 25	4.30 3.10	12.90 9.30	35.25 26.75	33.50 25.25	....	....	....	2.59 2.71	.25 .15
Average for rich milk..... Average for poor milk ..	4.22 3.22	63.30 48.30	168.50 138.25	160.50 130.75	8.90 10.84	9.34 11.47	2.66 2.86	2.53 2.70	.2 .144
November 1	4.20 3.20	12.60 9.60	35.00 26.50	33.25 25.00	....	....	....	2.63 2.60	.18 .15
" 3	4.20 3.10	12.60 9.30	35.00 26.75	33.25 25.25	....	....	....	2.63 2.71	.25 .15
Average for rich milk .... Average for poor milk	4.20 3.15	25.20 18.90	70.00 53.25	66.50 50.25	8.57 11.26	9.02 11.94	2.77 2.81	2.60 2.65	.215 .150

BUTTER FAT AND CASEIN LOST IN THE WHEY.

The loss of fat in the whey at the different stages of cheesemaking has been carefully determined by the scales and the Babcock tester. The casein was determined in the chemical laboratory of the college. We regret that more of these determinations were not made by the laboratory, as it is a very important point to know what amount of the caseous or curdy matter is lost in the process of making cheese. The "drippings," after salting and pressing, include all grease pressed from the cheese. The whole was melted and samples were taken for Babcock testing the same as last year.

BUTTER FAT LOST IN WHEY—300 LBS. MILK USED IN EACH VAT

Date.	Vat.	Drippings from dipping to milling.			Drippings from milling to salting.			Drippings after salting and pressing.		
		Lbs.	Per cent. fat.	Lbs. fat lost.	Lbs.	Per cent. fat.	Lbs. fat lost.	Lbs.	Per cent. fat.	Lbs. fat lost.
April 28th	H	4.75	.10	.00475	2.50	7.0	.17500	3.25	2.0	.06500
" 29th	"	4.50	.12	.00540	2.50	7.4	.18500	3.75	2.0	.07500
Average		4.62	.109	.00507	2.50	7.20	.18000	3.50	2.00	07000
April 28th	L	5.00	.05	.00250	2.00	5.4	.10800	5.50	2.6	.14300
" 29th	"	4.25	.10	.00425	1.50	5.8	.08700	3.25	2.4	.07800
Average		4.62	.073	.00337	1.75	5.57	.09750	4.37	2.52	.11050
May 6th	H	4.00	.15	.00600	......	......	....	6.25	3.6	.22500
" 11th	"	3.50	.12	.00420	......	......	....	7.50	6.0	.45000
" 19th	"	4.50	.12	.00540	1.50	4.0	.06000	3.50	4.3	.15050
" 25th	"	5.50	07	.00385	2.00	4.6	.09200	3.50	3.6	.12600
" 31st	"	3.00	.18	.00540	1.50	6.5	.09750	4.00	4.8	.19200
Average		5.10	.121	.00497	1.66	4.99	.08316	4.95	4.62	.22870
May 6th	L	5.00	.10	.00500	......	......	....	5.00	2.6	.13000
" 11th	"	2.00	.05	.00100	2.00	1.9	.03800	3.25	2.0	.06500
" 19th	"	2.50	.02	.00050	3.00	1.0	.03000	3.00	2.7	.08100
" 25th	"	7.50	.02	.00150	2.50	4.1	.10250	3.00	1.1	.03300
" 31st	"	4.50	.10	.00450	1.50	6.4	.09600	2.50	2.8	.07000
Average		4.30	.058	.00250	2.25	2.96	.06662	3.43	2.33	.07580
June 7th	H	4.50	.15	.00675	1.25	6.4	.08000	3.75	1.7	.06375
" 14th	"	1.75	.40	.00700	1.75	15.0	.26250	3.50	2.9	.10150
" 21st	"	2.25	.10	.00225	1.25	6.2	.07750	4.00	1.8	.07200
" 29th	"	6.25	.35	.02187	2.75	12.1	.33275	2.75	2.9	.07975
Average		3.68	.250	.00946	1.75	10.75	.18818	3.50	2.26	.07925
June 7th	L	5.00	.05	.00250	1.50	3.9	.05850	3.00	1.7	.05100
" 14th	"	2.00	.15	.00300	1.75	6.4	.11200	2.50	1.7	.04250
" 21st	"	2.25	.05	.00112	1.75	3.4	.05950	2.50	1.2	.03000
" 29th	"	7.25	.05	.00362	3.25	5.4	.17550	2.50	2.8	.07000
Average		4.12	.062	·00256	2.06	4.91	.10137	2.62	1.84	.04837
July 5th	H	5.75	.08	.00460	1.75	4.0	.07000	3.00	1.7	.05100
" 19th	"	3.25	.10	.00325	1.00	9.0	.09000	4.00	1.5	.06000
" 26th	"	4.25	.10	.00425	1.25	3.4	.04250	4.00	4.5	.18000
Average		4.41	.091	.00403	1.33	4.06	.05662	3.66	2.64	.09700
July 5th	L	7.00	.03	.00210	3.00	1.1	.03300	2.50	8.6	.21500
" 19th	"	5.75	.08	.00460	1.50	4.8	.07200	3.50	3.2	.11200
" 26th	"	4.25	.08	.00340	1.75	6.8	.11900	3.00	1.8	.05400
Average		5.66	.059	.00336	2.06	3.58	.07466	3.00	4.23	.12700
August 3rd	H	3.75	.08	.00300	1.75	10.5	.18375	3.75	4.00	.15000
" 9th	"	3.75	.12	.00450	2.25	14.0	.31500	4.00	6.10	.24400
" 16th	"	....	....	....	2.00	7.5	.15000	3.25	6.70	.21775
" 30th	"	3.25	.15	.00487	1.25	7.5	.09375	3.50	1.60	.05600
Average		3.56	.115	.00412	1.81	10.24	.18562	3.62	4.60	.16693
August 3rd	L	5.25	.03	.00157	2.00	10.2	.20400	3.25	3.1	.10075
" 9th	"	6.50	.05	.00325	3.00	7.1	.21300	2.75	1.8	.04950
" 16th	"	.....	.	......	1.00	9.2	.09200	3.00	2.3	.06900
" 30th	"	3.25	.10	.00325	1.50	5.4	.08100	3.00	1.4	.04200
Average		5.00	.053	.00269	1.87	7.86	.14750	3.00	2.18	.06531
September 13th	H	4.50	.08	.00340	1.75	5.0	.08750	4.25	3.2	.13600
" 27th	"	4.00	.10	.00400	1.75	6.0	.10500	4.00	6.3	.25200
Average		4.25	.087	.00370	1.75	5.50	.09625	4.12	4.70	.19400
September 13th	L	4.00	.08	.00320	1.75	2.2	.03850	2.75	2.3	.06325
" 27th	"	5.75	.05	.00287	3.25	1.4	.04550	3.00	3.2	.09600
Average		4.87	.062	.00303	2.50	1.68	.04200	2.87	2.76	.07962

Butter Fat Lost in Whey.—*Concluded.*

Date.	Vat.	Drippings from dipping to milling.			Drippings from milling to salting.			Drippings after salting and pressing.		
		Lbs.	Per cent. fat.	Lbs. fat lost.	Lbs.	Per cent. fat.	Lbs. fat lost.	Lbs.	Per cent. fat.	Lbs. fat lost.
October 4th	H	3.50	.05	.00175	1.75	7.8	.13650	3.75	2.1	.07875
" 8th	"	3.50	.08	.00280	3.50	6.6	.23100	3.75	1.4	.05250
" 11th	"	3.00	.10	.00300	5.50	3.6	.198 0	3.75	2.6	.09750
" 18th	"	3.50	.08	.00280	2.00	4.2	.08400	4.25	1.4	.05950
" 25th	"	4.00	.10	.00400	1.50	4.0	.06000	4.00	2.8	.11200
Average		3.50	.082	.00287	2.85	4.98	.14190	3.90	2.05	.08005
October 4th	L	5.50	.05	.00275	2.50	3.3	.08250	3.25	1.8	.05850
" 8th	"	3.50	.08	.00280	2.75	3.9	.10725	3.50	1.4	.04900
" 11th	"	4.00	.04	.00160	5.00	1.6	.08000	3.00	0.8	.02400
" 18th	"	3.00	.06	.00180	2.00	3.2	.06400	3.00	1.2	.03600
" 25th	"	4.75	.04	.00190	2.75	3.0	.072 0	3.50	2.8	.09800
Average		4.15	.052	.00217	3.00	2.74	.08245	3.25	1.63	.05310
November 1st	H	4.25	.08	.00340	1.50	3.2	.04800	3.00	1.0	.03000
" 3rd	"	4.00	.04	.00160	2.50	2.0	.05000	3.00	0.8	.02400
Average		4.12	.060	.00250	2.00	2.45	.04900	3.00	0.90	.02700
November 1st	L	4.50	.08	.00360	2.25	5.4	.12150	2.50	2.2	.06000
" 3rd	"	3.50	.04	.00140	2.50	4.3	.10750	2.75	1.6	.04400
Average		4.00	.062	.00250	2.37	4.86	.11550	2.62	1.98	.05200
Total loss for season	H	102.75	......	.12100	50.00	......	3.30725	105.00	......	3.40150
	L	117.75	......	.06958	59.25	......	2.40825	84.25	......	1.96450
Average loss per 300 lbs. milk	H	3.91	......	.00476	2.00	....	.13229	3.88	......	.12592
	L	4.52	......	.00267	2.27	.....	.09[illegible]62	3.12	......	.07275

Total Fat lost in Whey (before dipping) and the loss per 100 Pounds Cured Cheese.

Total pounds milk used.	Average per cent. fat in milk.	Total loss of fat in whey.	Loss of fat in whey per 100 lb. cured cheese.
		lbs.	lbs.
900	2.92	1.09	1.41
7,200	3.14	9.21	1.48
4,500	3.88	7.67	1.74
3,600	4.21	6.86	1.81

Percentage of Fat in Whey by Months.

—	Fat in whole milk.		Fat in whey from—	
	Rich milk.	Poor milk.	Rich milk.	Poor milk.
April	3.77	3.25	.150	.150
May	4.04	3.03	.226	.134
June	4.07	3.01	.212	.142
July	3.80	3.13	.176	.130
August	3.92	3.00	.190	.142
September	4.10	3.25	.200	.125
October	4.22	3.22	.200	.144
November	4.20	3.15	.215	.150
Average for season	4.03	3.12	.200	.139

Casein in the Whey and Drippings from Rich and Poor Milk, as determined in Chemical Laboratory.

Date.	Per cent. fat in whole milk.	Vat.	Before dipping.	Drippings from dipping to milling.			Drippings from milling to salting.			Drippings after salting and pressing.		
				Lbs.	Per cent. casein.	Lbs. casein lost.	Lbs.	Per cent. casein.	Lbs. casein lost.	Lbs.	Per cent. casein.	Lbs. casein lost.
May 25	4.00	H	.104	5.50	.119	.00654	2.00	.343	.00686	3.50	.270	.00945
" 31	4.30	"	.100	3.00	.207	.00621	1.50	.333	.00493	.....	.....	.....
Average	.....	.....	.102	4.25	.150	.00637	1.75	.338	.00592	3.50	.270	.00945
May 25	3.20	L	.094	7.50	.073	.00533	2.50	.269	.00672	3.00	.213	.00639
" 31	3.00	"	.089	4.50	.082	.00369	1.50	.372	.00558	.....	.....	.....
Average	.....	.....	.091	6.00	.075	.00451	2.00	.307	.00615	3.00	.213	.00639
June 8	4.10	H	.074	4.50	.117	.00526	1.25	.379	.00473	3.75	.372	.01395
" 15	4.20	"	.181	1.75	.331	.00579	1.75	.627	.01097	3.50	.530	.01855
" 22	3.90	"	.114	.....	.....	.....	1.25	.407	.00508	4.00	.194	.00776
" 30	4.00	"	.121	6.25	.128	.00862	2.75	.395	.01097	2.75	.239	.00657
Average	.....	....	.125	4.16	.157	.00655	1.75	.451	.00795	3.50	.334	.01170
June 8	3.00	L	.056	5.00	.066	.00330	1.50	.434	.00651	3.00	.252	.00756
" 15	3.00	"	.105	2.00	.124	.00248	1.75	.694	.01212	2.50	.355	.00887
" 22	2.95	"	.089	.....	.....	.....	1.75	.502	.00528	2.50	.210	.00525
" 30	3.10	"	.095	7.25	.114	.00826	3.25	.365	.01187	2.50	.165	.00412
Average	.....	.....	.086	4.75	.098	.00468	2.06	.433	.00894	2.62	.245	.00645
July 5	3.8	H	.109	5.75	.108	.00621	1.75	.417	.00729	3.00	.115	.00345
" 19	4.0	"	.100	3.25	.240	.00780	1.00	.435	.00435	4.00	.217	.00868
" 26	3.6	"	.125	4.25	.105	.00446	1.25	.212	.00265	4.00	.189	.00756
Average	.....	.....	.111	4.41	.....	.00615	1.33	.357	.00476	3.66	.179	.00656
July 5	3.2	L	.089	7.00	.068	.00476	3.00	.291	.00873	2.50	.099	.00247
" 19	3.0	"	.082	5.75	.069	.00396	1.50	.429	.00613	3.50	.254	.00889
" 26	3.0	"	.115	4.25	.144	.00612	1.75	.303	.00530	3.00	.255	.00765
Average	....	.....	.....	5.66	.087	.00494	2.06	.327	.00682	3.00	.211	.00633
Total loss for season	....	H	.....	34.25	.....	.05089	14.50	.....	.05789	23.50	.....	.07597
	....	L	.....	43.25	.....	.03790	18.50	....	.06851	22.50	.....	.05120
Average loss per 300 lbs. milk	....	H	.113	4.28	.148	.00636	1.61	.399	.00643	3.50	.266	.00949
	....	L	.091	5.40	.087	.00473	2.05	.370	.00761	2.81	.227	.00640

Loss in Weight of Cheese During One Month in Curing Room.

Per cent. loss in cheese made from	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Average
	%	%	%	%	%	%	%	%	%
Rich milk	4.8	4.2	3.4	3.9	3.3	3.4	4.7	5.0	4.1
Poor milk	5.2	4.8	4.4	4.1	3.7	4.3	5.4	5.6	4.7

It will be noticed that the cheese made from the rich milk lost less in weight during one month's curing than did the cheese made from poor and medium milk—about one-half of one per cent. less. One reason for this is that there is a larger surface exposed per 100 lbs. of cheese in those made from the poorer milk, hence more evaporation.

The Experiments Grouped According to the Percentage of Fat in the Milk.

Group.	Percentage of fat in milk. Range.	Percentage of fat in milk. Average.	Milk required to make 1 lb. cheese.	Cheese produced per 100 lbs. of milk.	Cheese produced from 1 lb. fat in milk.	Per cent. of fat in whey.
	%	%	lbs.	lbs.	lbs.	%
I.	below 3.	2.92	11.650	8.583	2.94	.133
II	3.00 to 3.50	3.14	11.598	8.620	2.74	.140
III	3.55 to 4.00	3.88	10.209	9.791	2.52	.189
IV	4.05 to 4.50	4.21	9.504	10.520	2.49	.213
Average	....	3.57	10.675	9.367	2.619	.1680

It will be noticed in the forgoing table, (1) that less milk was required to make a pound of cheese as the percentage of fat increased; (2) that the pounds of cheese per pound of fat in the milk decreased with an increased percentage of fat in the milk; (3) the percentage of fat in the whey increased with an increase of the fat in the milk.

The Quality of the Cheese.

Points scored by cheese.	Flavor.	Closeness.	Even color.	Texture.	Finish.	Total.
April (two experiments):						
Possible score	70	40	30	40	20	200
Milk 3.77% fat	59	36	28	35	20	178
Milk 3.25% fat	59	36	28	33	20	176
May (five experiments):						
Possible score	175	100	75	100	50	500
Milk 4.0[illegible]% fat	152	86	68	85	50	441
Milk 3.08% fat	151	86	68	82	50	437
June (four experiments):						
Possible score	140	80	60	80	40	400
Milk 4.07% fat	126	71	57	71	40	365
Milk 3.01% fat	126	67	57	69	40	359
July (three experiments):						
Possible score	105	60	45	60	30	300
Milk 3.80% fat	94	56.5	42	54.5	30	277
Milk 3.13% fat	91.5	54.5	39	53.5	30	268.5
August (four experiments):						
Possible score	140	80	60	80	40	400
Milk 3.92% fat	123	72	58	72	40	365
Milk 3.00% fat	122	72	57	69	40	360
September (two experiments):						
Possible score	70	40	30	40	20	200
Milk 4.10% fat	60	38	30	32	20	180
Milk 3.25% fat	60	36	30	33	20	179
October (five experiments):						
Possible score	175	100	75	100	50	500
Milk 4.22% fat	158	94	75	85	50	462
Milk 3.2[illegible]% fat	145	93	75	81	50	444
November (two experiments):						
Possible score	70	40	30	40	20	200
Milk 4.26% fat	66	38	30	36	20	190
Milk 3.15% fat	64	37	30	34	20	185
Total possible score	945	540	405	540	270	2700
Total points scored by H cheese	838	491.5	388	470.5	270	2458
" " " L "	818.5	481.5	384	454.5	270	2408.5

TABLE SHOWING AVERAGE SCORE OF QUALITIES IN THE CHEESE MADE FROM MILK GROUPED ACCORDING TO THE PERCENTAGE OF FAT.

Percentage fat in milk.	Flavor. (Max. 35.)	Closeness. (Max. 20.)	Even color. (Max. 15.)	Texture. (Max. 20).	Average total score. (Max. 90.)
Under 3.00 per cent	31.60	16.66	13.66	16.66	77.98
3.00 to 3.50 "	30 23	17.97	14.29	16 85	79.34
3.55 to 4 00 "	30.74	18.16	14.20	17 56	80 66
4.05 to 4.50 "	31.41	18 25	14.55	17.06	81.28

The cheese made from an increased percentage of fat have scored higher this yar as shown by the foregoing tables.

AMOUNTS OF MONEY (CHEESE 8C) CREDITED BY THREE SYSTEMS AND ACCORDING TO WEIGHT OF CHEESE.

Pounds milk.	Average per cent. fat.	Pounds cheese made.	Weight milk.	Per cent. fat.	Per cent fat. +2.	Weight cheese.
			$ c.	$ c.	$ c.	$ c.
900	2.92	77.25	6 74	5 50	5 96	6 18
7 200	3.14	620.75	53 96	47 47	49 78	49 66
4,500	3.88	440.75	33 72	36 62	35 59	35 26
3,600	4.21	378.75	26 98	31 81	30 07	30 30

DIFFERENCE IN THREE SYSTEMS COMPARED WITH THE ACTUAL VALUE (AT 8 CENTS PER POUND) OF THE CHEESE PRODUCED.

Value of cheese made at 8c. per pound.	Weight of milk.	Per cent. of fat.	Per cent fat. +2.	Per cent. fat in milk.
$ c.	$ c.	$ c.	c.	
6 18	+ 56	— 68	—22	2 92
49 66	+4 30	—2 19	+12	3 14
35 26	—1 54	+1 36	+33	3.88
30 30	—3 32	+1 51	—23	4.21

MIXING RICH AND POOR MILK.

Average per cent. fat in milk.	Average lbs. fat in milk.	Average lbs. cheese.		Average lbs. cheese per lb. fat.		Average per cent. fat in whey.	Kind of milk.	Average lbs. cheese made per 300 lbs. milk.
		Green.	Cured.	Green.	Cured.			
4.23	12.36	33.66	32.08	2.65	2.52	0 21	Rich	29.16
3.23	9.70	27.75	26.25	2.85	2.70	0.13	Poor	
3.73	11.20	31.08	29.50	2.77	2.63	0.14	Mixed	29.50

It has been suggested by some that if the milk containing different percentages of fat were mixed together, as is the practice in cheese factory work, where the milk is not made up separately as in our experiments, the results might be different. To test this point three trials were made in September, October and November, by taking 450 lbs. of rich milk and 450 lbs. of medium or poor milk, and then after removing 300 lbs. of each the remainder was mixed together and made into cheese to compare with the vats of rich and poor milk. The table shows the results to practically agree with those obtained by making up the milk of different qualities separately. There seems to have been a slightly greater weight of cheese produced from the mixed milk than from the average of the rich and poor milk made up separately, though this may be due to differences in the amount of moisture retained in the cheese.

GENERAL SUMMARY OF FIVE YEARS' EXPERIMENTS ON THE RELATION OF FAT IN MILK TO THE QUANTITY AND QUALITY OF CHEESE MADE.

—	1894.	1895.	1896.	1897.	1898.	Totals and averages.
Number of experiments	42	*101	†50	29	27	250
Pounds of milk used in each vat	300	300	600	600	300	....
Total lbs. milk used in H (rich milk) vat each year	12,600	30,300	30,600	17,400	8,100	99,000
" L (poor milk) "	12,600	30,600	30,000	17,400	8,100	98,700
Total pounds milk used each year	25,200	60,900	60,600	34,800	16,200	197,700
Highest per cent. fat in milk each year	4.50	5.50	5.30	4.30	4.30	5.50
Lowest " "	2.90	2.70	2.90	2.80	2.90	2.70
Average per cent. fat in H milk	3.94	4.013	4.190	3.874	4.031	4.023
" L "	3.37	3.178	3.238	3.171	3.120	3.216
Average per cent. fat in milk used during five years	3.654	3.593	3.698	3.525	3.575	3.620
Pounds fat in H milk each year and for five years	496.44	1,216.00	1,269.60	574.10	326.55	3,982.69
Pounds fat in L milk each year and for five years	424.62	972.60	971.40	552.90	252.75	3,174.27
Pounds cured cheese made from H milk	1,236.25	3,155.75	3,258.00	1,753.75	819.50	10,223.25
" " L "	1,123.50	2,763.50	2,779.00	1,572.00	698.00	8,936.00
Pounds cured cheese made from 1 lb. fat in H milk	2.490	2.595	2.566	2.600	2.509	2.566
" " L "	2.645	2.841	2.860	2.843	2.761	2.815
Average pounds cured cheese made from 1 lb. fat in H and L milk	2.561	2.704	2.693	2.710	2.619	2.677
Pounds cured cheese made from 1 lb. fat and casein (per cent. fat + 2) in H milk	1.651	1.732	1.737	1.715	1.677	1.716
Pounds cured cheese made from 1 lb. fat and casein (per cent. fat + 2) in L milk	1.660	1.744	1.768	1.747	1.683	1.736
Average pounds cured cheese made from 1 lb. fat and casein (per cent. fat + 2) in H and L milk	1.655	1.738	1.751	1.730	1.680	1.725
Average per cent. fat in whey from H milk and average for five years	.197	.230	.271	.331	.200	.242
Average per cent. fat in whey from L milk and average for five years	.187	.185	.201	.246	.139	.190

The above table shows that during the five years of this work 250 experiments have been made, in which nearly 200,000 lbs. of milk were used. The percentage of fat in the milk ranged from 2.7 to 5.5 and averaged 3.6. The pounds of cured cheese per pound of fat in the milk averaged 2.5 for rich milk and 2.8 for poor milk. The pounds of cheese per 1 lb. of fat and casein (estimated by adding two to the per cent. of fat) was fairly constant whether rich or poor milk was used, there being a slight decrease as the percentage of fat increased. The average percentage of fat in the whey was higher from rich milk.

* One vat of H milk not included as it was over-ripe.

† One vat of L milk not included because of accident in handling.

TABLES SHOWING LBS. CHEESE MADE PER 1,000 LBS. MILK, PER LB. FAT IN THE MILK, AND PER LB. FAT AND CASEIN (PER CENT FAT + 2) IN THE MILK. ALSO LOSSES OF FAT AND CASEIN IN WHEY. EXPERIMENTS OF FIVE YEARS GROUPED ACCORDING TO PERCENTAGE OF FAT IN MILK.

—	Cheese made per 1,000 lbs. of milk.	Cheese per lb. of fat.	Cheese made per lb. of fat and casein.	Average fat in whey.	Average per cent. casein in whey.
	lb.	lb.	lb.	lb.	
Milk below 3. per cent.—Average 2.87	87.518	3.040	1.794	.184	.115
" 3.00 to 3.50 " — " 3.22	90.345	2.802	1.729	.191	.112
" 3.55 to 4.00 " — " 3.83	100.255	2.615	1.718	.222	.134
" 4.05 to 4.50 " — " 4.23	106.781	2.538	1.712	.242	.118
" 4.55 to 5.00 " — " 4.74	114.404	2.412	1.697	.412	....
" 5.05 to 5.50 " — " 5.21	121.388	2.328	1.682	.387	....

TABLE SHOWING LOSS OF FAT AND CASEIN IN WHEY BY MANUFACTURING RICH AND POOR MILK INTO CHEESE.

—	Per 1,000 lbs. Milk.			Per 100 lbs. Cured Cheese.		
	Fat.	Casein.	Fat and Casein.	Fat.	Casein.	Fat and Casein.
	lb.	lb.	lb.	lb.	lb.	lb
Av. loss of fat and casein in whey below 3 per cent.	1.671	1.004	2.718	1.910	1.190	3.094
" " " " 3.00 to 3.50 "	1.867	1.018	2.754	1.923	1.165	3.153
" " " " 3.55 to 4.00 "	1.997	1.203	3.315	1.992	1.223	3.212
" " " " 4.05 to 4.50 "	2.161	1.054	3.217	2.024	0.991	3.023
" " " " 4.55 to 5.00 "	3.648	....	......	3.189	.... ..	....
" " " " 5.05 to 5.50 "	3.400	... ..	....	2.801	....	....

These tables bring out some interesting points in the experiments when grouped according to the percentage of fat in the milk. The chief points to notice are:

1. There is an increased yield of cheese per 1,000 lbs. of milk as the percentage of fat increases. An increase of one per cent. (3.2 to 4.2) in the fat of the milk caused an average increase of nearly 16.5 lbs. of cheese per 1,000 lbs. milk, which at 8c. per lb., gives an added value of \$1.32 per 1,000 lbs. of milk testing 4.2 per cent. fat as compared with the value of 1,000 lbs. of 3.2 per cent. milk.

2. As the *percentage of fat* in the milk *increased* there was a gradual *decrease* in the pounds of cheese made per pound of fat in the milk. Milk testing 3.2 per cent. fat produced an average of 2.8 lbs. cheese per lb. fat in the milk, while milk testing 4.2 per cent. fat yielded an average of 2.5 lbs. cheese per lb. of fat in the milk.

3. The yield of cheese per lb. of fat and casein, the latter estimated by adding 2 to the per cent. of fat, ranged from 1.7 to 1.8 lbs. A fairly constant ratio is necessary in order to establish the fat casein theory or method of dividing proceeds among patrons. As the yield of cheese is slightly less per lb of fat and casein in the richer milk as compared with the poorer, this system gives a slight advantage to the richer milk when compared with the actual cheese capacity of the two. This is well.

4. The experiments prove that not only is the percentage of fat higher in the whey from rich milk, but the total loss of fat per 1,000 lbs. of milk and per 100 lbs. of cured cheese is greater from the rich milk. There was not much difference in the loss of casein in the whey from rich and poor milk.

TABLE SHOWING PER CENT. LOSS IN WEIGHT DURING ONE MONTH'S CURING OF CHEESE MADE FROM RICH AND POOR MILK FIVE YEARS' EXPERIMENTS.

—	Average five years.
Per cent. loss in curing cheese made from milk below 3.00 per cent	4.260
" " " " " 3.00 to 3.50 "	4.434
" " " " " 3.55 to 4.00 "	4.107
" " " " " 4.05 to 4.50 "	4.054
" " " " " 4.55 to 5.00 "	3.076
" " " " " 5.05 to 5.50 "	3.532

TABLE SHOWING SCORINGS OF CHEESE MADE FROM RICH AND POOR MILK. AVERAGE OF FIVE YEARS' SCORINGS.

—	Flavor.	Closeness.	Color.	Texture	Average total.
	Max. 35.	Max. 20.	Max. 15.	Max. 20.	Max. 100
Average score of cheese made from milk below 3. per cent.	30.39	18.06	14.39	17.08	89.92
" " " " " 3.00 to 3.50 "	30.19	17.94	14.03	17.19	89.35
" " " " " 3.55 to 4.00 "	30.80	18.04	14.00	17.49	90.33
" " " " " 4.05 to 4.50 "	31.04	18.17	13.94	17.28	90.43
" " " " " 4.55 to 5.00 "	30.99	18.54	13.56	16.74	89.83
" " " " " 5.05 to 5.50 "	31.50	19.50	13.75	16.87	91.62

The preceding tables show:

1. That the rich milk cheese lost less in curing than did those made from poor or medium milk.

2. The average of the five years' scoring does not show very much difference in the quality of the cheese made from the milk containing the different percentages of fat In individual cases there was a marked difference in the quality, but when all was averaged this difference largely disappeared. The extreme difference in total points scored in the groups was 2.27 points in favor of the richer milk. The percentage of fat in *normal* milk is but a small factor in determining the quality of the cheese which is made from it, so long as the fat is about 3 5 per cent.

TABLE SHOWING AMOUNTS OF MONEY THAT WOULD BE CREDITED TO PATRONS BY THE THREE SYSTEMS NOW IN USE, BASED ON FIVE YEARS' EXPERIMENTS.

Pounds milk.	Average per cent. fat.	Pounds cheese made.	Amounts of money (cheese 8 c.) credited by three systems and according to weight of cheese.			
			Weight milk.	Per cent. fat.	Per cent. fat + 2.	Weight cheese.
lbs.	%	lbs.	$ c.	$ c.	$ c.	$ c.
13,800	2.87	1,207.75	106 99	85 13	92 91	96 62
77,400	3.22	6,992.75	660 07	534 88	558 09	559 42
72,300	3.83	7,248.50	560 53	594 01	582 09	579 88
28,200	4.23	3,011.25	218 63	255 93	242 65	240 90
4,200	4.74	480.50	32 56	42 68	39 08	38 44
1,800	5.21	218.50	13 96	20 11	17 92	17 48

TABLE SHOWING DIFFERENCES BETWEEN AMOUNTS OF MONEY RECEIVED BY THE THREE SYSTEMS AND THE ACTUAL VALUE OF THE CHEESE MADE DURING FIVE YEARS' EXPERIMENTS.

Value of cheese made.	Weight of milk.	Per cent. of fat.	Per cent. fat. + 2.	Average per cent. fat in milk.
$ c.	$ c.	$ c.	$ c.	%
96 62	+ 10 37	- 11 49	- 3.71	2.87
559 42	+ 40 65	- 24 54	- 1.33	3.22
579 88	- 19 35	+ 14 13	+ 2.21	3.88
240 90	- 22 27	+ 15 03	+ 1.75	4.23
38 44	- 5 88	+ 4 24	+ .64	4.74
17 48	- 3 52	+ 2 63	+ .44	5.21

NOTE.—+ 10.37 in the first co umn means that the patrons who supplied milk containing 2.87 per cent. fat and were paid according to the weight of milk, received $10.37 more than thay were entitled to ; and - 19.35 means that those who supplied milk containing 3 83 per cent. fat, and were paid according to the weight of milk, received $19.35 less than they were entitled to.

APPLICATION OF RESULTS TO METHODS OF PAYING PATRONS.

Many valuable scientific points have been settled as a result of the work done during the five years ; but, from a practical dairyman's standpoint, the most important feature of the experiments is their application to conditions as we find them in Canadian cheese factories. We have three methods or systems of dividing proceeds of sales of cheese among the patrons who have supplied the milk to make this cheese. The oldest is that known as the "pooling system," or dividing according to the weight of milk delivered. The results indicate very clearly that this system is very unjust, yet the majority of factories continue to divide on this basis, largely for the reason that it is the easiest and least expensive method. The second system practised by a number of factories is the "butter-fat" or "test" plan. This is a marked improvement over the former, but our experiments show that this system places too great a premium on the butter-fat when compared with the actual cheese produced from the milk. The third system, that proposed by this station, is what may be called the "fat and casein" method, the latter being estimated by adding two to the percentage of fat. Our five years' experiments prove that this system comes nearest to the actual value of the cheese produced, though it still places a slight premium on the butter-fat. It encourages the production of good milk, and at the same time does not discourage the majority of patrons who have average milk, and who are apt to envy those patrons whose cows give a small amount of rich milk and draw a disproportionately large share of the proceeds of cheese sales when the money is divided on the basis of the fat alone.

EFFECT OF SETTING MILK AT DIFFERENT TEMPERATURES.

The experiments relating to the effects of temperature of the milk at time of adding rennet are a continuation of those made in 1895 and 1896. One vat of milk was set at 86° at each trial and the other vat varied in temperature from 76° to 96°. In former trials, when the milk was set below 80°, the time from setting to dipping and from dipping to setting was increased ; but this year there is not so much difference on these points when compared with setting at 86°. There was, however, an agreement in the greater loss of fat in the whey from setting at a low temperature and consequently a smaller yield of cheese, as shown by the table. There is not much difference in the quality of the cheese from setting at different temperatures, as shown by the score.

We may repeat the rule as laid down in bulletin 102 and in the report for 1896 : "Above 86° and up to 95°, each increase of one degree in temperature of the milk decreases the time required for coagulation by about one minute. Below 86° to 80° a decrease of one degree in temperature of the milk increases the time for coagulation by from one to two minutes. Below 80° the time is irregular."

Date.		Per cent. fat in milk.	Temperature for setting.	Minutes coagulating.	Hours from setting to dipping.		Hours from dipping to salting.		Per cent. fat in whey.	Lbs. cheese.	Score.
		%	°	min.	hrs.	min.	hrs.	min.	%	lbs.	
October	1......	3.50	86	31	2	49	2	59	.15	27.75	89
"	1	3.50	76	52	2	35	3	15	.28	27.25	90
Sept.	16	3 30	88	29	3	06	2	53	.15	27.50	86
"	16......	3.30	77	49	2	49	3	02	.25	26.50	88
"	14......	3.40	86	32	2	51	3	14	.12	27.50	87
"	14......	3.40	78	45	2	58	3	14	.20	27.25	87
Oct.	28......	4.20	86	31	2	42	3	08	.15	31.75	90
"	28	4.20	93	25	2	46	3	08	.15	31.75	86
"	28	4.20	79	46	2	41	3	19	.25	31.25	86
Sept.	24......	3.30	86	30	2	42	3	23	.15	27.75	84
"	24	3.30	80	39	2	40	3	32	.20	27.75	84
Nov.	5.....	3.50	86	32	2	46	3	07	.15	30.00	90
"	5.....	3.50	82	40	2	47	3	07	.20	29.75	88
"	5......	3.50	90	26	2	45	3	07	.15	30.25	90
Sept.	23......	3.20	86	31	3	00	3	05	.12	28.00	86
"	23	3.20	82	38	3	10	3	14	.15	27.75	86
Oct.	12......	3.50	86	32	3	17	3	45	.15	29.25	91
"	12.....	3.50	92	26	3	31	3	45	.15	29.00	91
"	21......	3.80	86	33	2	48	3	22	.15	29.50	92
"	21......	3.80	94	26firm	2	48	3	22	.15	29.25	91
"	22	3.30	86	33	2	57	3	17	.15	28.25	91
"	22......	3.30	94	26	2	57	3	23	.15	28.25	92
"	26......	3.80	86	32	2	20	3	55	.15	29.50	88
"	26	3.80	95	25	2	22	3	51	.25	29.25	89
"	14......	3.60	86	33	2	57	3	42	.15	29.50	91
"	14......	3.60	96	25	3	03	3	44	.18	29.50	90

This rule is valuable when making a rennet test of milk which is not at the proper temperature, viz., 86°. With normal milk, a temperature of 86° is advisable when adding the rennet.

Effect of Different Quantities of Rennet.

This is the fourth year for the experiments relating to the effect of different quantities of rennet used in milk for cheesemaking. They point to the following conclusions:

1. Less than 3 oz. of standard rennet per 1,000 lbs. of milk causes a loss of fat in the whey much greater than is the case by using over 3 oz. of rennet. In the experiments for 1898, it will be noticed that where 1 to 2 oz. of rennet was used, the percentage of fat in the whey was .45 and .30, whereas when a larger quantity was used, the fat in the whey was seldom over .15 of one per cent.

2. The length of time from setting to dipping and from dipping to salting was much the same whether a large or a small quantity of rennet was used.

3. When less than 2 oz. of rennet per 1,000 lbs. of milk was used, the yield of cheese was considerably lessened; but an extra large quantity did not always give an increased yield, though it did in some cases, especially in 1897.

4. The highest scoring cheese were made by using about 3 oz. of standard rennet per 1,000 lbs. of milk.

5. The time required for coagulation decreased as the quantity of rennet was increased. (See table.)

Date.	Rennet test—seconds.	Rate of rennet per 1,000 lb. milk. (ounces.)	Minutes coagulating.	Time from setting to dipping. (hrs.)	(min.)	Time from dipping to salting. (hrs.)	(min.)	Lbs. cured cheese from 300 lb. milk. (lbs.)	Per cent. fat in— Whole milk. (%)	Whey. (%)	Score—max. 100.
June 10	21	3⅓	32	3	29	3	04	26.75	3.20	.12	89
" 10	21	1	90	3	30	3	11	25.50	3.20	.45	86
" 15	21	3⅓	33	3	11	3	05	27.50	3.30	.12	90
" 15	21	1½	61	3	16	3	04	27.25	3.30	.30	90
" 16	20	3⅓	35	2	52	3	01	27.75	3.30	.15	87
" 16	20	2	50	2	57	3	00	27.75	3.30	.30	87
" 17	20	3⅓	35	3	23	3	28	28.00	3 40	.15	92
" 47	20	2½	45	3	25	3	29	28.00	3.40	.18	88
" 18	20	3⅓	34	3	17	3	00	26.75	3.40	.15	87
" 18	20	4	28	3	17	3	01	26.75	3.40	.12	85
" 23	14	3⅓	25	1	22	4	09	27.25	3.40	.30	91
" 23	14	4½	21	1	21	4	10	27.25	3.40	.30	91
" 24	21	3⅓	34	3	06	3	51	25.00	3.00	.15	76
" 24	21	5	26	3	04	3	51	24.50	3.00	.15	70
" 25	20	3⅓	34	3	25	3	55	26.75	3.20	.10	81
" 25	20	5½	23	3	25	3	55	26.75	3.20	.20	83
" 28	18	3⅓	31	2	44	3	43	27.50	3.20	.10	88
" 28	18	6	18½	2	45	3	43	27.50	3.20	.10	85
" 30	19	3⅓	30	3	30	3	20	27.50	3.30	.15	89
" 30	19	6½	17	3	25	3	27	27.25	3.30	.15	87
July 6	18	3⅓	31	3	20	4	08	27.25	3.30	.15	90
" 6	18	7	15	3	22	4	07	27.50	3.30	.15	88
" 8	19	3⅓	33	3	09	3	11	25.50	3.10	.15	84
" 8	19	8	15	3	10	3	10	24 75	3.10	.15	88
" 9	19	3⅓	32	3	10	3	17	26.50	3.30	.12	89
" 9	19	8½	14	3	11	3	10	26.50	3.30	.12	89½

6. Cheese having a large quantity of rennet matured more quickly than those made by using a small quantity of rennet in the milk.

7. We have endeavored to deduce a law for the effect of rennet on the time required for coagulation; but many difficulties are met, such as the difference in the ripeness of milk, and a difference in the susceptibility of milk for rennet influence. However, roughly speaking, we may say that the average of four years' experiments indicate that an increase of from 1 oz. to 2 oz per 1,000 lbs of milk decreases the time for coagulation about 30 minutes; from 2 to 3 oz. the time is decreased 10 minutes; from 3 to 4 oz. the time is decreased 7 minutes; and above 4 oz. the time is decreased an average of about 3 minutes for each increase of one oz. of rennet per 1,000 lbs. milk.

The time required for Coagulation.

Quantity of rennet per 1,000 lbs. milk.	Minutes coagulating. Rennet test 20 seconds.				
	1895.	1896.	1897.	1898.	Average for four years.
1 ounce	65	65.5	79	90	74.8
1½ "	....	53.0	59	61	57.3
2 "	42	37	53	50	45.5
2½ "	40	36	44	40	40.0
3 "	33	....	36.5	35	34.8
3½ "	27	....	....	....	27.0
4 "	26	28	26	28	27.0
4½ "	25.5	23	24	21	23.3
5 "	20	26	23	26	23.7
5½ "	....	20	22	23	21.6
6 "	18	18.5	20.5	18.5	18.8
6½ "	....	17.5	19	17	17.8
7 "	16	17	18	15	16.5
7½ "	....	15	18	....	16.5
8 "	17.5	14	17.5	15	16.0
8½ "	....	14	....	....	14.0
9 "	13	13	....	14	13.3

Effect of Dipping at Different Stages of Acid.

Date.	Hot iron test.	Hours from setting to dipping.		Hours from dipping to salting.		Lbs. cheese.		Per cent. fat in			Score. Max. 100.
						Green.	Cured.	Milk.	Whey.	Drippings	
	Inch.	h.	m.	h.	m.	lbs.	lbs.	%	%	%	
June 3..	Slight show.	2	30	4	05	28.50	27.50	3.30	.15	1.90	87
" 3..	⅛	3	26	3	22	28.50	27.50	3.30	.15	1.90	90
May 13..	1-16	2	40	3	38	28.00	26.25	3.30	.15	3.00	90
" 13..	⅛	3	05	3	01	27.75	26.25	3.30	.15	3.10	92
" 16..	⅛	3	09	3	12	27.75	26.25	3.30	.17	2.60	94
" 16..	¼	3	37	2	44	28.00	26.50	3.30	.17	3.80	85
" 5..	⅛	2	55	2	42	29.00	27.50	3.50	.16	4.00	87
" 5..	⅜	3	21	2	21	29.00	27.25	3.50	.16	5.20	85
" 23..	⅛	3	13	3	40	28.00	26.75	3.40	.20	4.20	91
" 23..	⅜	3	55	3	02	28.50	27.50	3.40	.20	3.60	89
" 14..	⅛	2	38	2	52	29.00	28.00	3.50	.18	4.40	90
" 14..	½	3	02	2	28	28.50	27.75	3.50	.18	10.30	88
" 30..	⅛	3	03	3	11	30.00	28.75	3.60	.15	1.70	87
" 30..	½	3	41	2	31	29.75	28.50	3.60	.15	3.70	91
June 6..	⅛	3	14	3	31	29.50	28.25	3.30	.15	1.40	87
" 6..	½	3	47	3	00	29.50	28.25	3.30	.15	2.40	89
May 18..	¼	2	40	3	02	29.75	28.00	3.40	.15	1.80	85
" 18..	¾	3	17	2	25	29.25	27.50	3.40	.15	3.70	85
June 9..	⅛	2	29	2	57	27.50	26.00	3.00	.15	2.30	90
" 9..	⅞	3	17	2	10	27.50	26.00	3.00	.15	2.40	83
May 26..	¼	2	37	3	00	28.50	27.25	3.30	.20	2.20	89
" 26.	1	3	14	2	22	28.50	27.00	3.30	.20	4.40	85

These experiments, relating to the effect of acid on curds when in the whey, have been conducted for four years. The four years' work points to the following conclusions :

1. Curds dipped with one-eighth to one-quarter of an inch as shown on the hot iron, remained less time in the whey than those allowed to develop one-half to one inch of acid, but they took a longer time to mature after dipping before they were ready to salt. The whole length of time from setting to salting was much the same, whether curds were dipped early or late. There is no gain in time by leaving curds in the whey too long.

2. There was not a great deal of difference in the yield of cheese from early or late dipping. What difference there was, was in favor of early dipping—one-eighth to one-quarter inch acid.

3. The loss of fat in the whey first drawn was practically the same in both cases; but the percentage of fat in the whey drippings was, in nearly every case, higher from the curds allowed to develop over one quarter of an inch of acid in the whey. This explains the harsh nature of acidy cheese. It is, to some extent at least, due to the loss of butter fat from the curds after dipping,

4. The quality of the cheese in nearly every case was better from the early-dipped curds. Curds allowed to remain in the whey until they show over half an inch of acid are harsh in texture, "cut" in color, and usually sour to the taste.

About one-eighth of an inch of acid by the hot iron, or two-tenths of one per cent. of acid as shown by the alkali test, gives the most satisfactory results with normal milk in Canadian Cheddar cheesemaking.

Putting Curds to Press at Different Temperatures.

These experiments have been conducted for the fourth year. The range of temperature at pressing has been from 60° to 92°. The highest scoring cheese in 1898 was from curd put to press at 82°, and the next highest was put to press at 94°. A range of from 80° to 90° seems to be favorable for putting curds to press. No particular harm resulted from cooling the curds to 60° or 62°, except that in one or two cases the cheese were slightly open, as was also the result from pressing at 92°. Again at 94° the cheese were fairly close.

Date.	Lbs. of milk.	Per cent. fat in milk.	Lbs. cheese.		Temperature when put to press.	Scoring of cheese.					
			Green.	Cured.		Flavor.	Closeness.	Even color.	Texture.	Finish.	Total.
	lbs.	%	lbs.	lbs.	Deg.						
October 29	600	3.90	31.75	....	85	32	19	15	16	10	92
			33.25	....	60	31	19	14	16	10	90
November 8	600	3.60	31.25	....	84	31	17	14	17	10	89
			33.00	....	62	30	19	12	16	10	87
" 10	600	3.60	32.00	....	81	31	18	13	18	10	90
			33.75	....	62	31	19	12	16	10	88
" 12	600	3.60	32.00	....	82	32	19	14	18	10	93
			33.50	....	62	31	17	13	16	10	87
July 14	600	3.40	28.50	27.25	81½	29	18	14	17	10	88
			28.00	26.75	88	28	18	14	18	10	88
August 23	600	3.30	27.50	26.50	83	32	18	14	18	10	92
			28.00	27.00	88	32	18	14	18	10	92
" 17	600	3.30	28.00	27.25	83	30	18	14	16	10	88
			27.50	26.25	92	29	18	14	17	10	88
July 29	600	3.20	27.00	26.00	84	30	18	14	18	10	90
			26.50	25.50	92	30	17	14	17	10	88
" 22	600	3.20	27.00	25.75	84	31	18	14	18	10	91
			26.00	25.00	94	31	18.7	14	18.7	10	92.4
" 30	600	3.40	28.00	27.00	79	30	18	13	17	10	88
			27.00	26.00	94	29	18	14	18	10	89

The general conclusion is that quite a wide range in temperature may be allowed for putting curds to press, so long as the press room is kept moderately warm to enable the cheese to form a proper rind.

Curing Cheese at Different Temperatures.

During June, July, August and September, eighteen experiments were made to note the effects of temperature in curing cheese. Three cheese were made from one vat of milk, after which each cheese was weighed and then placed in the rooms kept at the different temperatures as shown in the tables. At the end of a month each cheese was weighed again, and at the end of about six weeks each cheese was scored. A number of the cheese were kept four or five months and scored several times by different judges. In nearly every case there was a marked difference in favor of the cheese cured at a temperature of about 60°. These cheese weighed about 30 lbs. each. The readings for temperature and moisture were taken about 8 a.m. each day. During July and August from 150 to 200 lbs. of ice were used in room No. 2. Steam was used to regulate the temperature in September and October. In August fresh lime was used in No. 1 room to reduce the moisture, but it had little or no effect.

Beginning October 18th, we arranged for three cheese per day to be sent to our curing rooms from Freelton and Rockwood factories. (Owing to a misunderstanding, only two cheese were sent the first day from Rockwood.) This was done for three days. The cheese were taken from the hoops at the factories and sent to us as quickly as possible. On arrival at the curing rooms, they were carefully weighed and one cheese placed in each of the rooms kept at different temperatures. The cheese were weighed weekly for four weeks. They were scored by Messrs. Brill and Bell during the same week when they were a month old, and again on November 29th by Mr. I. W. Steinhoff, Stratford, western representative of Hodgson Bros., cheese exporters of Montreal. The cheese from these factories weighed an average of 84 lbs. from Rockwood and 80 lbs. from Freelton.

Cheese-curing experiments for month of June. The highest outside temperature was 93°, the lowest 34°, and the average 61.5°.

Number of experiments, 4.	Room No. 1.	Room No. 2.	Room No. 3.
Size of room—cubic feet	1,844	863	863
Method of controlling temperature	Sub-earth duct.	Sub-earth duct and ice.	No control.
" " moisture	"	"	"
Highest temperature in room during month	72°	66°	75°
Lowest " " "	58°	56°	59°
Average " " "	66.2°	60.3°	67.5°
Highest per cent. moisture in room during month	95	95	84
Lowest " " " "	83	84	73
Average " " " "	87.9	88.8	77.2
Average per cent. shrinkage in cheese in one month	3.08	2.71	3.19
Quality of Cheese. Average flavor (max. 35)	31	31	30
" closeness (max. 20)	17	18	17.6
" color (max. 15)	14.2	14	14
" texture (max. 20)	17	17.2	17.2
" total score (max. 100)	89.2	90.2	89

Cheese-curing experiments for month of July. The highest outside temperature was 96°, the lowest 34°, and the average 68.2°.

Number of experiments, 4.	Room No. 1.	Room No. 2.	Room No. 3.
Size of room—cubic feet	1,844	863	863
Method of controlling temperature	Sub-earth duct.	Ice.	No control.
" " moisture	Lime & "	"	"
Highest temperature in room during month	75°	67°	79°
Lowest " " "	55°	53°	57°
Average " " "	65.8°	59.7°	67°
Highest per cent. moisture in room during month	95	95	84
Lowest " " " "	73	84	63
Average " " " "	88.1	88.9	76.8
Average per cent. shrinkage in cheese in one month	3.44	3.22	4.04
Quality of Cheese. Average flavor	29.2	29.5	28.7
" closeness	17.5	18.2	18.2
" color	13.7	13.7	13.5
" texture	16.7	17.7	17.5
" total score	87.2	89.2	88.0

Cheese-Curing experiments for month of September. The highest outside temperature was 96°, the lowest 11°, and the average 51.20°.

Number of Experiments. 6.	Room No. 1.	Room No. 2.	Room No. 3.
Size of room—cubic feet	1844	863	863
Method of controlling temperature	sub. earth duct.	Ice	some steam
" " " moisture	" "	"	no control
Highest temperature in room during month	75°	65°	86°
Lowest " " " "	55°	53°	57°
Average " " " "	66.3°	59.5°	70.0°
Highest per cent moisture in room during year	91.	97.	91.
Lowest " " " " "	70.	43.	46.
Average " " " " "	81.9	76.1	68.5
Average per cent shrinkage in cheese in one month	4.34	3.76	4.67
Quality of cheese Average Flavor	28.6	29.6	27.1
" Closeness	19.0	19.1	18.5
" Color	14.8	15.0	14.8
" Texture	13.8	16.3	13.0
" Total Score	86.3	90.1	83.5

Cheese-curing experiments for the month of October. The highest outside temperature was 87°, the lowest 11°, and the average 44.20°.

Number of Experiments. 4.	Room No. 1.	Room No. 2.	Room No. 3.
Size of room—cubic feet	1844	863	863
Method of controlling temperature	Duct. & Small amt. of steam	Ice used on Oct. 3rd.	Steam
" " " moisture	"	duct. part of time	Pan of water on steam pipe
Highest temperature in room during month	75°	65°	86°
Lowest " " " "	62°	54°	62°
Average " " " "	66.6°	59.0°	71.6°
Highest per cent. moisture in room during month	90.	97.	85.
Lowest " " " " "	70.	43.	46.
Average " " " " "	79.4	70.0	62.6
Average per cent. shrinkage in cheese in one month	4.71	3.97	5.32
Quality of cheese: Average Flavor	30.5	32.0	27.2
" Closeness	18.7	19.2	18.0
" Color	15.0	15.0	14.5
" Texture	16.0	17.2	13.7
" Total Score	90.2	93.5	85.5

Detail and average score of cheese cured at different temperatures.

Dates cheese were made	Dates of Scoring	66.1 degrees		60 degrees		68.6 degrees	
		Points scored	Average	Points scored	Average	Points scored	Average
June 8	July 13 Aug. 13	89 91	90.0	90 92	91.0	....	....
" 13	July 13 Aug. 13 Sept. 2	92 89 86.5	89.1	93 90 90	91.0	92 89 86	89.0
" 20	Aug. 13 Sept. 17 Oct. 13	87 86 91	88.0	87 91 93	90.3	88 86 90	88.0
" 27	Aug. 13 Sept. 17 Oct. 13 Nov. 17 " 29	89 89 92 91 86	89.4	91 88 92 90 90	90.2	87 90 90 83 73	84.6
July 4	Sept. 17 Oct. 13	90 87	88.5	92 91	91.5	89 86	87.5
" 25	Sept 17 Oct. 13 Nov. 17 " 29	83 87 83 80	83.2	89 93 89 87	89.5	85 86 85 74	82.5
Sept. 3	Nov. 17 " 29	89 86	87.5	92 92	92.0	86 77	81.0
" 12	Nov. 17 " 29	81 85	83.0	90 91	90.5	77 72	74.5
" 19	Nov. 17 " 29	84 85	84.5	91 93	92.0	81 75	78.0
Oct. 3	Nov. 17 " 29	90 90	90.0	96 94	95.0	84 76	80.0
" 10	Nov. 17 " 29	90 92	91.0	92 93	92.5	87 84	85.
" 17	Nov. 17 " 29	91 93	92.0	93 97	95.0	86 84	85.0
" 24	Nov. 17 " 29	90 88	89.0	93 96	94.5	85 82	83.5
Average for season	....	....	87.95	....	91.42	....	83 71

Summary of cheese-curing experiments—four months. Cheese made in College Dairy. The highest outside temperature was 96°, the lowest 11°, and the average 59.7°.

Total number of experiments, 18.	Room No. 1.	Room No. 2.	Room No. 3.
Size of room, cubic feet	1,844	863	863
Method of controlling temperature	Sub-earth duct.	Ice and duct.	No control.
" " moisture	"	"	"
Highest temperature in room	75°	67°	86°
Lowest " "	55°	53°	57°
Average " "	66.15°	59.69°	68.64°
Highest per cent. moisture in room	95	97	91
Lowest " " "	70	43	46
Average " " "	84.63	81.71	72.16
Average per cent. shrinkage in cheese in one month	3.85	3.40	4.31
Quality of Cheese — Average flavor	29.72	30.44	28.53
Quality of Cheese — " closeness	18.16	18.72	18.17
Quality of Cheese — " color	14.50	14.50	14.29
Quality of Cheese — " texture	15.66	17.05	15.00
Quality of Cheese — " total score	88.04	90.71	85.99

Cheese-curing experiments with cheese bought from factories. The highest outside temperature was 66°, the lowest 11°, and the average 39.3°.

Three experiments, factory at Rockwood.	Room No. 1.	Room No. 2.	Room No. 3.
Size of room, cubic feet	1,844	863	863
Method of controlling temperature	Duct and steam.	Steam.	Steam.
" " moisture	Duct.	No control.	Water pan on pipe.
Highest temperature in room	72°	64°	80°
Lowest " "	62°	54°	66°
Average " "	66.6°	58.6°	72.1°
Highest per cent. moisture in room	84	80	75
Lowest " " "	64	43	45
Average " " "	76.0	61.6	56.3
Average per cent. shrinkage during first week	1.17	.98	1.57
" " " " second week	.89	.89	1.00
" " " " third week	.60	.70	.91
" " " " fourth week	.60	.30	.81
" " " " four weeks	3.23	2.86	4.21
Quality of Cheese — Average three scorings on flavor	30.16	30.66	28.88
Quality of Cheese — " " " " closeness	17.50	18.11	17.00
Quality of Cheese — " " " " color	14.50	14.55	14.33
Quality of Cheese — " " " " texture	16.33	17.11	14.88
Quality of Cheese — " " " " total	88.50	90.44	85.11

Cheese-curing experiments with cheese bought from factories. The highest outside temperature was 66°, the lowest 11°, and the average 39.3°.

Three experiments, factory at Freelton.	Room No. 1.	Room No. 2.	Room No. 3.
Size of room, cubic feet	1,844	863	863
Method of controlling temperature	Duct and steam.	Steam.	Steam.
" " moisture	Duct.	No control.	Water pan on pipe.
Highest temperature outside 66°			
Lowest " " 11°			
Average " " 39,3°			
Highest temperature in room	72°	64°	80°
Lowest " "	62°	54°	66°
Average " "	66.6°	58.6°	72.1°
Highest per cent. moisture in room	84	80	75
Lowest " " "	64	43	45
Average " " "	76.0	61.6	56.3
Average per cent. shrinkage during first week	1.05	.94	1.56
" " " " second week	.85	.84	1.05
" " " " third week	.75	.53	.74
" " " " fourth week	.43	.43	.75
" " " in four weeks	3.05	2-72	4.06
Quality o Cheese — Av. three scorings on flavor	31.00	31.88	29.44
" " " " closeness	18.77	19.33	18.44
" " " " color	14.44	14.55	14.22
" " " " texture	17.22	18.00	14.66
" " " " total	91.44	93.77	86.77

Freelton.			Score of cheese cured at an average temperature of					
			66.6°.		58.6°.		72.1°	
Dates cheese were made.	Dates of scoring.	Names of judges.	Points scored.	Average.	Points scored.	Average.	Points scored.	Average.
Oct. 17	Nov. 15.	G. J. Brill	90		94		88	
	" 17.	A. T. Bell	91	91.3	91	93.3	87	87.0
	" 29.	I. W. Steinhoff	93		95		86	
" 19	" 15.	G. J. Brill	92		93		93	
	" 17.	A. T. Bell	89	91.3	93	94.6	88	87.0
	" 29.	I. W. Steinhoff	93		98		80	
" 21	" 15.	G. J. Brill	94		93		92	
	" 17.	A. T. Bell	90	91.6	92	93.3	85	86.3
	" 29.	I. W. Steinhoff	91		95		82	
				91.44		93.77		86.77
Rockwood.								
Oct. 18	Nov. 15.	G. J. Brill			88		88	
	" 17.	A. T. Bell			91	88 3	87	85.3
	" 29	I. W. Steinhoff			86		81	
" 19	" 15.	G. J. Brill	89		90		86	
	" 17.	A. T. Bell	90	88.6	94	91.6	87	84.3
	" 29.	I. W. Steinhoff	87		91		80	
" 20	" 15.	G. J. Brill	87		91		88	
	" 17.	A. T. Bell	87	88.3	91	91.3	86	85.6
	" 29.	I. W. Steinhoff	91		92		83	
				88.50		90.44		85.11

Conclusions.

1. The cheese lost considerably more during one month's curing when kept at a comparatively high temperature. This was true for each month during the experiments, and also for the season. The average per cent. of shrinkage during the season for one month, in cheese weighing about thirty pounds, cured at 60°, was 3.40 per cent.; cheese cured at 66° lost 3.85 per cent. in weight, and cheese cured at 69° lost 4.31 per cent.

2. The quality of the cheese was very much better by curing at 60°. The average score for the season of cheese made in the College dairy was nearly three points in favor of cheese cured at 60° as compared with similar cheese cured at 66°, and five points higher compared with those cured at 69°. The difference was more marked still in September and October cheese. The flavor was very much better in the cheese cured at 60°, and the texture was a marked improvement. Cheese cured at a high temperature go off in flavor quickly and have a sandy or mealy texture. Mr. Steinhoff pronounced the cheese made in October, and cured at 60°, as being worth from one to two cents more per pound than similar cheese cured at 70° to 75°. Cheese cured at the lower temperature have very much better keeping quality.

3. There was little or no mould on the cheese in room No. 3, kept at a high temperature. After the duct was closed in No. 2 and ice was used to lower the temperature very little mould appeared on the cheese. In room No. 1, where the duct was open all summer, and partly open in the fall, a great deal of mould grew on the cheese until steam heat was used. Various strengths of formalin solutions were used to prevent the growth of this mould. We commenced with a two per cent. solution and increased it to ten per cent.; it was ineffective. A ten per cent. solution prevents the mould for about a week; and to keep cheese right they need to be sprayed every week or ten days; but cheesemakers have not time to spray so often.

Mottled Cheese.

In 1897 there was considerable trouble with what are known as "mottled" cheese. Several factories had losses due to this mottling. A cheesemaker sent us a small sample of mottled cheese in the autumn of 1897. From this sample a starter was made by pasteurizing skim-milk, and to this was added some mottled cheese which had been finely grated. After the starter had developed properly, it was strained into a vat of 300 pounds of milk on November 27th, 1897. The cheese made was very badly mottled and had a characteristic unpleasant odor. At the present time (December 1st, 1898) the coloring has nearly all disappeared. This cheese is what is known as Starter No. 1 in the experiments of the past year.

During the session of the Dairy School of 1898, one day's make, (February 21st,) developed mottles. It is supposed that the starter used in making the cheese for that day was set in the curing-room, near the cheese made on November 27th. Starter No. 2 was made from a cheese of February 21st.

When the experiments began on April 4th, the first starter was from cheese made February 21st. This cheese was used as a foundation for future propagations, and is indicated in the table as Starter No. 3.

Experiments were made during April, May, August and September—forty-five in all; 300 pounds of milk were used in each vat. Unless otherwise stated, the cheese made were colored with Hanson's Cheese Coloring at the rate of one and a quarter ounces per 1,000 pounds of milk. In most cases a "control" vat of the same milk was used. Starters were made by pasteurizing skim-milk and adding to it either some of the cheese from which we wished to make a starter, or some of a previous day's starter. On four days sour whey from the whey tank was added directly to the vat of milk. Several cultures were sent from the Bacteriological Laboratory and were used as starters. These came originally from the mottled cheese in the Dairy.

Table showing results of experiments relating to Mottled Cheese.

Date cheese were made.	Description of Starter.	Lbs. Starter used.	Effect on quality of cheese.
April 4..	Propagated from No. 2....	4	Flavor very bad; badly mottled; mottles appeared when cheese was two weeks old.
" 5..	Same starter as used April 4th	6	Flavor bad; badly mottled; mottles appeared when cheese was two weeks old. November 30th, 1898, color nearly all gone.
" 6..	Propagated from starter used April 5th..	8	Poor flavor; no mottling.
" 7..	Same as used on 6th	8	Poor flavor; mottled.
" 9..	Propagated from No. 1......	6	Flavor very bad; two or three mottles. May 7th; mottled June 10th.
" 11..	" " April 9th starter	7	Flavor bad; no mottling (white cheese).
" 12..	Same as used April 11th	7	" " "
" 13..	Propagated from No. 1.................	9	Milk was pasteurized; flavor fair; slightly mottled.
" 14..	Same as used on 13th	9	Milk was pasteurized; flavor fair (white cheese); very pale color.
" 15..	Propagated from No. 2.........	9	Milk was pasteurized; flavor fair; (white cheese) color good.
" 16..	Same as used on April 15th......	9	Milk was pasteurized; flavor sour; color good May 7th; mottled June 10th.
" 18..	Culture from Bacteriological Laboratory.	$2\frac{1}{2}$	Flavor fair; color good.
" 19..	Propagated from starter used on 18th....	5	Mustard flavor; color good.
" 20..	Culture from No. 1	$1\frac{3}{4}$	Flavor fair; color fair.
" 21..	Propagated from starter used April 20th.	$2\frac{1}{4}$	Flavor fair; mottles appearing May 7th; badly mottled June 10th and July 13th; mottles almost gone August 13th.
" 22..	Culture from Laboratory...	$2\frac{3}{4}$	Flavor fair; color good.
" 25..	Propagated from starter used April 22nd.	$3\frac{1}{4}$	Flavor good "
" 26..	Culture from No. 1	$2\frac{1}{2}$	Flavor fair "
" 27..	Propagated from starter used on 26th....	$3\frac{1}{2}$	" "
" 30..	Culture from No. 3	2	" "
May 2..	Propagated from starter used April 30th.	$2\frac{1}{4}$	Flavor fair; slightly mottled.
" 3..	Sour whey from whey tank.............	3	Poor flavor; slightly mottled (milk over-ripe).
" 4..	" " "	3	Flavor very bad; badly mottled.
" 7..	Culture from Laboratory......	2	Flavor very good; color good.
" 9..	Propagated from starter used May 7th...	$2\frac{1}{2}$	" " slightly mottled.
" 10.	Culture from Laboratory....	2	" " "
" 12..	Propagated from starter, May 10th	$2\frac{1}{2}$	Flavor fair; color good.
" 20..	Culture from Laboratory	3	" "
" 21..	Propagated from starter, May 20th	4	" "
August 12 .	Sour whey from whey tank........	6	Flavor fair October 13th; color good October 13th; very bad flavor November 29th; white spots appearing November 29th.
" 15..	" " "	6	Bad flavor; mottled.
" 18 .	Propagated from No. 3	6	Flavor fair, color good.
" 19..	Same as used August 18th	6	" "
" 20..	Propagated from starter, 19th.........	4	" "
	" "	4	" " (white cheese).
" 22..	Same as used on 20th......	4	" "
	" "	4	Flavor fair; black mould on end of cheese: color, navy, October 13th; two out of five plugs mottled on November 29th; special coloring used.
" 27..	Propagated from No. 3.................	4	Poor flavor; slightly mottled October 13th; no mottles November 29th.
" 29 .	Propagated from starter, August 27th..	4	Fair flavor; no mottling.
	" " " ..	4	" " (white cheese).
" 31..	Propagated from starter, August 29th..	3	Good flavor; no mottling.
	" " " .	3	Good flavor; slightly mottled October 13th; no mottles November 29th; special coloring used same as on 22nd.
Sept. 15..	Culture from mottled cheese	$3\frac{3}{4}$	Flavor fair; color good.
	" "	$3\frac{3}{4}$	" "

Conclusions.

1. Mottled cheese may spread from one day's make to another, but it is most likely to do so from or through the starter.

2. The mottles usually appeared in from two to four weeks after the cheese were made.

3. Sometimes a starter produced mottles, and sometimes the same starter did not.

4. Pasteurizing the whole milk used in the vat did not prevent mottling.

5. In no case did mottles appear in the white cheese made from any of the starters.

6. The cultures sent from the Bacteriological Laboratory did not cause the mottling to any extent. In one or two cases, there was a slight waviness or mottling.

7. In some cases the mottles appeared quite strongly and then disappeared after a time. In some cases the mottling appeared in spots through the cheese. A cheese made Aug. 22 was examined on Nov. 29th, and the first plug showed no mottles. Out of five plugs drawn from different parts of the cheese, two of them showed mottling.

8. Starters made from the whey tank produced mottling of the cheese and a very bad flavor. It is probable that the difficulty is caused in some cases by taking whey home in the milk cans and then sending the milk to the factory in these cans not properly washed and scalded.

9. It is also probable that the root of the difficulty lies in the fact that a germ or bacterium attacks the coloring matter added to the milk to produce colored cheese. It takes some time for the effects to become marked and the white spots to appear.

10. So far we have heard no complaints about mottled cheese made in 1898; and it is likely that the trouble appears only under certain favorable conditions of weather, etc. Should this trouble appear in a factory, the maker should look closely after the whey tank and washing of cans, especially if the whey is returned to patrons in the milk-cans. He should also make white cheese, which are cleaner and more wholesome.

Excelsior Cheese Coating.

A sample of what is known as Excelsior Cheese Coating was sent to us by a Toronto firm to experiment with. It is claimed for this material that it prevents loss of weight in curing; that it improves the flavor and keeping quality of the cheese; and that it prevents the growth of mould on the cheese. The following table shows that it does prevent shrinkage; but the scorings do not indicate any improvement in the quality of the cheese. It did not prevent mould.

——	Cheese coated.			Not coated.
	When taken from press.	When two weeks old.	When four weeks old.	
Average score	91.6	91.3	91.5	92.0
" per cent. shrinkage in eight weeks	3.31	4.03	6.27	7.00

It is some trouble to "dip" the cheese into the melted wax; and it is doubtful if the average cheese-maker has the time to melt the coating and dip the cheese. It is also doubtful if the results would warrant the expense and trouble.

The cheese weighed only about 8 lbs. each; hence the large percentage of shrinkage in the uncoated cheese.

EXPERIMENTS IN DAIRY STABLE.

Milking Cows Twice and Three Times per Day.

During the month of July two cows—Margaret 4th, a Holstein, and Patience 5th, an Ayrshire—were milked three times per day. Beginning Aug. 1st they were milked twice a day. The bulky feed was also changed on Aug 1st from green peas and oats to corn silage and hay. The meal remained practically the same during each period reported on, though there was slightly less fed during the period when the cows were milked twice per day, as the cows did not eat it quite so clean. The table shows the amount of food consumed per week for two weeks of each milking period and the yield of milk and butter fat by weeks when the cows were milked three times a day and when milked twice. The food consumed and the milk and fat produced for an intervening week (when the food was changed and the cows were milked three times per day for five days and twice a day for two days) are also given.

Margaret dropped her last calf on June 20th, 1898; and Patience was fresh on May 5th, 1898.

Table showing food consumed and milk and fat produced when milking two cows twice and three times per day.

Week ending.	Cow.	Lbs. food consumed per week. Green peas and oats.	Corn silage.	Hay.	Oats.	Pease	Bran.	Oil-cake.	No. times milked per day.	Lbs. milk in 1 week	Lbs. fat in 1 week	Gain (+) or loss (−) Lbs. milk	Lbs. fa
ly 19	Margaret.	560	......	.....	35	35	70	10	3	348	10.39	......	......
" 26	"	560	......	......	35	35	70	10	3	387	10 83	+39	+0.44
Aug. 2	"	400	160	6	35	35	70	10	2 (2days) 3 (5days)	376	10.53	−11	−0.30
" 9	"	.....	490	21	35	35	60	10	2	369	10.32	−7	−0.21
" 16	"	.....	490	21	35	35	60	10	2	353	11.29	−16	+0.97
ly 19	Patience .	490	......	.....	30	30	60	10	3	289	10.40	......	.....
" 26	"	490	.....	......	30	30	60	10	3	308	10 47	+19	+0 07
Aug. 2	"	350	120	6	30	30	60	10	2 (2days) 3 5days)	295	9.44	−13	−1.03
" 9	"	....	420	21	30	30	57	7	2	312	9 66	+17	+0.22
" 16	"	......	420	21	30	30	57	7	2	290	9.86	−12	+0.20

Conclusions.

Margaret gave 13 lbs. less milk in two weeks when milked twice per day as compared with the quantity given in the same length of time when she was milked three times per day; but she produced 0.39 lbs. more fat during the two weeks when milked twice a day than she did in the same length of time when milked three times a day.

Patience gave 5 lbs. less milk when milked twice a day for two weeks than she did in two weeks when milked three times a day; and she produced 1.35 lbs. less fat when milked twice a day for two weeks.

In the case of these two cows, one of which produced an average of 52 lbs. of milk per day, and the other about 42 lbs. per day, it did not pay to milk them three times a day. With cows producing 60 lbs. of milk or over per day it will likely be profitable to milk them three times a day.

The percentage of fat by weeks was for Margaret, 2.7, 2.8, 2.8, 2.8, 3.2; Patience, 3.6, 3.4, 3.2, 3.4, 3.4. Samples were taken from each milking and the whole was tested once a week. Margaret, it will be seen from the foregoing, gave the highest weekly test for the *last* week of the experiment, and Patience for the *first* week.

Pasteurized vs. Raw Skim Milk for Calves.

It has been claimed that pasteurizing (scalding) skim milk renders it indigestible for calves, and that they will not thrive upon it. An experiment was commenced July 18th, 1898, with four calves—three heifers and one steer. A preliminary feeding period of one week was allowed before the experiment proper began. Two of the calves were fed on pasteurized skim milk for four weeks; and, after a preliminary period of one week, they were fed on raw, or unscalded, skim milk for four weeks. Two others were started on raw skim milk fed warm, and then changed to pasteurized skim milk at the end of four weeks, with an intervening period of one week as with the other two.

The table following shows milk consumed and gain of calves fed on raw and scalded skim milk:

Name.	Breed.	Dropped.	Lbs. milk consumed in 4 weeks.	Kind of milk.	Lbs. meal, oats, bran, oil cake in equal parts.	Gain during 4 weeks.	Period.
						Lbs.	
1. Meg. ...	Holstein......	Dec. 18, 1897..	840	Pasteurized.	28	59	July 18 to Aug. 15.
			896	Raw	35	47	Aug. 22 to Sept. 19.
2. Chummy.	Grade steer. ...	Jan. 25, 1898..	840	Raw	28	48	July 18 to Aug. 15.
			896	Pasteurized.	35	68	Aug. 22 to Sept. 19
3. Minnie ..	Grade Ayrshire.	Jan. 15, 1898..	700	Pasteurized.	14	53	July 18 to Aug. 15.
			784	Raw........	21	43	Aug. 22 to Sept. 19.
4. Jean.....	Grade Holstein.	Mar. 1, 1898..	700	Raw.......	14	64	July 18 to Aug 15.
			784	Pasteurized.	21	52	Aug. 22 to Sept. 19.

Conclusions.

All the calves appeared to thrive equally well whether fed on the pasteurized or on the raw skim milk. No. 1 weighed 536 pounds at the beginning of the experiment and 675 pounds at the close—a gain of 139 pounds in ten weeks, or nearly two pounds per day. No. 2 weighed 352 pounds at the beginning and 515 pounds at the close—a gain of 163 pounds in ten weeks. No. 3 weighed 297 pounds at the beginning and 425 pounds at the end of ten weeks—a gain of 128 pounds. No. 4 weighed 228 pounds at the beginning and 363 pounds at the close of the experiment—a gain of 135 pounds. In addition to the milk and meal, all the calves were fed some hay and green feed; the amount varied according to appetite. It would seem that after calves receive a fair start they will do well on skim milk, meal, green feed and hay. The gains were good, and in this experiment three of the four calves made the greatest gain on the pasteurized skim milk along with meal and other food. To prevent skim milk souring at the creamery or on the farm, pasteurization is the most practicable method; and all creameries should adopt this plan, in order to return the skim milk in good condition to the farm, and thus preserve a valuable food for calves and pigs.

DAIRY STOCK.

As intimated in my report last year, no pigs were fed by this department during the past year, as Mr. Day has taken the piggery, which formerly belonged to the dairy, for experimental purposes. The by-products were sold to private persons and to the Experimental department.

A horse and rig are maintained by the Dairy, for the use of the Dairy, Experimental and Poultry departments.

The dairy herd consists of four Jersey cows, three Holsteins, one Ayrshire, and twenty-five grade cows and heifers.

At the annual sale, the following bull calves were disposed of at fair prices: Two Jerseys, two Holsteins and one Ayrshire.

An approximate account of the food fed to each cow was kept during the year. Each cow's milk was weighed night and morning and samples were taken to determine the percentage of butter fat, as in other years. The pounds of butter produced by each cow were estimated by adding fifteen per cent. to the butter fat. The table shows the record for 1898 of all the cows which were in the herd a full year, with the exception of the last two in the list which were here eleven and ten months respectively. The record for the two previous years is also given for comparison.

The food cost of milk, butter, and cheese was estimated as closely as possible by weighing the food fed to each cow once a month and measuring it for the rest of the time. The hay, silage and mangels were furnished by the Farm department and were charged at the following prices: Hay, $6.00 per ton; silage, $1.30 per ton; mangels, 7c. per bushel.

Pasture was also furnished by the Farm, and was charged at one dollar per month per cow for five months.

Grains and the bran fed were bought on the Guelph market at an average of 73c. per 100 lbs. for oats, 75c. for peas (including grinding), 50c. for bran.

The pounds of butter were estimated from the fat by adding ten per cent. to the fat, though this is too low. Fifteen per cent. is more nearly correct and we have added a column in the individual cow's record to show the production by adding fifteen per cent. to the fat.

Points to Notice.

1. The cost of the food fed to the individual cows in the herd varied from $20 to $45 during one year. It will also be noticed that the food cost for the cows was usually much less in 1897 than in 1896 or 1898, largely for the reason that the season of 1897 was an excellent one for grass, and very little grain was fed during the summer.

2. The pounds of milk given by one cow varied from 3,000 to nearly 10,000 per year. The cow which consumed the greatest amount of feed produced the greatest amount of milk during the year.

3. The pounds of butter varied from 186 to 437 as the yearly production of individual cows. There was also a marked variation in the production of the same cow from one year to another, due to various causes, such as sickness, being farrow, bad season, etc. The *lowest* producer and the *highest* producer are cows belonging to the same breed, which shows plainly that there is as much difference in the cows of the *same* breed as among cows of different breeds.

4. The pounds of cheese varied from 400 to nearly 1,000 lbs. per cow per year.

5. The cost of food to produce a gallon of milk varied from nearly seven cents to as low as about three cents. (This food cost includes the value of the food fed to each cow during the period when she was not milking as well as when milking.) This *low* food cost was produced in 1897, a year of abundant pasture in this section, by a cow of a breed specially adapted to making good use of grass for milk production.

6. The food cost of a pound of butter varied from fifteen to six and a half cents for the individual cows. In order to grow wealthy, if the food cost of the butter was near fifteen cents, it is evident that a man would need to keep a *great many cows* when selling butter at "a shilling a pound."

7. The food cost of a pound of cheese varied from nearly seven cents to below three cents. Some cows are constituted to produce butter and cheese more economically than milk, while others produce milk more cheaply than butter or cheese.

8. The most important point to notice is that it pays to *learn* what each cow in the herd is doing, by weighing and testing the milk, and by keeping an account of the food consumed by each cow.

INDIVIDUAL RECORD OF COWS IN DAIRY HERD FOR THREE YEARS.

Name.	Breed.	Total cost of food.			Pounds of milk.			Pounds of butter.				Pounds of cheese.				Food cost 1 gal. milk.			Food cost 1 lb. butter.				Food cost 1 lb. cheese.			
								10 p.c. added to fat.			15% to fat.	10 p.c. added to fat.			15% to fat.				10 p.c. added to fat.			15% to fat.	10 p.c. added to fat.			15% to fat.
		1896.	1897.	1898.	1896.	1897.	1898.	1896.	1897.	1898.	1898.	1896.	1897.	1898.	1898.	1896.	1897.	1898.	1896.	1897.	1898.	1898.	1896.	1897.	1898	1898.
		$ c.	$ c.	$ c.												c.	c	c.	c.	c.	c.	c.	c.	c	c.	c.
Margaret.....	Holstein..	39 89	27 98	45 35	7,994	9,131	9,793	312	335	343	358	702	753	772	806	5 0	3.06	4.63	12.7	8.35	13.22	12.67	5.6	3.71	5.87	5.62
Belle Temple..	Jersey....	37 50	29 32	Dry	6,702	5,907	....	424	360	....	....	954	810	....	....	5 6	4 96	....	8 8	8.14	....	....	3 9	3.62	....	....
Birdie	Grade....	38 85	26 90	26 98	7,787	6,375	4,142	365	264	197	205	821	594	443	461	4.9	4.22	6.51	10.6	10.18	13.69	13.11	4.7	4.52	6.09	5.85
Annie......	Grade....	28 23	26 92	29 23	5,341	4,463	5,561	239	213	258	270	537	479	581	608	5.2	6.03	5.25	11.8	12.63	11.32	10.82	5.2	5.62	5.93	4.80
Patience......	Ayrshire..	30 06	23 09	39 46	7,473	5,559	8,779	329	266	398	416	740	598	896	936	4.0	4.15	4.49	9.0	8.68	9.91	9.48	4.0	3.86	4.40	4.21
*Wedo.......	Holstein..	19 90	28 52	31 89	3,434	6,617	5,992	119	238	208	218	293	536	468	491	5.8	4 31	5.32	16.7	11.98	15.33	14.62	6.8	5.32	6.81	6.49
*Ont. Belle...	Jersey....	17 43	22 37	20 14	3,195	3,214	3,035	194	220	178	186	436	495	401	418	5.4	6 96	6.64	9 0	10.16	11.31	10.82	4.0	4.51	5.02	4.81
*Rena B'nette	Jersey....	18 21	22 17	28 44	4,126	3,188	7,611	231	200	418	437	520	450	941	983	4.4	6.94	3.73	7.9	11.08	6.80	6.50	3.5	4.92	3 02	2.89
*Lily X. Y...	Jersey....	8 17	21 26	Dry	1,278	3,705	....	66	224	....	....	150	504	....	....	6 3	5.74	....	12.3	9.49	....	....	5.4	4.21	....	....
Meg	Holstein..	....	27 40	27 01	....	†4,442	6,393	....	†159	231	245	....	†397	527	551	....	6.17	4 22	....	†17.23	11.11	11.02	....	†6.90	5.10	4.90
Jean	Grade....	....	....	27 80	....	....	6,785	....	....	288	301	....	....	648	677	....	....	4.10	....	....	9.65	9.23	....	....	4.29	4 10
Elsie	Grade....	....	....	24 37	....	....	6,335	....	....	212	222	....	....	477	500	....	....	3.85	....	....	11.49	10.97	....	....	5.10	4.87
Ethel	Grade....	....	....	24 05	....	....	6,034	....	....	248	259	....	....	558	583	....	....	3.98	....	....	9.69	9.28	....	..	4.31	4.12
Grey.........	Grade....	....	....	36 81	....	....	8,411	....	....	360	377	....	....	810	848	....	....	4.37	....	....	10.22	9.76	....	....	4.54	4.34
Lady.........	Grade....	....	....	31 61	....	....	6,754	....	....	269	281	....	....	605	632	....	....	4.68	....	....	11.76	11.25	....	....	5.22	5.00
Bessie.........	Grade....	....	....	32 61	....	....	6,468	....	....	315	329	....	....	709	740	....	....	5.04	....	....	10.35	9.91	....	....	4.59	4.40
Cherry	Grade....	....	....	30 94	....	....	8,297	....	..	286	299	....	....	644	673	....	....	3.73	....	....	10.81	10.34	....	....	4.80	4.59
Beatrice...	Grade....	....	....	30 83	....	....	7,096	....	....	273	285	....	....	614	641	....	....	4.34	....	....	11.29	10.81	....	....	5.02	4.81

*Not a full year in '96. † Not full year.

FOOD COST OF MILK, BUTTER, AND CHEESE, FROM DAIRY HERD FOR THREE YEARS.

Month.	No. of cows milking.			Total food cost.			Pounds of milk.			Pounds of butter.			Pounds of cheese.			Food cost of 1 gal. milk,			Food cost of 1 lb. butter.			Food cost of 1 lb. cheese.		
	1896.	1897.	1898.	1896.	1897.	1898.	1896.	1897.	1898.	1896.	1897.	1898.	1896.	1897.	1898.	1896.	1897.	1898.	1896.	1897.	1898.	1896.	1897.	1898.
				$ c.	$ c.	$ c.										c.	c.	c.	c.	c.	c.	c.	c.	c.
December	16	19	16	62 00	49 25	46 39	7,767	8,246	8,096	329	384	333	740	864	749	8.0	5.97	5.73	18.8	12.82	13.93	8.4	5.70	6.19
January....	16	*19	20	43 60	58 33	62 06	7,043	10,609	11,812	317	466	511	713	1,152	1,149	6.2	5 50	5.25	14.0	11.39	12.14	6.1	5 06	5.40
February.	*15	19	16	46 00	50 91	44 54	8,029	8,839	9,491	373	392	411	839	969	924	5.7	5.76	4.69	12.3	11 81	10.83	5.5	5 25	4.82
March	17	18	17	45 53	48 62	50 54	7,224	8,590	9,724	334	411	416	722	924	936	6 3	5 66	5.19	13 6	11.82	12.14	6.1	5.26	5.39
April	*18	16	18	48 40	40 59	53 02	10,487	7,033	12,394	463	308	523	1,041	693	1,176	4.6	5.77	4.27	10.4	13.17	10.13	4 6	5 84	4.50
May	*17	*20	21	33 09	65 46	52 28	11,665	13,178	12,478	490	590	522	1,102	1,327	1,174	2.8	4 97	4.19	6.7	11.09	10.01	3.0	4 93	4.45
June	21	22	21	23 73	32 57	21 00	11,664	13,240	15,476	568	551	648	1,278	1,239	1,458	2 0	2.46	1.35	4 2	5.91	3 24	1 8	2 62	1.44
July	22	22	21	37 65	30 88	58 53	10,245	12,277	16,952	454	486	664	1,021	1,093	1,494	3.7	2.51	3.45	8.3	6.35	8.81	3.7	2.82	3 91
August...	24	21	23	58 64	31 27	56 93	11,511	14,633	15,248	464	575	594	1,045	1,293	1,336	5.1	2.13	3.73	12.6	5.43	9.58	5.6	2.41	4.26
September......	21	19	21	69 34	35 87	52 60	8,939	9,934	13,551	400	423	555	900	951	1,248	7.7	3.60	3.88	17.3	8.48	9.47	7.7	3.77	4.21
October	*22	20	22	73 65	31 63	59 60	10,205	9,653	14,984	479	403	632	1,077	906	1,422	7.2	3.27	3.97	15.3	7.84	9 43	6 8	3.49	4.19
November......	20	*18	23	54 38	63 12	67 08	9,237	9,209	12,746	435	420	565	979	945	1,271	5 9	6 86	5.26	12 5	15.02	11.87	5 6	6 67	5.27
Averages ..	19.1	19.4	19.9	49 66	44 88	52 01	9,501	10,453	12,746	425	450	531	955	1,029	1,194	5.2	4.53	4.08	11.6	10.9	9 79	5.2	4 48	4.35

* Five weeks in the month.

1. The average number of cows milking each month was about twenty.

2. The average cost of the food per month for these twenty cows varied from $45 to $52 during the three years.

3. By charging pasture at one dollar per month per cow, the month of June is most favorable for the economical production of milk, butter and cheese, although in 1897 the month of August was the most favorable.

4. The food cost of a gallon of milk varied from four to five cents as the average cost for the three years. The lowest cost for one month was 1.35c. and the highest was 8c.

5. The food cost of a pound of butter varied from 10 to 11½ cents. The lowest was 3.2c., the highest 18.8c.

6. The food cost of a pound of cheese varied from 4.35 to 5.2 cents. The lowest food cost for one month was 1.44c. in June, 1898, and the highest was 8.4c. in December, 1896.

MISCELLANEOUS DAIRY NOTES.

Milking Competitions at Fairs.

I took charge of the dairy tests at Brantford Southern Fair; at the Bayham Central Exhibition, Straffordville; and at the Walpole Exhibition, Jarvis. At Brantford the prizes were awarded according to a scale of points, the same as last year; at Straffordville the prizes were given for a herd of three cows, according to a certain scale of points; and at Jarvis the competition was for the greatest production of butter fat. At Brantford seven cows entered and six completed the test, which continued for twenty-four hours. At Straffordville twelve cows entered and completed the test, which continued but six hours; while at Jarvis six cows entered and finished the test of twelve hours.

Southern Fair, Brantford, September 21. Test, twenty-four hours.

	Rank.	Name of cow.	Breed.	Owner.	Lbs. milk.	Lbs. fat.	Lbs. solids not fat.	Total score.
Open to factory cows.	1	Daisy Banks	Holstein	Jas. Rettie	56.25	1.431	4.786	123.81
	2	Daisy of Clandeboye	Jersey	W. J. Elliott....	29.50	1.253	2.672	94.65
	3	Dunoon	Ayrshire	J. R. Alexander .	32.25	0.999	2.889	86.59
Open to all .	1	Brierybanks Cora	"	N. Dyment......	45.75	1.711	4.187	115.92
	2	Nellie Gray.....	"	N. Dyment	36.25	1.369	3.098	104.62
	3	Maud	Grade Holstein.	Wm. Brittain....	33.50	1.091	2.872	83.90

Straffordville, September 21st. Test, six hours.

Open to all .	1	3 cows	Grades	J. A. Jackson ...	35.25	1.498	3.233	186.83
	2	3 cows	"	L. Johnson	29.25	1.127	2.600	151.57
	3	3 cows	"	Geo. Murphy....	24.25	0.910	2.124	142.13
	4	3 cows	"	A. L. Scott......	23.75	1.180	2.056	141.57

Jarvis, September 30. Twelve hours' test.

Open to all .	1	....	Grade Jersey ..	Jas. Williamson..	17.0	0.816	......	......
	2	Beckie	" ..	J. Lawrence	12.0	0.588	......	......
	3	Spot	" ..	A. Underhill	8.0	0.256	......	......

These milk tests at fairs are becoming very popular; and there is likely to be more of them during the coming years. If the competition continued for a greater length of time, and if all would agree on some basis or scale to be used at all these tests, it would be an improvement. The cost of the food is also an important item which should be considered; but we must "creep before we walk." No doubt these things will come in due time. The fact that people are becoming awakened to the importance of weighing the milk from individual cows and having it tested is a very important step in advance. It is the first fruits of the agitation in favor of individual testing of cows in a herd. The seed has been sown and the harvest is just appearing. There are many difficulties in the way of conducting a milk test in a satisfactory manner at a fair; but most of these will be overcome in time. The graduates of our College and Dairy Schools should be able to take full charge of such tests.

Milk Tests at Farms.

Some cows are very much affected by their surroundings at a fair and are unable to do themselves or their owners justice at such a time; hence the need for tests conducted at home, where the cows are surrounded by their usual conditions. Several of our Canadian breeders of Holsteins have competed for the liberal prizes given by the American Holstein-Friesian Association. We have had several requests to go, or send reliable persons, to make such tests; and we are arranging that, so far as possible, this work shall be done by graduates of the College, thus entailing less expense upon those who are having their cows tested and less loss of time on the part of our dairy staff, who cannot be spared for a whole week at any season of the year.

Thermometers and Hygrometers for the Dairy and Curing Room.

It is very difficult to secure thermometers which are accurate and will register alike at different temperatures. A prominent cheesemaker sent us the following test of thermometers made by him May 18th, 1898:

Kind of thermometer.	Temp. 50% F.	Temp. 60% F.	Temp. 86% F.	Temp. 100% F.
Quevenne lactometer (standard)	50	60	86	100
Float bulb (dairy) No. 1	51	61	86½	101
" " 2	50	60¼	87½	102¼
Float dairy No. 1	53	64	91	106½
" 2	51	61¾	88	104
Metal back	53	63	88	102¼
Brass guards No. 1	51	61½	86	102
" 2	52	62	86¼	101

It will be noticed in the table that some of the thermometers read alike or nearly so at fifty degrees, but at eighty-six and one hundred degrees there was quite a marked difference. This difference at the various temperatures is caused by the unequal size of the bore, or opening, in which the mercury expands. There is room for some firm to upply a large trade in accurate thermometers at reasonable prices.

To know what variation in temperature has taken place in the curing-room during twenty-four hours a maximum (highest) and minimum (lowest) recording thermometer is necessary. We have tried several different makes and, all things considered, a U-shaped thermometer, made in Germany and sold in this country for ninety cents, is the one we can recommend to dairymen. It is simple, fairly accurate and easily set. When purchasing, select one that corresponds with a standard thermometer, between sixty and seventy-five degrees, as we have found quite a variation in the different instruments of this make. The needles which mark the highest and lowest temperatures are set with a magnet. These needles should be set at regular intervals of twenty-four hours, to be of good service. A maximum and minimum thermometer (latest U. S. Weather Bureau pattern) sold by dealers in New York, is a serviceable and accurate instrument; but it is more trouble to set than the one previously mentioned, and it costs $8.

The "relative humidity" of the curing-room is also an important point in curing cheese. If the atmosphere is too dry the cheese crack and lose a great deal in weight by evaporation. We found that the sub-earth duct supplied an abundance of moisture in the air—in fact too much, as it made the conditions very favorable for growth of mould.

For ascertaining the "relative humidity," or percentage of moisture in the air, several kinds of hygrometers or psychrometers are in use. We have three kinds in our curing rooms—the Polymeter (cost $8), the dry and wet bulb thermometer (latest U. S. Weather Bureau pattern, cost $6.50), and the coil hygrometer ($2). This last is not an accurate instrument at all; but it points to the maker and says the air is becoming dry in this room, or it is moist or moderately moist, etc.

Any cheesemaker can make a hygrometer by securing two ordinary dairy thermometers which read alike. About the bulb containing the mercury of one thermometer, wrap the end of a piece of lamp-wick. The other end of the lamp-wick may be placed in a cup containing condensed steam or clean rain water. Hang the two thermometers in a convenient place near the centre of the room and place the cup containing the water a little to one side of the "wet bulb" thermometer. As the water evaporates from about the bulb it causes the mercury to contract in the wet bulb thermometer by taking up heat, and gives a lower reading. The dry bulb thermometer is also read; and a table sent out by the Dairy Division of the Experimental Union gives the percentage of moisture in the atmosphere. Any cheesemaker can make such a hygrometer as is here described.

Testing New Churns.

Nearly everyone of an inventive turn of mind tries his skill at a new style of churn, which promises, in his estimation, to take the place of the old-fashioned churns now in use. We have tried a few of these new churns during the past season and in other years with the same result—failure. Most of the men who invent and patent these churns are honest, and really think they have done a service to mankind in general, and to dairymen and buttermakers in particular, by placing on the market the results of their brain work and skill.

The goal of nearly all these churns is to obtain butter quickly, and experience shows that butter which is churned too quickly is not so good in quality as that which takes a moderate amount of time—say twenty to thirty minutes with a small churning and forty to sixty minutes with a larger one.

Another feature of these churns is that they will remove turnip, pantry, cellar and other flavors, as if by magic. Our experience is that these flavors do not disappear so rapidly by the simple process of churning. A great deal of time and money are being wasted by the inventors who do not understand that it is simplicity which is required in a churn. Many farmers are persuaded to buy these churns, and find that they are difficult to clean and no better than the common box or barrel churn.

Excursionists.

The month of June was almost wholly given up to the instruction and entertainment of the thousands of visitors who came to see us from the farms, villages, and towns of Ontario. Miss Rose gave valuable assistance in this work. Her practical lessons on buttermaking were very much appreciated by the farmers' wives and daughters, who form a large proportian of these annual visitors.

Our rooms are far too small to handle in a satisfactory manner the very large crowds which come on some of these excursions. By giving a number of lessons and talks during the afternoon, and requesting the people to move from the class-room to some other department at the close of each lesson, we managed fairly well.

Correspondence.

This branch of our work grows larger each year. A great deal of help and advice is given to dairymen by means of letters, bulletins, pamphlets, etc. It takes a good deal of time, but it keeps the department in touch with the needs of dairymen in all parts of the Province.

Another feature in this connection is becoming quite prominent. Many persons send us samples of butter, cheese, milk and cream, to score and test. The results of the scoring and testing are returned to the parties as soon as possible, and we frequently receive a second or a third lot, and in some cases we notice a marked improvement in the quality of the second samples. One man sent us, from the northern part of the Province, twenty samples of milk at one time and twenty-six samples at another time to test. Many excursionists bring samples of whole milk, skim-milk and butter-milk to be tested. The results are reported through the mail, as we seldom have time to do so at once.

Improvements.

To conduct experiments in the curing of cheese, we divided the curing-room into three parts and lined the inside with building paper and matched lumber. Each room is connected with a sub-earth duct, which was also put in about the same time as the changes in the curing-room were made. The duct is about 90 feet long and has six rows of ordinary six inch drain title placed at a depth of six feet in the ground. Three rows of tile are placed in the bottom of the drain and three directly on top of these, but the joints are broken about four inches apart. The inlet is a galvanized iron pipe, fourteen inches in diameter, and thirty feet high, with a hood or cowl on the top so arranged that it always faces the wind. An outlet from the curing-room consists of a wooden box from the ceiling to the roof and a twelve-inch galvanized iron pipe fifteen feet long placed over that. Slides regulate the amount of cold air coming into the room, and a door on hinges, worked by a rope, regulates the outlet of warm air. The whole cost of the duct was about $65, including a drain 220 feet long from the inlet end to take away any water that might collect in the duct.

As an instance of the effect of the duct in cooling the air coming into the room, we may mention that on September 3rd the maximum temperature outside was 94°, the air coming into the room was 68° and the temperature of the curing-room was 70°.

The only drawback to the duct that we have noticed so far is, that it appears to cause mould to grow on the cheese at a very rapid rate. This may not be so bad another year.

At the time of writing we are making some changes in the Dairy School building which will add to its effectiveness in teaching creamery practices.

Meetings Attended During the Year.

In addition to my regular work at the College, I have attended meetings in connection with the dairy industry at the following places: Lindsay, (Eastern Butter and Cheese Association); London, (Western Butter and Cheese Association); Woodstock, (Cheese and Butter Makers' Association); Fenwick, Strathallan, Thorndale, Peterboro', Straffordville (Fair), Jarvis (Fair), Cannington, Orillia, Nilestown, and Dorchester.

I judged butter and dairy cattle at Brantford Fair, and judged butter and cheese at Jarvis. The churning competition at the Jarvis Fair was also under my supervision.

In December I am advertised to attend Farmers' Institute meetings at Chesterville and Mountain, in the County of Dundas.

Dairy Exhibit at the Industrial Fair, Toronto.

A small exhibit of pasteurized and "preserved" milk and cream, and experimental butter and cheese, was sent to Toronto during the Exhibition. The cheese and butter were scored by the judges in dairy products, and cards stating how each lot had been made were tacked on the different articles, together with the judges' score-card. Many questions were answered and the work of the dairy school and experimencal dairy was brought to the notice of quite a large number of people; but, owing to the dairy building being in such an out-of-the-way place, so much good as might have been done was not accomplished. Many bulletins, pamphlets, Dairy School circulars, etc., were given to visitors.

Fly Mixtures for Cows.

A number of these mixtures were tried, but the most satisfactory was the following: 10 lbs. lard, 1 pint coal oil, 1 pint coal tar, and 2 ounces of crude carbolic acid. Melt the lard, then pour in the coal tar, and mix thoroughly. Remove from the stove, or from wherever it is being heated, and add the coal oil and carbolic acid and apply at once with cloths. Put the mixture on all parts of the body. The quantities given will be sufficient for about twenty-five cows. It takes two men about one and one-half hours to apply this to 25 animals, and it will keep the flies off for three to seven days. It is more effective for the first two or three applications than later. If a rain comes soon after the mixture is applied the benefits are largely lost. The lard at five cents a pound is cheaper as the base of the mixture than fish oil, which costs 80 cents per gallon. Ten pounds of lard are equal to one gallon of the oil.

During the past year a bulletin was issued prepared by the Instructors in the Dairy School (32 pages). Copies of this bulletin may be had on application to the Department of Agriculture at Toronto. The subjects discussed in that bulletin are as follows: Methods of Sewage Disposal; Milk Testing; Care of Milk for Cheese Factories and Creameries; A Starter, Separators, and the Separation of Milk; Butter-making in the Creamery; Butter-making on the Farm; Cheese-making.

Suggestions and Improvements Needed.

1. It having been decided to give more attention to the practical work of our regular College students, more room will be required in the Home Dairy department. As the Home Dairy classes of our Special Course are likely to be larger hereafter, this change is advisable in the near future. The present room devoted to Home Dairy instruction will not accomodate more than ten or twelve students at once with any degree of satisfaction.

2. During November and December we have had two men and one lady student taking up special work along with our College classes. It will be well to consider whether a short course before Christmas, say from Dec. 1st to 21st, would not be advisable, as others have written to know if they could not begin the Dairy School before the New Year. Many who are establishing winter creameries would likely come for a short term if we had the necessary accomodation and means of instruction.

3. The dairy stables need repairing before another winter.

All of which is respectfully submitted,

H. H. DEAN,

Professor Dairy Husbandry.

Guelph, December 30th, 1898.

PART VII.

PEPORT OF THE AGRICULTURIST.

To the President of the Ontario Agricultural College :

Sir,—I have the honor to submit herewith my sixth annual report.

Teaching. Lectures in the College constitute, probably, the most important part of my work, and I have essayed to make my teaching as practical as possible. Believing that animal husbandry is bound to become the leading industry of our Province, I have made every effort to interest our students in live stock. To this end I have devoted considerable time to training students in judging live stock ; for I have found this to be the most effective means of awakening interest. The course of lectures in agriculture and live stock is fully outlined in the College Circular, and therefore does not require further description.

Bulletin. A considerable portion of my time during the summer months was devoted to the preparation of a bulletin on farm-yard manure, which has been recently published as Bulletin 109. The bulletin deals with the characteristics, composition, care, application and valuation of farm-yard manure, and an attempt was made to bring the light of most recent investigations to bear upon the subject.

Correspondence. During the year I have received a large number of letters containing questions relating to a great variety of agricultural topics. I have attempted to answer the questions satisfactorily, though they have made very serious demands upon my time.

Live Stock Experiments. Work in this department has increased considerably, and a number of investigations are under way. Much of our work is a repetition of last year's work ; for if experiments in feeding are to be of value, they must be thorough, and thoroughness requires repetition. Following is an account of the principal experiments of the year.

EXPERIMENTS IN CATTLE FEEDING.

Different Quantities of Meal for Fattening Steers.

This experiment is a repetition of last winter's work, an account of which appears in my last report. Nine steers were divided into three groups, with three steers in each group. It was planned to start group I. on a medium meal ration and increase rapidly until the ration reached, as nearly as possible, one pound of meal per day per 100 pounds live weight of the animals. Group II. was to receive, as nearly as practicable, two-thirds of a pound of meal per day per 100 pounds live weight. Group III. was to be started on about one-third of a pound of meal per 100 pounds live weight and increased as deemed advisable until equal with group II. In addition to the meal ration, the steers received a mixture of hay and straw during part of the time, and hay without straw during the remainder of the feeding period, together with 15 pounds of roots per steer per day. The quantity of roots was increased to 25 lbs. on April 1st, and continued at this rate until the close of the experiment. Outside the meal the steers were fed exactly the same rations, and all fodders were carefully weighed and recorded. After 30 days' preliminary feeding, during which all the steers received the same ration, the experiment proper commenced December 3rd and closed May 31st, covering a period of 179 days. The meal ration consisted of equal parts by weight of peas, barley and oats.

The daily meal rations for each group weıe, approximately, as follows :

——	Group I.	Group II.	Group III.
	lbs.	lbs.	lbs.
December	8	6	4
January	10	8	4.5
February	11	8	5
March	12	9	8
April	13	9	9
May	13	10	10

One steer in group I. was considerably lighter than the other two, and his daily meal ration was one pound lighter than the quantities stated above for Group I.

In order to show the relation which the weight of meal consumed by the animals bears to the weight of the animals, the following table is given, in which the calculations are based upon the quantities of meal actually consumed.

The table shows the average weight of the steers for the whole fattening period, and the relation which the meal rations bears thereto.

——	Average weight of steers throughout experiment.	Average daily meal ration per steer.	Average amount of meal consumed per day per 100 lbs. live weight.
	lbs.	lbs.	lbs.
Group I. (Heavy ration)	1,229	10.66	.81
" II. (Medium ration)	1,265	8.21	.65
" III. (Light ration)	1,269	6.68	.53

From the above table it will be seen that group I. averaged slightly over four-fifths, group II. slightly under two-thirds, and group III. a little over one-half of a pound of meal per day per 100 pounds live weight.

As the experiment proceeded, one steer in group II. and one in group III. were discarded as unsuitable for the test, and the experiment was completed with two steers in each of these two groups.

The following table shows the weights and gains of the different groups:

——	Weight Dec. 3rd.	Weight May 31st.	Total gain in 179 days.	Average gain per steer in 179 days.	Average gain per steer per day.
	lbs.	lbs.	lbs.	lbs.	lbs.
Group I. Heavy ration, (3 steers)	3,235	4,140	905	301.66	1.68
" II. Medium ration, (2 steers)	2,245	2,815	570	285.	1.59
" III. Light ration, (2 steers)	2,241	2,835	594	297.	1.65

It will be noticed that all the gains are low. This was due to having to feed some very poor hay during part of the time. It will also be noted that the results are somewhat contradictory, the medium ration group making the smallest gain, whereas the light and heavy ration groups are practically equal. This apparent discrepancy is due to the individuality of the animals in different groups. However, the rate of gain is not the most important point, but the cost of gain is extremely important. In valuing fodders difficulties always arise ; but, as the sole object of this experiment is to compare the relative merits of different methods of feeding, it has been thought advisable not to attempt to follow the fluctuating market prices, but to adopt reasonable average values for the different fodders. For the sake of uniformity, therefore, the same values are used in this experiment as were employed in the first experiment, namely, meal, $13 ; hay, $6 ; straw, $3 ; and roots, $2 per ton. The valuation of the meal is rather below the average market price of the past winter, but a higher valuation would simply make the comparison of the different methods even more striking. Using the same values throughout simplifies the comparison of results obtained in the two experiments.

The table given below shows the cost of one pound of gain in each experiment, together with the average of the two experiments.

——	Cost of 1 lb. gain, first experiment.	Cost of 1 lb. gain, second experiment.	Cost of 1 lb. gain, average of two experiments.
Group I. Heavy ration..	6.37c.	7.70c.	7.03c.
" II. Medium ration	5.59c.	7.26c.	6.42c.
" III. Light ration ..	5.91c.	6.46c.	6.13c.

In the case of the light and medium rations, the results of the two experiments are somewhat contradictory, since in the first experiment the medium ration proved to be the more economical of the two, while in the second experiment this result has been reversed. But in both experiments the results have been decidedly in favor of the two lighter rations as compared with the heavy ration. The results of the two experiments, therefore, point to the conclusion that for fattening steers, a moderately light meal ration is more profitable than a heavy meal ration, provided, of course, that the coarser fodders are of good quality and palatable.

Corn vs. Peas for Fattening Steers.

Corn is attracting considerable attention as a food for stock, and numerous questions have been received regarding its value as compared with peas, for fattening animals. One experiment was conducted with steers during the winter of 1897-98, in which a mixture of corn, barley, and oats, equal parts by weight, was compared with equal parts by weight of peas, barley, and oats. Three steers were fed a ration exactly the same as that of Group II. in the experiment with different quantities of meal, except that their meal ration consisted of corn, barley, and oats, instead of peas, barley, and oats.

In estimating the cost of a pound of grain, corn has been charged at the same price per pound as peas, though the actual cost was less than the peas. This plan has been followed in order to simplify the comparison. In this experiment the same values have been adopted as were used in the preceeding one, viz., meal $13 ; hay, $6 ; straw, $3 ; and roots, $2 per ton.

The following table shows the weights, gains, and cost of a pound of gain in the two groups:

——	Total weight Dec. 3rd.	Total weight May 31st.	Total gain in 179 days.	Average gain per steer.	Average gain per steer per day.	Cost of 1 lb. gain.
	lb.	lb.	lb.	lb.	lb.	c.
Group I. (3 steers): Meal ration—Corn, barley and oats..	3,233	4,175	942	314	1.75	6 56
Group II. (2 steers): Meal ration—Peas, barley and oats..	2,245	2,815	570	285	1.59	7.26

In this experiment, therefore, the corn, barley, and oats gave much better results than the peas, barley, and oats. If reference is made to the experiment with different quantities of meal, it will be seen that Group II., that is the group receiving the medium meal ration, made lower gains than the light ration group. As previously noted, the difference is, no doubt, due to individuality rather than to food. This makes the comparison of corn and peas unsatisfactory, and it would not be fair to assume that the larger gain of group I. in this experiment was entirely due to the superior feeding value of corn as compared with peas. It is worthy of note, however, that the group receiving corn, barley, and oats made more rapid gains than any of the groups receiving peas, barley, and oats. That is to say, the group receiving about two-thirds of a pound of meal per day per 100 pounds live weight, when the meal ration was corn, barley, and oats, made a more rapid gain than the group receiving about four-fifths of a pound of meal per day per 100 pounds live weight, where the meal ration was peas, barley, and oats.

Though the results are decidedly in favor of corn as compared with peas for fattening steers, the experiment will be repeated.

Green Oats and Peas and Oats and Tares as Soiling Crops for Milch Cows.

The green fodders used in this experiment were grown by Mr. Zavitz on the experimental plots. In order to extend the feeding period, early and late varieties of peas and oats were used. For the early plots, Daubeney oats and Chancellor peas were used, and Siberian oats and Prussian Blue peas were used for the later plots. All the plots were sown on the same date and comprised one-eighth acre Daubeney oats mixed with Chancellor peas, one-eighth acre Daubeney oats mixed with tares, one eighth acre Siberian oats mixed with Prussian Blue peas, and one-eighth acre Siberian oats mixed with tares.

The cows received their first feed of green fodder on the evening of July 7th. At this time the Daubeney oats were in the early milk stage and the Chancellor peas had a few pods well formed. The early plots lasted until July 16th at noon, or a period of nine days. By this time the Siberian oats and Prussian Blue peas were fit to use, and extended the feeding period nearly eleven days longer. Thus, by sowing early and later varieties of oats and peas, green fodders from the same date of seeding were furnished for practically twenty days. On the whole, the oats and tares gave a somewhat heavier yield yer acre than the oats and peas in this particular case. This is contrary to the results of other experiments here, and attention is called to the report of the Experimentalist, Mr. Zavitz, where much fuller information is given regarding yields of different mixtures for green fodders. In the feeding experiment, four cows were used. The cows were obtained from the Dairy department, care being taken to select animals as near the same period of lactation as possible. Cows No. 1 and No. 2 were fed oats and peas for eleven days, and cows No. 3 and No. 4 were fed oats and tares for the same time. At the end of eleven days the rations were changed; cows No. 1 and No. 2 receiving oats and tares, and cows No. 3 and 4 oats and peas during the remainder of the time. For purposes of comparison, it has been thought advisable to take an equal number of days on each kind of food, after the cows had become accustomed to changed conditions. For this reason the milk yield during the first five days has been left out of consideration, and Period I. is made to comprise the remaining six days before the rations were changed. The milk yield during the two days following the changing of the rations has been omitted, and Period II. comprises the next six days. This arrangement, therefore, shows the milk yield of each cow for six days on oats and peas, and for six days on oats and tares, thus allowing a very fair comparision to be made. In addition to the green fodders, each cow received two pounds of bran per day during the first eleven days, and four pounds per day during the remainder of the time.

The results of the test are given in the following tables:

TABLE I.—Milk Yield During Period I. (July 13-18.)

Date.	Oats and peas.		Oats and tares.	
	Cow No. 1.	Cow No. 2.	Cow No. 3.	Cow No. 4.
	lbs.	lbs.	lbs.	lbs.
July 13	21.25	21.	23.50	19.25
" 14	18.	19.25	22.50	19.75
" 15	18.25	20.	22.25	18.25
" 16	18.75	20.25	22.	19.75
" 17	18.	19.50	20.	18.
" 18	19.25	19.	21.	18.
Total	113.50	119.00	131.25	113.00

TABLE II.—Milk Yield During Period II. (July 21-26.)

Date.	Oats and tares.		Oats and peas.	
	Cow No. 1.	Cow No. 2.	Cow No. 3.	Cow No. 4.
	lbs.	lbs.	lbs.	lbs.
July 21	19.	19.	20 25	18.25
" 22	19.	19.25	19.75	19.25
" 23	18.50	18.75	17.50	19.
" 24	17.50	18.	18.	17.
" 25	17.75	17 50	20.75	18.75
" 26	17.25	18.25	17.75	18.75
Total	109.00	110.75	114.00	111.00

TABLE III.—Summary showing Milk Produced and Green Fodder Consumed.

—	Milk produced		Green Fodder consumed.	
	by 4 cows in 6 days from oats and peas.	by 4 cows in 6 days from oats and tares.	Oats and peas consumed by 4 cows in 6 days.	Oats and tares consumed by 4 cows in 6 days.
	lbs.	lbs.	lbs.	lbs.
Cow No. 1	113.50	109 00	510	510
" 2	119.00	110.75	510	510
" 3	114.00	131.25	420	420
" 4	111 00	113.00	420	420
Total	457.50	464.00	1,860	1,860

Difference in favor of oats and tares, 6.5 lbs., or an average of .27 lb. milk per cow per day.

From tables I. and II. it will be noted that cow No. 3 shrunk considerably in milk yield after changing from oats and tares to oats and peas, whereas cow No. 4 maintained a very constant flow under the same conditions. This would indicate that the shrinkage was not altogether due to the change of food.

It will also be noted, as shown in table III., that cows 1 and 2 were much larger eaters than cows 3 and 4, the average daily consumption of green fodder per head being 85 lbs. for cows 1 and 2, against 70 lbs. for cows 3 and 4. Owing to the arrangement of the results, this fact does not materially affect the comparison.

Taking everything into consideration, the results of the experiment indicate that there is very little, if any, difference between the value of oats and peas and oats and tares as milk-producers.

SUGAR BEETS *vs.* MANGELS FOR MILCH COWS.

In this experiment four cows were used, which were obtained from the Dairy department. The sugar beets and mangels were grown on the experimental plots, under the direction of Mr. Zavitz. The experiment covered a period of four weeks During the first two weeks cows 1 and 2 received sugar beets, and cows 3 and 4 mangels while during the second two weeks cows 1 and 2 received mangels, and cows 3 and sugar beets. Each cow received per day 60 lb. roots, 7 lb. meal (equal parts by weight of peas, barley and oats) and all the hay she would eat.

The following table shows the average daily milk yield for each week :

—	Average daily milk yield during first week ; cows 1 and 2, sugar beets; cows 3 and 4, mangels.	Average daily milk yield during second week ; cows 1 and 2, sugar beets; cows 3 and 4, mangels.	Average daily milk yield during third week ; cows 1 and 2, mangels ; cows 3 and 4, sugar beets.	Average daily milk yield during fourth week ; cows 1 and 2, mangels ; cows 3 and 4, sugar beets.
	lb.	lb.	lb.	lb.
Cow No. 1. First two weeks, sugar beets ; second two weeks, mangels..........	22.33	21.46	20.	19.64
Cow No. 2. First two weeks, sugar beets ; second two weeks, mangels	27.75	28.50	28.71	29.39
Cow No. 3. First two weeks, mangels ; second two weeks, sugar beets................	19.08	19.82	19.21	18.21
Cow No. 4. First two weeks, mangels ; second two weeks, sugar beets..................	22.71	22.82	22.64	21.00

The results of this experiment are far from conclusive. It will be noticed that cow No. 1 steadily decreased in milk yield throughout the four weeks, while cow No. 2 increased in milk yield during the same time. On the other hand, cow No. 3, and cow No. 4 both increased in milk yield while receiving mangels, and both decreased while receiving sugar beets. On the whole, the results are slightly in favor of the mangels as the following table shows :

—	Milk produced on sugar beets.	Milk produced on mangels.
Cow No. 1..	306.75	277.50
" 2..	393.75	406 75
" 3..	262.	272.50
" 4..	305.50	318.75
Total	1,268.00	1,275.50

It will be seen that while cow No. 1 is the only one which gave more milk on sugar beets, yet the difference in her case was so great as to make the total difference in favor of mangels comparatively insignificant. (For comparative yields of mangels and sugar beets, see Report of Experimentalist.)

Another experiment is in progress, which, when completed, may afford more definite information.

EXPERIMENTS IN SHEEP FEEDING.

Comparison of Alfalfa and Red Clover Hay for Lambs.

In this experiment thirteen lambs were used. Group I. contained four lambs and received red clover hay. Group II. contained five lambs, and received first crop alfalfa hay. Group III. contained four lambs, and received third crop alfalfa hay. In addition to the hay ration, each group received a grain ration composed of equal parts by weight of oats and peas, the quantity of grain per lamb being the same for all groups. Each group received, proportionately, the same quantity of hay. The red clover and first crop of alfalfa were both injured by rain, but the third crop of alfalfa was in very good condition, and was much finer in stalk than the first crop. The experiment continued for 74 days. The results of the experiment are given in the following table :

——	Group I. Red Clover.	Group II. First Crop Alfalfa.	Group III. Third Crop Alfalfa.
	lbs.	lbs.	lbs.
Average weekly gain per lamb	2 10	2.15	2.31
Meal consumed per 1 lb. gain	5.14	4.93	4.67
Hay received per 1 lb gain	9.03	8.48	8 20
Total cost of 1 lb. gain	6.63 cts.	6.32 cts.	6.05 cts.

In the above table, oats are valued at 25c. per bushel, peas at 48c. per bushel, and hay at $6.00 per ton. In all groups there was some hay wasted, the waste in the case of the first crop alfalfa being considerably greater than in the other two.

Throughout the whole experiment all the animals were in perfect health, no bad results being noticeable from eating the somewhat woody first crop alfalfa.

A comparison of the groups would lead to the conclusion that groups I. and II. are practically even, it being quite as probable that the slight difference is due to individuality as to feed. Group III., however, possesses quite a marked advantage over the other two groups, a result which would naturally be expected, owing to the superior quality of the hay. The results are rendered somewhat unsatisfactory owing to the fact that it is impossible te say which of the two kinds of hay, viz., the red clover or the first crop of alfalfa, had been most seriously injured. The best obtainable hay of each kind was used, but further experiments may give different results.

So far as the experiment goes it would indicate that the feeding value of alfalfa hay approaches very closely to that of red clover when fed to sheep.

Corn vs. Peas for Fattening Lambs.

In this experiment, eight lambs were used. Group I. contained four lambs, which were fed equal parts by weight of peas and oats, together with clover hay. Group II. also contained four lambs, but received equal parts by weight of corn and oats with clover hay. The experiment lasted 74 days. The results of the experiment are given below.

	Group I. Peas and Oats.	Group II. Corn and Oats.
	lbs.	lbs.
Total Meal consumed	456.75	456.75
Total Hay fed	802.	802.
Average weekly gain	2.10	2.29
Meal consumed per 1 lb. gain	5.14	4.72
Hay fed per 1 lb. gain	9.03	8.27
Cost of 1 lb. gain	6.63 cts.	5.79 cts

In estimating the cost of the fodders, the peas are valued at 48c. per bushel, and the corn at 38c. per bushel, which was the actual cost including grinding, while the hay is valued at $6.00 per ton.

This experiment, therefore, gives a marked difference in favor of the corn, both in rate of gain and cost of gain, and at the same price per pound for corn and peas the corn would still have the advantage. Further tests are necessary, and preparations are being made for repeating the experiment.

EXPERIMENTS IN SWINE FEEDING.

Experiments With Pure Bred Swine.

This experiment is a continuation of the work of the past two years, and constitutes the third experiment of the series. This year some new features were added, a report of which is given below. In the spring, thirty-six pure bred pigs were purchased, comprising six pigs of each of the following breeds: Yorkshire, Chester White, Tamworth, Duroc Jersey, Poland China, and Berkshire. The pigs were purchased from reputable breeders, and they arrived at the College early in June. Their ages ranged from seven to nine weeks at time of delivery. They were weighed and divided into three groups on June 14th, and the experiment proper commenced July 4th, after the pigs had become accustomed to their changed surroundings and feed. Each group contained two pigs of each breed, or twelve pigs. The pigs in Group A were kept in pens, the pigs of each breed being kept separate. Group B was treated in exactly the same way—the two groups occupying the same building. Each pen opened into a small outside yard, thus allowing a limited amount of outside exercise. The pigs in Group C were given the run of a half-acre lot with shelter. This lot furnished some clover and grass until about the middle of August, after which it afforded practically no pasture. The pigs, however, took plenty of exercise and did considerable rooting.

The meal ration for all the groups was as follows: Wheat middlings until August 19th. Barley and shorts, equal parts by weight, from August 19th until September 12th. Peas, barley, and shorts, equal parts by weight, from September 12th until October 24th, the close of the experiment. The pigs in Group B, however, were fed whey in addition to the meal ration. Thus Group B differed from Group A in that it received whey in addition to the meal ration; and Group C differed from Group A in that it was fed in an outside lot, with plenty of room for exercise.

In comparing the gains and food consumed by the different breeds, only Groups A and B were used, because it was only in these groups that the breeds were kept separate. Therefore the comparisons are based upon four pigs of each breed, In dividing up the pigs into groups, several rather unthrifty animals were put into Group C so as not to interfere with the comparison.

The table given below, in which the breeds are arranged in order of economy of gain, represents the average results of Groups A and B. The whey consumed by Group B is not taken into consideration in this table, because it was the same for all breeds, and therefore does not affect the comparison.

Breed.	Average weight July 4th.	Average weight Oct. 24th.	Total gain per hog in 112 days.	Average daily gain per hog.	Meal consumed per 100 lb gain.
	lbs.	lbs.	lbs.	lbs.	lbs.
1 Yorkshire	52.	175.75	123.75	1.10	350.1
2 Berkshire	49.5	169.5	120.	1.07	369.79
3 Duroc Jersey....	59.25	179 25	120.	1.07	376.04
4 { Tamworth	47.75	167.	119.25	1.06	377.77
4 { Chester White	56.	175.25	119.25	1.06	377.77
5 Poland China ..	68.75	186.5	117.75	1.05	383.22

The uniformity of the gains of the different breeds is rather remarkable. The Yorkshires and Berkshires consumed rather less meal than the other breeds, and this accounts for the considerable difference in the quantities of meal required for 100 pounds gain. The Poland Chinas were placed at a slight disadvantage in that they were heavier than the other breeds. This point will be found illustrated in a subsequent table.

At the close of the experiment the hogs were shipped to the Wm. Davies Company, Toronto, where they were slaughtered and examined by experts. Mr. J. W. Flavelle, managing director of the firm, furnished the following report on the characteristics of the different breeds. Mr. Flavelle was given merely the number of the groups without any information regarding the breeds.

The groups were arranged as follows: A, Yorkshires; B, Chester Whites; C, Tamworths; D, Duroc Jerseys; E, Poland Chinas; F, Berkshires.

Mr. Flavelle's Report.

Dear Sir.—Covering the hogs which you marketed with us last week, please note the following concerning the various groups, as indicated by ear-tags:

Group A.—General characteristics: Great length, side of even depth throughout, sides full of flesh, great length between shoulder and ham, fat even on back, bone moderate, head small, fore-arm too long, belly only moderately thick, shoulder moderate in size. These pigs have qualities which make them peculiarly suitable for cross-breeding purposes on account of their great length, great development of flesh and the even depth of the side.

146: Too heavy, full of flesh, fat reasonably even down back; would have been an excellent pig if marketed earlier. Sides from this hog will not grade No. 1, because they are too fat.

126: Long, fat even on back, full of flesh, even depth of side throughout. Will make side of No. 1 selection.

The remaining four hogs of this class were scalded on account of being too thin for singers. They are simply good, strong stores, but they carry with them the same general excellent qualities of the other two, and if they had been fed for a sufficient time they would have made desirable sides.

Group B.—General characteristics: Heavy shoulder, head a little coarse, belly only moderate in thickness, bone moderate, short middle, quite too short to make a desirable side, undue development of fat on shoulder, fat uneven down back, tendency for fat to arch on the crown, generally undesirable because of shortness and tendency to run to thick fat shoulder.

145: Undue development of fat on shoulder, arches up on crown; would be classed as fat bacon, with an average value of say four shillings per cwt. less than best. Middle short, not long enough between ham and shoulder for good cutting, bone moderate, head a little coarse, belly only fair in thickness.

144: Better length than 145, fat more even down the back, and altogether a better pig; would be passed as No. 1 bacon, but would not make an ideal side.

128: Short, apparently stunted, fat arched a little on the shoulder; an undesirable hog.

129: Shows the same tendency of the fat arching on the crown, hog too small, developed as a finished pig too early.

119: Better length, fairly useful pig, coarse head, better development of flesh than any of the others; would be classed as a No. 1 side, but not at all an ideal one.

One scalded hog in this lot shows the same general characteristics.

Generally speaking, Group B. seems to represent a type of hog that will make short, thick, fat sides, unless there is the very greatest amount of care exercised in feeding.

Group C.—General characteristics: Moderate bone, long head but small jowl, flesh well developed, slight tendency for fat to arch on the crown, which would possibly cause too many sides to be classed as "fat" on account of thickness at this one point if hogs were moderately well fed, belly thick and very excellent, generally a desirable type of hog, which, with judicious feeding, ought make good export sides.

132: A little short, not enough cutting between shoulder and ham, slightly too fat but fairly even down the back, would not pass as a No. 1 owing to being too fat.

133: Very thick belly, fat on the back, arched somewhat at the crown, thus making the side too fat for No. 1 selection, if marketed a little earlier this defect would not have been so noticeable and the product would have made sides of No. 1 selection.

Three scalded hogs in this group, Nos. 131, 130 and 123, are too light for marketing, being a little better than good stores, but have the general characteristics indicated above, the thickness of the belly being particularly noticeable.

Group D.—General characteristics: Heavy shoulder with poorly developed loin, bone moderate, head moderate in size with a good deal of jowl, side uneven in depth, shoulder altogether over-balancing the ham and loin, short and thick, tendency of the fat on the shoulder to arch on the crown, fair belly, generally very undesirable on account of undue development of shoulder and shortness of hog. This hog if fed carelessly would develop short thick sides, the very opposite of an ideal side.

116: Short, dumpy, moderate bone, flesh well developed, good belly, would probably pass as a short No. 1 side.

137: Heavier than 116, longer, fat, would make decidedly fat bacon, skin coarse, bone somewhat coarse.

135: Bone coarse, but side full of flesh.

117: Has put on too much fat; would class as a No. 2 side on this account.

Two scalders in this lot were too light to be singed, 134 coarse in bone, but side full of flesh and fat even down the back. 136 shows great length, entirely unlike any other hog in the group, full of flesh, coarse in bone, very long fore arm, an undesirable hog on his own account, but would make an excellent type of hog to cross with some of the others in the group.

Generally speaking, the above class shows great irregularities and unevenness, no two hogs in the lot being alike.

Group E.—General characteristics: Coarse, very heavy shoulder, side runs off at loin, coarse head, generally full of flesh, undesirable because of coarseness, undue development of shoulder and heavy head. The heavy development of shoulder in these hogs and light loin fail to produce a side of even depth.

149: Thick, heavy, fat, coarse head and shoulder, undesirable.

148: Same type as 149, but not so fat.

114: An excellent pig, entirely unlike any other in the group, fat even on the back, excellent belly, head coarse, bone somewhat coarse, but on the whole a useful pig.

138: Very thick shoulder, pinched in the loin, coarse, skin coarse.

139: A strong, coarse, lean hog.

Group F.—General characteristics: Flesh well developed, fat even down back, well developed sides of reasonably even depth, hogs irregular in length, head moderate with rather large jowl, bone moderate, generally good hogs but show a decided tendency to uneven development as evidenced by the great irregularity in the length.

121: The best of the three singers in this group, good length, moderate shoulder, head slightly coarse, even middle and good hams; a desirable hog, the product of which will make a No. 1 side.

142: Much shorter than No. 1, with a thicker shoulder and a good deal of jowl.

143: A fairly useful hog, but quite too short, a good deal of jowl, plenty of flesh which would permit it to pass as a No. 1 selection on a general inspection, but not at all an ideal side.

Two scalders, 140 and 120, excellent length, good belly, would have made first-rate pigs if fed longer.

141 : Is much shorter than the above two pigs ; if forced, would probably give a thick pug when finished.

Generally speaking, this group is to be commended for the quantity of flesh developed If the hogs had been more even in length it would have greatly improved the general quality of the group.

Yours truly,

J. W. FLAVELLE,
Managing Director of The Wm. Davies Co., Limited.

TORONTO, Oct. 31st, 1898.

It must not be forgotten that Mr. Flavelle's report deals with the hogs purely from the standpoint of the export bacon trade. On the whole, the breeds rank pretty much the same in his report as in previous years.

It is worthy of note that it did not cost more in this feeding test to produce a pound of gain in the case of a good type of bacon hog than in the case of less suitable types.

The experiment also indicates that while the bacon type is apparently more common in some breeds than others, yet very good bacon types occur in practically all the breeds tested. The selection of breeding stock however, to conform to the bacon type, among some of the breeds tested, would mean a divergence from the standards of excellence provided for the direction of breeders.

FEEDING VALUE OF WHEY, AND INFLUENCE OF EXERCISE.

It has been explained already that the pure-bred hogs were divided into three groups, each group containing two hogs of each breed, or 12 hogs in all. Group A was fed in pens. Group B was also fed in pens and on the same meal ration, with the addition of whey. The whey feeding was commenced before the hogs were three months old. A very small quantity of whey was fed at first, but is was gradually increased until about two pounds of whey were fed with each pound of meal. Group C received exactly the same ration as Group A, but was given exercise in a half acre lot.

The following table shows the results of the different methods of treatment :

	Total weight July 4th.	Total weight Oct. 24th.	Total gain in 112 days.	Average daily gain per hog.	Food consumed per 100 lbs. gain live weight.	
					Meal.	Whey.
	lbs.	lbs.	lbs.		lbs.	lbs.
Group A. 12 hogs (two of each breed) in pens with meal and water	651	1,897	1,246	.92	428.25	....
Group B. 12 hogs (two of each breed) in pens with meal and whey	682	2,302	1,620	1.20	333.27	674.44
Group C. 12 hogs (two of each breed) outside with meal and water	598	1,953	1,355	1.00	400.22	....

The table shows a very marked difference in rate and economy of gain in favor of the whey, while the outside group shows a decided advantage over the inside group receiving the same ration. The fact that several unthrifty hogs were put into the outside group, makes the difference in gains all the more striking.

In this experiment, 100 pounds of whey proved equal in feeding value to 14 pound of meal, showing that whey is valuable food for swine when fed juidiciously.

Special attention is directed to the influence of whey on the firmness of bacon, which is reported in another place.

Influence of Weight Upon Amount of Meal Required for One Pound of Gain.

In the experiment with pure-bred hogs, a rather interesting point was brought out incidentally. It has been shown by other experiment stations that the cost of producing a pound of gain in hogs increases as the animal becomes heavier. As our pure-bred hogs were weighed at regular intervals, and as every pound of meal which they consumed was carefully weighed, an opportunity was afforded to test further the truth of the claim, and a statement of the results is given below. These results are computed from the gains made and the food consumed by 36 hogs, so that they afford very conclusive evidence. In computing the average weights of the hogs, fractions of pounds were neglected, the nearest whole number of pounds being taken in each case.

Statement of Food Consumed for One Pound of Gain by Hogs of Different Weights.

While increasing in live weight from 54 pounds to 82 pounds, hogs required 3.10 pounds meal per one pound gain.

While increasing in live weight from 82 pounds to 115 pounds, hogs required 3.75 pounds meal per one pound gain.

While increasing in live weight from 115 pounds to 148 pounds, hogs required 4.38 pounds meal per one pound gain.

While increasing in live weight from 148 pounds to 170 pounds, hogs required 4 55 pounds meal per one pound gain.

This statement shows that there is a steady increase in the amount of meal required to produce a pound of gain as the hogs increase in weight, and is a strong argument in favor of marketing hogs by the time, or a little before, they reach 200 pounds live weight.

Rape for Fattening Hogs.

Two experiments were conducted to test the feeding value of rape for fattening hogs. At the same time cornmeal was compared with a mixture of equal parts by weight of peas, barley and shorts. The primary object of the experiments was to test the effect of these foods upon the firmness of the bacon, and attention is directed especially to the report on firmness which is given under a special heading.

Experiment No. 1. For the first experiment twelve hogs were used. They were divided into three groups of four hogs each. Group I. was fed cornmeal and rape, the meal ration being two-thirds of that fed to Group II. Group II. was fed cornmeal alone, and Group III. was fed a mixture of equal parts by weight of peas, barley and shorts. The rape was fed to the hogs in their pens, and they were given all they would eat in addition to the meal ration. The weights, gains and food consumed per 100 pounds gain are given in the following table :

Group.	Average weight of hogs at beginning of experiment.	Average weight of hogs at close of experiment.	Total gain per hog in 42 days.	Average daily gain per hog.	Food consumed per 100 lbs. gain.	
					Meal.	Rape.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Group I. (4 hogs): Corn and rape	118	179	61	1.45	260.65	847.54
Group II. (4 hogs): Corn alone	107	171	64	1.52	368.75	....
Group III. (4 hogs): Peas, barley and shorts alone	104	164	60	1.42	393.33	....

Experiment No. 2. In the second experiment eleven hogs were used and divided into three groups. Group I. was fed equal parts by weight of peas, barley and shorts, together with rape, receiving two-thirds of the meal ration given Group II. The rape was fed to the hogs in their pens, and they were allowed all they would eat in addition to the meal. Group II. was fed cornmeal alone, and Group III. was fed peas, barley and shorts alone. The results are given in the following table :

Group.	Average weight of hogs at beginning of experiment.	Average weight of hogs at close of experiment.	Total gain per hog in 42 days.	Average daily gain per hog.	Food consumed per 100 lbs. gain.	
					Meal.	Rape.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Group I. (4 hogs): Peas, barley and shorts with rape....	100	147	47	1.12	278.72	846.81
Group II. (4 hogs): Corn alone	94	140.5	46.5	1.10	408.60	....
Group III. (3 hogs): Peas, barley and shorts alone.... ...	107	158	51	1.21	388.23	....

If the two tables are compared it will be seen that the hogs in the first experiment made more satisfactory gains than those in the second. Those in the first experiment had been running on stubble fields previous to the experiment, while those in the second experiment had been confined in pens from time of weaning, so that the difference in gains is easily accounted for. On the whole the gains of the different groups in each experiment show no marked variation—probably no more than might occur on the same food. The most striking feature of the experiments is the marked saving in meal required for 100 pounds of gain effected by the use of rape. It indicates that rape has a very considerable value as a food for hogs ; but owing to the somewhat contradictory results in connection with its effect on the firmness of bacon, it is hardly safe to recommend it for hog feeding until it has been further tested.

Influence of Food and Exercise on the Firmness of Bacon.

The question of the influence of food upon the quality of bacon is an extremely important one. If we are to maintain our footing in the English market, it is necessary that we should look carefully after the quality of our products. In fact quality is the first consideration, for it will be of little use to produce bacon cheaply if by so doing we ruin the reputation of our goods, and thus lose our best market. Unfortunately all Canadian bacon is not first-class, and the following extract from a letter written by Mr. J. W. Flavelle, managing director of the Wm. Davies Company, should be sufficient to set feeders thinking : "Every year the packer finds in the product of hogs purchased during the months of May, June, and part of July, an inordinate quantity of soft bacon. We have never known such a quantity as was present this year, when, for weeks at a time, the percentage of soft, inferior bacon averaged 20, 30, and 40 per cent. of the whole." Such a condition of affairs is certainly lamentable, for when this inferior product is put upon the market as Canadian bacon it tends to discredit Canadian bacon as a whole. While the loss upon inferior goods falls upon the packer in the first place, it must of necessity fall upon the farmer in the end, and there is no doubt that had there been less soft bacon this year prices would have been higher at the present time.

"Soft bacon" does not mean fat bacon. In fact, observations during this year indicate that softness is more likely to develop in hogs that are too lean than in those which are too fat. The softness develops while the bacon is in the salt, and when taken out of the salt the fat is soft and spongy, the value of the bacon being reduced according to the degree of softness.

Since softness is evidently due to the methods of feeding and managing hogs, it becomes of great importance to discover, if possible, the conditions likely to produce soft and firm bacon. With this object in view experiments were commenced during the past summer, and, though they constitute merely a beginning, they are not without value.

The hogs used in these experiments comprised three different classes of animals, which will be described in turn. In September, twelve hogs, which had been running on the stubble fields for about six weeks, were purchased from a neighboring farmer. They were well-grown, fleshy stores, averaging about 109 pounds in weight. They were divided into three groups and constitute groups I., II., and III., described in the table which follows. Group I. was fed rape and corn meal, the meal ration being two-thirds of that fed to Groups II. and III Group II. was given a full ration of corn meal, and Group III. a full ration of equal parts by weight of peas, barley, and shorts. They were kept on these rations for six weeks before slaughtering.

Groups IV., V., and VI., comprised 11 hogs which were purchased when about six weeks old, and were kept in pens until they were slaughtered. They were fed on wheat middlings, and wheat middlings with shorts, mixed with skim milk until they weighed between 90 and 100 pounds. They were then divided into three groups and fed as follows: Group IV. received rape with a mixture of equal parts by weight of peas, barley, and shorts, the meal ration being two-thirds of that fed to Group V· Group V. received corn meal, and Group VI. peas, barley, and shorts. These rations also were continued for six weeks.

Groups A, B, and C, were made up of the purebred hogs used in the breed experiment previously described. These hogs were purchased when from 7 to 9 weeks old. Each group contained two hogs of each of the six breeds in the test.

The hogs of Group A were kept in pens with small outside yards—two hogs in each pen. From June 14th to Aug. 19th, they were fed wheat middlings mixed with water. From Aug. 19th to Sept. 12th, they were fed equal parts by weight of wheat, shorts, and barley, with water. From Sept. 12th to Oct. 24th (the close of the experiment), they were fed equal parts by weight of peas, barley, and shorts, with water. The hogs in Group B were given exactly the same treatment and the same meal ration as those in Group A, but were fed whey in addition—about two pounds of whey to one of meal. The hogs in Group C had the run of a half-acre lot, which furnished some grass until about the middle of August. They received exactly the same ration as Group A. Thus, Groups A and B were kept under the same conditions but received different rations, while Groups A and C received the same rations but were kept under different conditions.

At the close of the experiments all the hogs were shipped to the Wm. Davies Company, Toronto. There they were slaughtered, and the different groups were kept separate when in the salt. When they were taken out of the salt, the firmness of the bacon was carefully noted, and the report of the examination is given in the table which follows.

The terms used in the table require some explanation. Wiltshire bacon is made from well-fed hogs, weighing from 160 to 200 pounds live weight. Cumberland bacon is made from lighter and, generally, leaner hogs, and the side is cut differently. Thus, in Group I. all the hogs were heavy enough for Wiltshire bacon, but in Group II. only three of the hogs were suitable for "Wiltshires," and the fourth hog was cut into "Cumberlands." Where the tenderness is barely noticeable, the bacon may still pass as "number one selection;" when there is decided tenderness, it must go into a cheaper grade; but a really soft side is of very little value.

Table showing condition of bacon from the different groups.

Description of groups.	Condition of bacon.
Group I. 8 sides. Hogs had been running on stubble fields. Average weight at commencement of experiment, 118 lbs. Fed 6 weeks on corn meal and rape.	Wiltshires: 8 sides firm.
Group II. 8 sides. Same previous treatment as Group I. Average weight at beginning of experiment, 107 lbs. Fed 6 weeks on corn meal.	Wiltshires: 6 sides firm. Cumberlands: 2 sides firm.
Group III. 8 sides. Same previous treatment as Group I. Average weight at beginning of experiment, 104 lbs. Fed 6 weeks on peas, barley, and shorts.	Wiltshires: 4 sides firm. Cumberlands: 2 sides firm. 2 sides tender.
Group IV. 8 sides. Hogs had no outdoor exercise from time of weaning. Previous to experiment were fed wheat middlings and shorts, with skim milk. Average weight at beginning of experiment, 100 lbs. Fed 6 weeks on peas, barley, and shorts, with rape.	Wiltshires: 2 sides firm. 2 sides showing very slight indications of tenderness. Cumberlands: 2 sides firm. 2 sides soft.
Group V. 8 sides. Same treatment previous to experiment as Group IV. Average weight at beginning of experiment, 94 lbs Fed 6 weeks on corn meal.	Wiltshires: 2 sides firm. Cumberlands: 6 sides firm.
Group VI. 6 sides. Same treatment previous to experiment as Group IV. Average weight at beginning of experiment, 107 lbs. Fed 6 weeks on peas, barley, and shorts.	Wiltshires: 2 sides firm. Cumberlands: 4 sides firm.
Group A. 24 sides. Pure bred hogs, comprising two hogs of each of six different breeds. Purchased when from 7 to 9 weeks old. Kept in pens with small outside yards. Fed wheat middlings until Aug. 19; shorts and barley until Sept. 12; peas, barley, and shorts, until Oct. 24. See "Experiments with pure bred swine," Group A.	Wiltshires: 4 sides firm. 2 sides showing indication to tenderness. 2 sides tender. 2 sides soft. Cumberlands: 4 sides firm. 8 sides tender to soft.
Group B. 24 sides. Same as Group A. Same treatment and same meal ration as Group A, but fed whey with meal ration. See "Experiments with pure bred swine," Group B.	Wiltshires: 20 sides firm. Cumberlands: 2 sides firm. 2 sides tender.
Group C. 22 sides. Same as Group A. Hogs were allowed to run in a half-acre lot during whole of experiment. Lot furnished some grass until about the middle of August. Fed the same ration as Group A. See "Experiments with pure bred swine," Group C.	Wiltshires: 10 sides firm. 2 sides very slightly tender. Cumberlands: 2 sides firm. 8 sides tender to soft. Quality of Group C much superior to that of Grou A as regards firmness.

A careful analysis of the results brings out some rather interesting points, though care must be exercised in drawing conclusions at this early stage of the investigation.

In the first place it will be noticed that the condition of the first three groups was generally satisfactory. The hogs fed on rape and corn meal and on corn meal alone al produced firm bacon, while the only tenderness was developed in the group fed on peas, barley, and shorts. It is scarcely probable that this tenderness was due to the food, since only one hog was tender while the other three were remarkably firm. It must not be assumed that corn will not produce soft bacon, for it must be borne in mind that the hogs in these three groups were strong, fleshy hogs before the corn-feeding commenced, and that they had had an abundance of exercise up to the commencement of the experiment. It is fairly safe to assume, however, that neither corn nor rape will injure hogs that have been reared in this manner, but the influence of corn on very young animals is not shown in this experiment. Investigations in this latter connection are in progress

Passing on to Groups IV., V., and VI., which all received the same treatment previous to the commencement of the experiment, we find that tenderness is evinced in only one group, namely Group IV., which received peas, barley and shorts with rape. A logical conclusion would be to attribute the tenderness to the rape, but an objection to this conclusion is encountered when we refer back to Group I., where rape produced no injurious effect. Possibly the hogs in these groups, having had no exercise like those in the first three groups, were more susceptible to injury from rape feeding. Be that as it may, the point must be left for further investigation. In these groups, also, six weeks of corn feeding produced no bad results.

But the most striking comparisons are yet to be made. A glance at the condition of Group A shows it to be very bad indeed, while that of Group B may be called very satisfactory. The only difference in the treatment of these two groups consisted in feeding whey to Group B along with the meal, and giving Group A only water and meal. The difference in firmness is so striking that we are forced to the conclusion that whey tends to produce firm bacon.

Again, Group C, though it can hardly be called satisfactory, is decidedly superior to Group A in point of firmness. Both groups received the same ration, but Group C had the run of a half acre lot, while Group A had only the small yards outside of the pens. The outdoor feeding, therefore, proved more satisfactory than the inside feeding when the ration was the same. In spite of lack of exercise, however, the whey group was the best of the lot.

One more comparison remains. Until September 12th, Groups IV., V. and VI. were fed practically the same meal ration as Group A. They were also confined in pens, with even less liberty than Group A. From September 12th until the close of the experiment, Group VI. received exactly the same ration as Group A, but in Groups IV. and V. the rations were different after September 12th. It is therefore of interest to compare the condition of Groups IV., V., and VI. as a whole, with that of Group A. It will be seen that the firmness of these three groups is very much superior to that of Group A, a condition of affairs which is difficult to account for on any other basis than that the superior firmness of Groups IV., V. and VI. is due to the skim milk fed with the meal ration previous to September 12th.

A peculiar feature of the experiment is the much greater development of softness among the Cumberlands, or light, lean sides, as compared with the Wiltshires. From this it would appear that softness is more likely to result from under-feeding and from marketing hogs too light and thin, than from marketing more matured and heavier hogs, even though they may be too fat. Thus, if the comparison of Groups A and C is made on the basis of the Wiltshire sides, there is a marked difference in favor of Group C; while in Cumberlands, Group A has the advantage. In justice to Group C, it must be borne in mind that the most unthrifty hogs among the pure breeds were purposely put into this group, because Group C was not used in comparing the gains of the different breeds, and at the time of marketing there were at least four hogs in this group which were decidedly too thin for slaughtering. For this reason it would be fairer to base the comparison of Groups A and C on the condition of the Wiltshire sides.

The principal points brought out in these experiments, may be summarized as follows:

1. Corn apparently produces no evil effects upon the firmness of bacon when used for finishing hogs that have plenty of exercise until they reach about 100 pounds live weight

2 Neither does corn appear to have any bad effects when used for finishing hogs that have had no exercise, but have been fed skim milk with a mixed grain ration until they reach 100 pounds live weight.

3 What has been said of corn may also apply to rape, when fed with a two-thirds meal ration, though the evidence is somewhat conflicting on this point.

4. Hogs confined in pens and fed on wheat middlings during the early stages of growth, and on peas, barley, and shorts during the finishing period, have a marked tendency to softness.

5. Hogs given plenty of exercise, and fed as just described, produce firmer bacon than those confined in pens.

6. The evil effects arising from lack of exercise can be overcome by the judicious use of skim milk and whey. The amount of whey recommended, is from two to two and one-half pounds of whey to a pound of meal.

7. Whey and skim milk appear to have a greater influence than exercise in producing firm bacon.

8. Unthrifty hogs are more likely to produce soft bacon than growthy, well-fed hogs.

The points mentioned above are not offered as definite conclusions, for the investigation is only well begun. On the whole, however, there seems to be nothing in the results which might not reasonably be expected—a fact which adds to their value in no slight degree.

Acknowledgment. In concluding my report, I wish to acknowledge the assistance and co-operation of other departments, notably the Farm, Dairy, and Experimental departments.

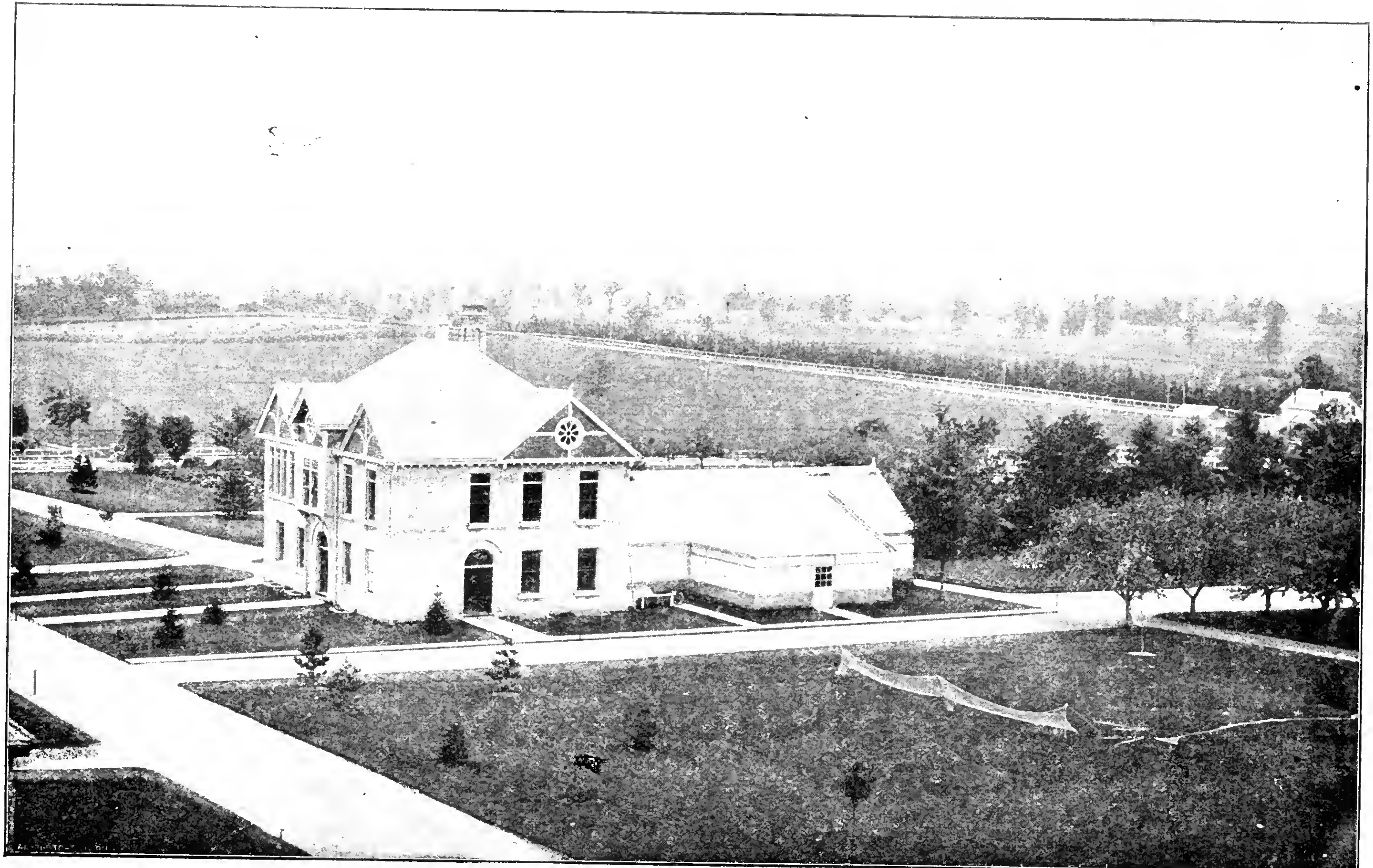
I have the honor to be,

Your obedient servant,

G. E. DAY,

Agriculturist.

GUELPH, Dec. 31st, 1898.



Botanical Laboratory and Greenhouse, O.A.C., Guelph.

PART VIII.

REPORT OF THE HORTICULTURIST.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of presenting herewith my sixth annual report of the work of the Horticultural Department. In doing so I take pleasure in noting the progress that has been made in this department during the past five years. Horticulture, from being an almost unknown subject in the College curriculum, covered by a few lectures and a single examination, has been developed into one of the most important departments of the College work, involving an extensive course of lectures, with laboratory and practical work, to students of the first, second and third years; a course in which graduating students now specialize for their University degree, and have to pass a number of examinations set by the College and University examiners in five branches of the subject.

Apart from the work of the class-room, the outside work of the department has been organized, systematized, and advanced in all its branches, and we are now getting into a position not only to be able to teach students more satisfactorily by practical illustrations, but to carry on experiments, the results of which must be of value to farmers, fruit-growers, gardeners, and florists throughout the Province.

The instruction to students has been given in lectures and in laboratory and practical work in the varied branches of the department. This part of the work has been increasing year by year, and during the past year the time taken with classes has been nearly seven times what it was when my duties began here five years ago.

LECTURES. To the students of both A and B divisions of the first year lectures were given during the winter term, on the first principles in connection with the growth of trees and plants. Second year students received a full course of lectures, as outlined in the College circular, on Fruit-growing, Vegetable-gardening, Forestry, Landscape-gardening, and Floriculture. A more extended course in the same subjects was given throughout the year to those students of the third year who were specializing in Horticulture for their University degree.

Owing to the illness and death of our esteemed friend and fellow-worker, Prof. Panton, it fell to my lot to carry on, for the year, his work of teaching Entomology to the students of the second and third years. These courses were made as practical as possible, particular attention being given to those insects with which the farmer and fruitgrower have to deal. A short course of lectures was also given to the students of the Winter Dairy School, touching upon Fruit-growing, Floriculture and Entomology in connection with Dairying.

PRACTICAL INSTRUCTION. The studies taken up in lectures have been supplemented as far as possible by demonstration and practical work, during the afternoons, in the orchard, vineyard, small-fruit plantation, garden, greenhouses, and laboratory. This has been found to be the most satisfactory way of impressing lessons taught in the class and it enables students to acquire some degree of skill in the various operations, in addition to the theories upon which the operations are based.

Outside Work. The regular work of this department, apart from that of teaching, is of a varied character, and includes the care and management of: 1, Orchards; 2, Vineyard; 3, Small-fruit plantation; 4, Vegetable garden; 5, Lawn and grounds; 6, Forestry plantations; 7, Conservatories and greenhouses. The work undertaken in each of these branches during the past year will be briefly noted in the order mentioned.

1. The Orchards.

In the young orchard set out a year ago, made up of apples, pears, plums, and cherries, the trees of most varieties have made an excellent growth during the past season. The pear, plum and cherry trees were given a slight winter protection by wrapping them in straw. This was thought to be advisable in this latitude for the first winter, but now that the trees seem to have become established, no further protection of the kind will be given. So far all varieties have come through the winter uninjured.

The cultivation of the orchard began as early as possible in the spring, which stimulated a vigorous early growth, and although the land was cropped with oats, a strip three feet wide on each side of the trees was kept thoroughly cultivated throughout the season until about the middle of August, when cultivation was stopped to allow the trees to mature their wood.

All vacancies caused by the failure of trees to grow were filled early in the spring The following additional planting was done with a view to finding out what can be accomplished in this section with some of the more tender fruits.

Quinces—20 trees, of 3 varieties: Orange, Champion, and Meech's Prolific.

Dwarf pears—20 trees, of five varieties: Beurre d'Anjou, Bartlett, Clapp's Favorite, Duchesse d'Angouleme, Flemish Beauty.

Peaches—20 trees, 10 varieties: Alexander, Barnard's Early, Crane's Early, Fitzgerald, Golden Drop, Hill's Chili, Ingold's Mammoth, Longhurst, New Prolific, Tyrhurst.

Upon our bearing apple trees there was an excellent crop of apples this year. Many visitors remarked that we had the best crop of clean apples they had seen anywhere, the whole secret of which was that the trees were regularly and thoroughly sprayed. Seven applications were made of the combined Bordeaux and Paris green mixtures, and as a result there was comparatively little scab and very few wormy apples.

2. The Vineyard.

This is not, and probably never will be, a good section for growing grapes, as the vines generally require winter protection, and as a rule only the earliest varieties get a chance to mature their fruit before the frost destroys the foliage.

Yet it is desirable that we should have vineyard enough to give our students practice in pruning, training, and caring for the vines, and to give information to the public as to what varieties can be most successfully grown in a section like this.

Our present vineyard consists of about 120 vines, which is altogether too few for our purpose, and it contains a number of varieties which are too late to come to maturity in this section. Already it has been found that varieties ripening with, or later than the Concord, do not mature a crop in more than one season out of four or five.

A new vineyard, which it is hoped will more nearly meet our requirements, was set out last spring. It is made up of 680 vines, and contains the following 18 varieties, all of which should ripen earlier than Concord:

Brighton	Early Ohio	Moore's Early
Brilliant	Green Mountain	Moore's Diamond
Campbell's Early	Hartford Prolific	Massasoit
Champion	Jessica	Moyer
Delaware	Lindley	Worden
Early Victor	Lady	Wyoming Red

3. Small-fruit Plantation.

In the small-fruit plantation set out in the spring of 1896, there were quite a number of failures, owing to the extremely dry weather after the time of planting. The following spring all vacancies were filled with plants of our own raising, and during the past season the plants have made an excellent growth. All pruning was done early in the spring. Cultivation was begun as soon as the ground was fit to work, and was repeated after every heavy shower till the fruiting season.

On most varieties there was an excellent crop, considering the age of the bushes. In the following tabular statements, full particulars are given regarding their fruiting this year, and column two shows their rank for total yield in 1897. Six good representative bushes of each variety were selected, and the crop carefully picked and weighed, the yields given below being the average per bush.

A large number of new varieties of raspberries, blackberries, currants and gooseberries have been obtained during the past two years. We are now propagating plants of these, and all others in our collection, with a view to setting a new plantation where plants of all varieties will be of the same age and growing under the same conditions.

Variety Test of Red Raspberries.

Rank in 1898.	Rank in 1897	Varieties.	First picking.	Last picking.	*Color.	Firmness.	Size.	Yield per bush. (ounces)
1....	6....	Turner	July 7	Aug. 6......	like C	S..	small......	32.08
2....	1....	Shaffer	" 16	" 10 ..	very dark ...	S.	large......	30.50
3....	2. ..	Loudon	" 13......	" 8 .	like C	V.F	large......	29.37
4....	4.. .	Marlboro'	" 7.....	" 3.....	like C	F .	large......	29.12
5....	. . ..	Columbian	" 20	" 10	very dark ...	S .	medium ..	23.71
6....	5....	Royal Church	" 16 . ..	" 10	dark	S .	large......	23.54
7....	10....	Clarke	" 18	" 6	like C	F .	large......	23.12
8....	7....	Highland Hardy..	" 7	" 1......	like C	S..	small......	22.96
9....	3....	Cuthbert	" 16.. ...	" 10	light red	F .	large......	20.17
10....	8....	Reliance	" 16	" 8......	like C	F .	medium ..	17.75
11....	11....	Brandywine	" 18......	" 8	like C	F .	large......	16.46
12....	9....	Rancocas	" 7......	July 27......	like C	S..	small......	15.58
13....	...	Golden Queen	" 18.....	Aug. 6......	yellow	S..	large......	14 87
14....	12....	Hansell	" 7......	" 3....	like C	S..	medium ..	9.46
15....	13....	Thompson's Early.	" 7......	" 1......	like C	F .	medium ..	6 29

*Abbreviations used: like C.=like Cuthbert; S.=soft; F.=firm; V.F.=very firm.

Variety Test of Black Raspberries.

Rank in 1898.	Rank in 1897.	Varieties.	First picking.	Last picking.	Size of fruit.	Yield per bush. (ounces).
1....	7....	Mammoth Cluster	July 7........	July 29.......	small...... ..	23.54
2....	3....	Older	" 9	" 25	very large	18.92
3....	11....	Gregg	" 16........	" 29.......	large	18.54
4....	2....	Souhegan	" 7........	" 25.......	small..........	17.21
5....	9....	Conrath	" 11........	" 25... ...	large	17 08
6....	......	Lucas	" 9........	" 22	medium	15.87
7....	10....	Hilborn	" 9........	" 25.......	medium	15.67
8....	5....	Ohio	" 16	" 29.......	small..........	15 17
9. ..	1....	Palmer	" 7	" 25	large	14.00
10....	......	Gault	" 11........	" 25	large	11.62
11....	6....	Eureka	" 9........	" 25.......	large	9.96
12....	4....	Carpenter's Early	" 7	" 23	small..........	8.17
13....	......	Cromwell	" 9........	" 16.........	medium	7 00
14....	.....	Hopkins	" 9.........	" 22	medium	6 31
15....	12....	Johnson's Sweet	" 7.... ...	" 18..	very small .. .	1.75

Variety Test of Blackberries.

Rank.	Varieties.	First picking.	Last picking.	*Firmness.	*Size of fruit.	Resistance to drouth (scale 1-10).	Yield per bush (ounces).
1..	Kittatinny	July 27	Aug. 27	M	V.L	10	41.12
2..	Stone' Early	" 27	" 27	V.F	S	9	36.87
3..	Taylor	" 27	" 22	F	M	8	34.21
4..	Western Triumph	" 27	" 22	F	S	9	31.66
5..	Agawam	" 27	" 22	V.F	M	5	26.50
6..	Gainor	" 27	" 25	M	L	9	21.66
7..	Snyder	" 27	" 25	M	L	9	17.29
8..	Ancient Briton	" 27	" 22	F	M	7	14.62
9..	Lovett	" 27	" 22	F	M	4	10.44

*Abbreviations used: Firmness—M.=medium; F.=firm; V.F.=very firm. Size of fruit—S.=small M.=medium; L.=large; V.L.=very large.

Variety Test of Currants.

Rank in 1898.	Rank in 1897.	Varieties.	Color.	Size of berry.	Yield per bush. (ounces).
1....	3....	Lee's Prolific	black	large	16.12
2....	2....	Champion	"	"	15.46
3....	1....	Naples	"	"	11.04
1....	2....	North Star	red	small	36.33
2....	4....	La Versailles	"	medium	35.66
3....	1....	Raby Castle	"	"	35.50
4....	8...	Cherry	"	large	26.00
5....	5....	Fay's Prolific	"	"	22.50
6....	6....	Prince Albert	"	medium	22.33
7....	3....	Victoria	"	"	20.66
8....	7....	Belle de St. Giles	"	large	19.83
1....	1....	White Grape	white	large	42.00
2....	2....	White Imperial	"	"	24.00

Variety Test of Gooseberries.

Rank in 1898.	Rank in 1897.	Varieties.	Color.	Weight of 50 berries (oz.)	Mildew.	Yield per bush. (ounces).
1....	1....	Pearl	light green	6.25	none	66.66
2....	5....	Red Jacket	red	9.75	"	55.00
3....	3....	Downing	light green	6.00	"	53.00
4....	2....	Houghton	red	4.75	"	43.62
5....	4....	Champion	greenish white	4.25	"	22.66
6....	9....	Autocrat	green	10.25	"	16.62
7....	6....	Crown Bob	greenish red	8.50	slight	11.29
8....	8....	Smith's Improved	greenish yellow	7.00	none	10.00
9....	7....	Keepsake	red	16.75	slight	7.08
10....	11....	Industry	red	5.50	badly	4.75
11....	10....	Whitesmith	greenish white	12.25	"	1.92
12*...	......	Dominion	green	10.50	slight	.29
13....	12....	Triumph	greenish yellow	10.00	"	.25

*One year old bushes.

Test of Varieties of Strawberries.

For the past three years we have been carrying on an extensive variety test of strawberries. In 1896, 121 varieties were fruited and reported upon. In last year's report, the results are given of a trial of 150 varieties. This year we have 219 varieties to report upon. The results of three years' trials have shown many of these varieties to be of little or no use, and twenty of the poorest were this year placed on our discarded list. On the other hand, the excellent yields maintained by some of our best varieties, enables us to recommend these with confidence to intending planters.

The treatment given in these experiments may be briefly outlined as follows: The ground on which the strawberries were planted was cropped the previous season with onions, beets, and carrots, during which time it was kept as free as possible from weeds. It was plowed in the fall after the removal of these crops, and top-dressed during the winter with short, barnyard manure As soon as the land was fit to work in the spring it was plowed again. and put in as fine condition as possible with the harrow and roller. The rows were then marked out four feet apart, and cross-marked with a fifteen-inch hand-marker. Twelve plants of each variety were planted, each variety thus being given fifteen feet of a row. A space of thirty inches was left between the different varieties in the same row, to avoid any mixing of runners.

Those of the plants that were of our own growing were taken from the plantation set out the year before, which had not yet borne fruit. Such plants are much more vigorous and thrifty than plants taken from an old plantation which has fruited for one or more seasons.

The planting was done by means of a spade, which was thrust deeply into the ground and then pressed backwards and forwards. Into the cleft thus made the roots were spread out fan-shaped by a quick slapping motion, and the soil packed firmly about them by the feet of the planters. As soon as possible after planting the surface soil was loosened with the horse cultivator and hand hoes, and thorough cultivation was given through the season.

All blossoms were picked off the first season, so that the plants were not allowed to exhaust themselves in the production of fruit. All runners were allowed to set forming wide-matted rows, but each variety was confined to its own fifteen feet of row.

After the ground had frozen hard in the fall, it was lightly covered with long strawy manure, which helped to hold the snow and protected the plants from injury early in the spring by preventing their alternate freezing and thawing. When growth had commenced in the spring, this covering was raked off the plants and left as a mulch between the rows. This not being heavy enough to keep down the weeds and properly conserve the soil moisture, an additional heavy mulch of coarse grass was put on before the fruit began to ripen. This kept the berries clean and retained the soil moisture while the crop was ripening.

In the following tabular statement the varieties under test are ranked in the order of their yield. In some cases all of the plants set did not live; where only one or two failed, this would not materially alter their yields, particularly in the case of the free running varieties, as their runners filled the fifteen feet of row alloted to them. The greatest number of failures were among the newly added varieties which came from a distance. Many of these will, no doubt, make a better record next year, when their yield will be from plants of our own growing. The number of plants which lived is mentioned for each variety, so that allowance may be made for some good varieties, which, on account of the failure of some of the plants, stand low on the list.

Test of varieties of Strawberries.

Rank in 1898.	Rank in 1897.	Rank in 1896	Variety.	Sex {B. Bisexual. P. Pistillate.	Number of plants lived.	Vigor of growth. Scale 1–10.	Freedom from rust. Scale 1–10.	Date of first bloom.	Date of first picking.	Date of last picking.	Yield.	Firmness.	Color.	Weight of 50 average berries.
								May.	June.		ozs			ozs.
1	2	13	Stone's Early	P	12	10	9	20	17	July 8	268.75	S	L S	6.75
2	...	....	Clyde	B	12	10	9	18	15	" 6	263 75	F	L S	13.25
3	42	3	Edgar Queen	P	12	10	8	23	19	" 11	258.00	S	L S	12 75
4	57	6	Standard	P	12	10	8	23	18	" 6	205.75		C	6.75
5	...	....	Glen Mary	P	12	10	9	21	17	" 8	204 75	M	C	14.50
6	....	....	Sadie	B	12	10	6	16	13	" 6	198.00	F	C	4 00
7	....	....	Buster	P	11	10	9	23	18	" 8	197.00	S	B S	10.00
8	16	1	Warfield	P	12	10	7	17	15	" 6	195.50	F	D C	7.25
9	46	31	Williams	B	12	10	6	24	16	" 6	191.50	F	C	13.25
10	....	....	Mammoth	P	12	10	9	23	17	" 4	190.00	S	L S	18.50
11	...	... .	Anery's Seedling	P	10	10	10	14	13	" 6	184.25	S	L S	10 25
12	3	8	Saunders	B	9	10	7	31	18	" 6	181.50	F	C	12.75
13	50	14	Boynton	P	12	10	9	16	13	" 6	179.00	M	C	8.00
14	9	....	Ruby	B	11	10	8	16	18	" 4	178 25	F	D C	11.00
15	72	67	Marshall	B	11	9	7	20	15	" 8	177.75	F	D C	19.25
16	49	44	Charlie	P	12	10	7	17	15	" 6	177.75	M	C	6.00
17	....	....	Lincoln	P	7	10	8	21	15	" 8	176.00	M	L S	6.75
18	....	....	Irene	P	10	9	10	21	17	" 6	175.00	V F	D C	8.25
19	19	35	Prince of Berries	B	12	9	5	19	18	" 8	170 25	S	R	8.00
20	44	34	Splendid	B	12	10	6	16	13	" 8	169.75	F	D C	6.75
21	....	...	Ridgeway	B	9	10	8	24	18	" 8	166.00	S	C	12.00
22	....	....	Wesley	P	12	10	7	16	15	" 4	164 00	F	L R	6.00
23	11	....	Dominion	B	12	10	6	20	18	" 11	162.50	S	L S	11.75
24	80	63	Beverley	B	12	10	8	19	17	" 6	162.00	S	D C	7.00
25	1	33	Tennessee Prolific	B	12	10	10	6	13	" 8	161.25	M	S	7.50
26	....	....	Giant	B	12	10	8	24	22	" 6	161.00	F	L R	11.25
27	....	....	Burt	B	11	10	6	20	17	" 8	159.75	F	B C	7.25
28	...	....	Manchester	P	12	10	8	20	13	" 4	158.75	F	C	7.25
29	35	54	Ohio Centennial	B	12	8	8	20	18	" 6	158.50	F	D R	10.25
30	....	....	Naomi	P	12	5	7	20	17	" 6	156.25	M	C	8.50
31	....	....	Satisfaction	B	12	10	6	19	17	" 6	154.00	F	B C	8.75
32	....	....	Holland	P	12	10	8	21	22	" 8	153 50	F	L R	5.50
33	....	....	Little's No. 39	P	12	9	8	20	22	" 8	144.25	M	R	11.00
34	36	22	Belle	B	12	10	8	21	22	" 8	142.75	F	S	8.75
35	66	70	Nehring's Gem	P	12	10	9	23	17	" 6	141.75	M	C	9.50
36	29	16	Lovett	B	12	10	8	20	15	" 6	140 50	F	C	11.00
37	83	2	Afton	P	11	10	7	19	13	" 4	139.75	F	D C	7.00
38	14	....	Liddle	B	12	10	8	20	18	" 6	138.00	F	C	5 00
39	95	88	Watson	P	12	8	4	19	15	" 6	138.00	F	C	7 75
40	26	15	Seedling A	P	12	9	6	17	15	" 6	136 25	S	C	6 25
41	5	52	Woolverton	P	10	9	8	20	17	" 6	136 00	F	L R	13 00
42	....	....	Sunrise	P	10	9	8	21	13	" 4	135.75	S	L S	9 75
43	8	9	Haverland	B	11	10	10	9	13	" 6	135.25	M	L S	9 00
44	15	26	Jocunda Improved	B	12	9	8	24	17	" 8	134.75	V F	D C	9.50
45	119	29	Martha	P	12	10	8	23	18	" 6	134 75	F	D C	11.25
46	21	37	Northern	B	12	10	7	21	15	" 6	133.25	F	C	10 50
47	39	....	Thompson's No. 40	P	11	10	9	23	18	" 6	126.25	M	L S	8.25
48	78	60	Sunnyside	P	11	10	6	21	18	" 4	124 25	S	L S	7 50
49	85	61	Timbrell	P	11	9	8	21	20	" 11	124.00	S	G R	7.75
50	74	50	Equinox	B	11	10	6	23	20	" 11	123.50	S	D R	6.75
51	....	....	J. C. Hale	B	12	10	8	20	17	" 4	123 25	F	D C	11 50
52	25	58	Princeton Chief	P	12	9	8	17	18	" 8	122.5	F	D C	6.00
53	105	11	Greenville	P	12	10	9	20	15	" 6	122.25	F	C	9.75
54	...	....	Early Idaho	B	12	10	7	20	15	" 6	121.25	F	D C	10.75
55	92	90	Jersey Queen	P	11	6	7	24	19	" 8	120.25	M	C	10.75
56	....	....	Sawlog	P	7	9	7	23	15	" 6	119 25	F	D C	9.25
57	62	86	Beder Wood	B	12	10	5	7	13	" 6	119 25	F	D R	4.75
58	91	73	Gov. Hoard	B	12	10	7	2[illegible]	15	" 4	118.25	S	C	10.25
59	45	72	Hatch Expt. Station 24	B	12	10	7	23	20	" 8	118.25	F	C	9.00
60	.	....	Brandywine	B	12	10	6	21	17	" 8	118.00	F	D R	5.50
	....	....	James Vick	B	12	9	8	23	18	" 8	118.00	F	C	6 00

Test of varieties of Strawberries.—*Continued.*

Rank in 1898.	Rank in 1897.	Rank in 1896.	Variety.	Sex {B. Bisexual. {P. Pistellate	Number of plants lived.	Vigor of growth. Scale 1—10.	Freedom from rust. Scale 1—10.	Date of first bloom.	Date of first picking.	Date of last picking.	Yield.	Firmness.	Color.	Weight of 50 average berries.
								May.	June		ozs.			ozs.
62	...	...	Kentucky	P	12	10	8	23	20	July 6	117.00	M	L S	6.50
63	....	....	Fountain	B	12	9	8	24	15	" 6	116.00	F	D C	10.50
64	....	...	Ostego	P	11	10	9	21	18	" 6	115.50	M	L S	8 25
65	....	....	Hayden	B	9	8	8	17	15	" 6	115.00	S	S	9 25
66	....	.. .	Great Pacific	P	12	10	10	20	13	" 4	114 50	M	C	10.50
67	....	....	Paris King	B	11	9	8	17	13	" 4	114.25	S	L S	8.75
68	104	56	Lady Rusk	P	12	10	8	21	17	" 4	114 25	M	C	7.25
69	64	21	Eureka	P	11	8	7	21	17	" 8	114.00	S	L S	9.75
70	7	.. .	Wm. Belt	B	12	10	6	20	15	" 6	113.75	M	C	11 25
71	....	....	Louis	B	11	9	7	23	18	" 6	113 00	F	B S	9.00
72	67	....	Kansas Prolific	B	11	10	7	20	15	" 4	111.75	M	C	5.00
73	...	....	Orange County	P	11	9	9	20	15	" 4	111.50	F	C	13.00
74	....	....	Edith	P	12	8	7	24	18	" 8	110.75	S	C	10 00
75	53	4	Bisel	P	12	9	7	20	17	" 6	110.25	F	D C	8 25
76	114	57	Mary	P	12	10	6	21	20	" 8	109 75	V F	L R	8.75
77	....	.. .	Parry	B	12	10	7	20	17	" 6	109 00	S	L S	8.25
78	58	68	Caughell's No. 2	B	12	10	5	20	15	" 6	109.00	S	D C	8.50
79	....	....	Carrie	P	12	8	9	17	17	" 6	108.75	M	L S	11.75
80	17	62	Aroma	B	12	8	10	25	18	" 4	108.50	F	L S	11.50
81	112	85	Alpha	P	12	8	10	16	13	" 4	108.25	S	L R	10.25
82	....	....	Sparta	B	12	10	4	16	13	" 4	108.00	V F	D C	7.50
83	12	47	Van Deman	B	12	9	9	14	13	June 30	108 00	F	D C	6.25
84	40	....	Cruse's No. 9	B	12	7	9	17	13	July 4	107.50	M	C	11.75
85	....	....	Bouncer	B	12	9	7	20	17	" 6	107.25	F	D C	10.50
86	....	....	Leviathan	B	12	10	9	23	17	" 6	107.25	S	L R	12.75
87	69	19	Gandy	B	12	8	8	17	17	" 4	107 25	F	C	8.00
88	10	40	Isabella	B	12	8	9	20	15	" 4	107.00	F	C	10.25
89	....	....	Thompson's Late	P	8	10	9	21	18	" 6	105.75	M	D C	7.75
90	13	....	Tubbs	B	12	8	8	16	13	" 4	104.25	S	L R	9.75
91	33	5	Prize	P	12	8	7	16	13	" 4	103 50	F	D R	6.00
92	82	...	Westlawn	P	11	10	8	20	15	" 4	102.00	F	D R	8.50
93	31	42	Howard's No. 41	P	12	9	6	20	17	" 4	101.75	V F	D C	8.50
94	....	....	Phipen	B	12	10	9	23	17	" 6	101.50	F	C	6.00
95	94	91	Parker Earle	B	10	9	6	17	13	" 6	100.25	F	D C	9.25
96	70	30	Robinson	B	12	10	7	20	18	" 6	99 00	S	D R	8.75
97	..	....	Princess	P	12	7	8	23	17	" 6	99 00	M	D C	10.25
98	76	9	Mrs Cleveland	P	12	10	8	17	13	" 6	98.75	F	C	5.50
99	84	77	Fremont	B	12	9	8	20	15	" 4	97 50	F	C	7.50
100	48	55	Dayton	P	11	10	9	20	13	" 4	96.50	S	L S	9.75
101	18	7	Barton's Eclipse	P	10	10	8	17	17	" 4	95 75	F	B C	10.00
102	102	89	Oberholtzer No. 2	P	12	10	6	24	20	" 6	95.50	F	D R	9.75
103	27	38	Enhance	B	11	10	9	20	17	" 4	95.25	V F	D R	9.75
104	....	....	Beede's No. 1	B	12	10	9	20	17	" 4	93.75	F	C	8.50
105	....	....	Champion of England	B	12	10	10	23	18	" 6	93.50	S	C	11 00
106	....	....	Longfield	P	10	8	8	16	13	" 4	93 25	F	D C	5 25
107	.. .	....	Michigan	B	12	8	6	23	20	" 8	93 00	F	D C	12.75
108	81	80	Scarlet Ball	P	12	7	9	25	24	" 8	92.75	F	L R	8.25
109	....	....	Maplebank	P	12	8	6	25	18	" 6	92.75	F	D C	8 75
110	...	....	Victor Hugo	B	10	8	6	19	13	" 6	91.75	S	D C	8.75
111	....	...	Annie Laurie	B	12	10	9	25	17	" 6	90 75	F	D C	11.50
112	20		Enormous	P	9	9	8	24	17	" 4	90.25	M	B C	11 25
113	86	106	Anna Forest	B	12	8	7	20	15	" 2	89.00	F	L S	11 25
114	37	...	Gandy Belle	B	10	7	5	21	13	" 6	87.25	F	D C	9 00
115	47	53	Snowball	B	12	10	6	19	15	" 6	86.50	F	C	6 50
116	...	....	World's Champion	B	8	8	9	25	17	" 6	86.50	S	D C	11.25
117	75	23	Gertrude	B	12	10	9	14	13	" 4	86 00	F	C	9 50
118	56	32	Dr. Arp	P	12	8	7	23	20	" 6	85.50	F	C	5.25
119	....	....	Sharpless	B	9	8	9	21	18	" 6	85.25	M	L S	9.50
120	89	71	Beauty	B	12	10	10	16	13	" 4	84.25	F	C	8 75
121	90	28	Crescent	P	12	9	9	14	13	July 4	84.25	F	C	5.50
122	23	....	Beebe	B	12	8	9	20	15	" 6	84.00	S	L C	17.50
123	101	41	Smith's Seedling	B	12	10	7	14	13	June 30	83.50	S	L R	3.75

Test of varieties of Strawberries.—*Continued.*

Rank in 1898.	Rank in 1897.	Rank in 1896.	Variety.	Sex {P. Pistillate. B. Bisexual.	Number of plants lived.	Vigor of growth. Scale 1—10.	Freedom from rust. Scale 1—10.	Date of first bloom.	Date of first picking.	Date of last picking.	Yield.	Firmness.	Color.	Weight of 50 average berries.
								May.	June.		ozs.			ozs.
124	59	43	Rio	B	12	10	7	16	13	July 4	83.50	F	C	9.00
125	51	20	Oberholtzer No. 1	B	12	7	9	9	13	" 4	83.50	S	C	9 25
126	....	....	Jay Gould	P	11	10	8	23	17	" 2	81.00	F	C	6.25
127	6	45	Shuster's Gem	P	12	8	8	11	13	" 6	81.00	F	S	6.75
128	30	....	Arrow	P	12	10	9	16	15	" 4	80.75	F	D C	5.25
129	68	69	Alabama	P	12	8	6	23	15	" 6	80.75	F	D C	8.00
130	100	24	Swindle	P	11	8	4	20	17	" 6	80.00	F	D R	10.25
131	41	51	Bessie	B	8	9	7	19	13	" 4	79.50	F	L S	8.00
132	4	17	No name	B	12	9	8	23	15	" 4	79.25	F	D C	8.75
133		....	Hiawatha	B	11	9	10	21	17	" 6	78.75	M	S	9.50
134	71	....	Epping	P	10	8	8	21	15	" 4	78.50	F	L R	8 00
135	....	....	Margaret	B	10	6	8	20	15	" 4	78 50	F	C	10.75
136	....	....	Gov Fifer	B	12	10	9	19	18	" 6	77.50	S	L S	6.00
137	22	79	Judsonia	B	11	5	8	20	15	" 4	77.25	M	S	6.50
138	72	78	Ivanhoe	B	12	8	9	16	15	" 4	77.00	F	C	6.00
139	43	36	Southard	B	10	8	9	16	13	" 4	76.50	S	D C	9 50
140	54	27	Phillips	B	12	10	7	21	17	" 4	75 25	F	C	7 25
141	....	....	Plow City	P	12	5	9	16	15	" 6	75 50	F	C	8.50
142	....	...	Australian Everbearing	B	9	9	8	20	15	" 4	75.25	F	L S	11.50
143	....	..	Eleanor	B	12	10	9	19	13	" 4	74.75	M	C	7.50
144	.	....	Zulu	B	9	8	9	16	13	" 4	72.75	F	C	6.50
145	108	....	Kossuth	B	12	9	6	9	13	June 30	72 25	F	D R	3.25
146	96	....	Crimson Cluster	P	11	5	6	20	13	July 4	72.50	F	C	10.00
147	110	82	Glenfield	B	12	10	7	11	13	June 30	71.50	S	D C	5.50
148	124	99	General Putnam	P	11	7	8	9	13	July 2	70 25	S	L R	8.75
149	88	....	Jessie	B	11	8	9	14	15	" 4	68.75	F	C	9 75
150	....	....	Berlin	P	7	9	9	19	15	" 2	68.00	F	D C	7.50
151	93	....	Hersey	B	12	10	6	20	15	" 6	67.50	F	D S	4.75
152	24	87	Ona	P	11	9	8	11	13	" 4	67.00	F	C	7.00
153	....	18	Bubach	P	12	8	9	24	15	" 4	66.75	F	C	12 00
154	....	....	No. 1,000	P	8	6	6	23	18	" 4	66.50	F	D C	9 75
155	...	....	Hope	B	12	9	4	19	15	" 4	66 25	S	C	9 50
156	....	....	Anna Kennedy	P	12	10	7	21	13	" 4	65.50	F	B S	6.50
157	....	....	Lady Franklin	B	12	10	9	21	15	" 3	65 25	F	D C	9.00
158	...	....	Mytrotts	B	4	6	8	20	17	" 4	65.00	F	D C	6.75
159	125	83	Oberholtzer No. 4	P	12	10	8	21	22	" 6	64.25	V F	L S	7 75
160	32	39	Leader	B	12	7	8	19	15	" 6	64.00	M	D C	6.50
161	79	74	Klickita	P	13	9	5	20	17	" 6	64.00	S	L S	7.25
162	....	....	Cumberland	B	12	7	8	17	15	" 4	62.50	S	L S	10.75
163	61	46	Effie May	B	11	8	8	9	13	" 4	62.00	S	D R	6.75
164	63	48	Michel's Early	B	12	10	9	9	13	June 30	63.00	M	L R	3.50
165	...	....	Smeltzer	B	11	10	5	16	13	July 2	61.50	F	R	3 75
166	109	84	Stone's No. 7	B	12	10	4	19	17	" 4	58.50	S	C	9.50
167	....	....	Little's No. 7	P	12	4	6	20	15	" 4	58.25	M	D C	7.25
168	123	....	Howard's No. 25	B	11	9	7	17	15	" 4	58 00	M	C	6.50
169	28	65	Muskingum	B	11	6	8	20	17	" 6	58 00	S	D C	9.50
170	106	75	Farnsworth	B	11	8	7	16	13	" 4	56.50	M	L R	4 25
171	65	49	Cyclone	B	12	10	10	16	13	" 4	55.75	S	C	5.75
172	....	....	Child's 1st Season	P	11	7	8	25	20	" 6	55.50	V F	S	7.00
173	....	....	Royal City	B	12	7	8	20	19	" 6	54.00	F	D C	5.00
174	....	...	Della K.	B	9	8	7	21	20	" 6	52.75	V F	D S	7.75
175	98	93	Wicomico	P	12	8	8	20	17	" 2	52.00	F	C	6.25
176	...	...	Erie	B	9	10	7	16	13	" 4	52.00	S	L R	4 00
177	116	117	Clark's Early	B	12	7	9	19	13	" 4	51.50	F	D C	5.50
178	...	....	No. 649	B	8	6	8	21	17	" 4	51.25	M	L S	8.50
179	....	....	Noble	B	9	7	5	19	15	" 4	51.00	F	D C	10.50
180	....	....	Lady Thompson	B	12	6	8	20	13	" 4	50.50	M	L R	6 50
181	120	....	Belle of Lacrosse	B	12	9	6	20	17	" 6	50.00	F	D R	5.50
182	....	....	Albert	B	10	6	5	25	22	" 6	49.50	M	L R	7.25
183	....	....	Sandoval	B	8	6	8	20	17	" 6	48.75	F	D C	7.75
184	....	....	Sensation	B	11	5	5	20	17	" 4	47.75	S	D C	19.00

Tests of varieties of Strawberries.—*Concluded.*

Rank in 1898.	Rank in 1897.	Rank in 1896.	Variety.	Sex { P. Pistillate. B. Bisexual.	Number of plants lived.	Vigor of growth. Scale 1–10.	Freedom from rust. Scale 1–10.	Date of first bloom.	Date of first picking.	Date of last picking.	Yield.	Firmness.	Color.	Weight of 50 average berries.
								May.	June.		ozs.			ozs.
185	77	12	Chairs	P	10	8	8	20	15	" 4	47.50	M	D R	6.25
186	87	....	Gillespie	B	10	5	7	20	15	" 4	44.50	M	C	4 25
187	....	..	Mineola	B	10	5	7	23	15	" 2	43.00	F	D C	10.00
188	....	....	Bismark	B	9	6	9	23	15	" 4	41.50	F	L R	6.25
189	103	94	Auburn	P	12	8	9	21	15	" 4	41.50	F	D C	8.50
190	....	....	Leroy	P	6	10	10	23	20	" 6	40.50	S	D R	3.50
191	....	....	Evans	B	10	6	9	20	17	" 4	38.75	M	L S	9.25
192	....	....	Gros Lombard	B	11	3	9	17	17	" 6	38,75	F	C	7.25
193	....	....	Hunn	P	4	7	8	20	24	" 6	37 00	F	D C	13.50
194	....	....	Cameronian	B	11	6	8	20	15	" 4	35.50	M	C	10.50
195	....	....	Brunette	P	5	10	9	21	17	" 6	35.00	M	D C	6.00
196	....	....	Huntsman	B	11	8	7	23	17	" 4	31.25	F	C	5.75
197	38	....	Hunt's No. 3	B	12	4	8	20	17	" 2	28.50	F	D C	5.00
198	....	....	Meek's Early	B	12	8	8	16	13	June 30	27.25	F	D C	3.00
199	....	.. .	Scarlet Queen	B	11	8	4	19	15	July 6	27 00	F	C	7.00
200	....	....	Columbian	B	12	10	7	18	15	" 2	25 50	S	D R	4.50
201	113	....	Edward's Favorite	B	12	2	7	21	15	" 4	23 50	M	D C	7.00
202	130	....	Steven's Early	B	9	6	4	12	13	June 27	21.00	F	D C	1.75
203	....	....	Pres. Carnot	B	11	3	5	17	18	July 4	20.75	M	D C	6.00
204	....	....	Slaymaker	B	6	7	7	14	13	June 30	20.50	F	D C	7.00
205	....	.. .	Ocean City	B	7	2	9	23	18	" 30	20.50	S	L S	7.00
206	. ..	....	Oriole	P	7	4	8	20	15	July 4	19 00	F	D C	8 00
207	....	....	Quality	B	11	9	10	23	18	" 2	18.75	M	L S	6.25
208	131	....	E. P. Roe	B	6	3	8	21	19	" 4	16.75	M	L R	9.00
209	118	114	Wentzel	B	11	4	8	9	15	June 27	16 50	F	D R	3.50
210	....	....	White Novelty	B	10	10	5	19	22	July 6	16.50	F	W	1.75
211	133	109	Regina		11	6	7	25	22	" 4	13.25	F	D R	5.50
212	....	....	Laxton's No. 1	B	10	5	3	18	13	June 30	12 50	F	D C	4.00
213	...	....	Beecher	B	12	8	9	25	20	July 4	10.50	S	S	6.00
214	139	104	Price	B	5	3	6	16	13	June 27	8 25	F	L R	3 50
215	....	....	Wilson	B	3	4	8	21	17	" 27	6.75	F	D C	6.50
216	142	.. .	Westbrook	P	12	3	9	14	13	" 27	6.75	F	D R	3.00
217	141	103	Accomack	B	12	2	8	21	15	" 30	4 25	M	C	7.00
218	....	....	Allen	B	3	4	9	11	17	" 30	4 00	F	C	5.00
219	....	...	Gunton Park	B	12	4	4	9	13	" 22	3.25	F	D C	3 00

By the term "vigor of growth" is meant the ability of the plant to send out runners and make a full matted row. On ordinary soils the most vigorous varieties, graded ten, might well be planted two feet apart in the row and yet make a full matted row.

Strawberry rust (*Sphærella fragariæ*) may be prevented or held in check by spraying with the Bordeaux mixture; but in our experimental plots the plants were not treated, our purpose being to find out the susceptibility of the different varieties to the disease. By reference to column 6 it will be seen that many of the most productive varieties are the most susceptible to it,

The date of bloom, as noted in column 9 should be carefully noted by planters who wish to select bisexual varieties to fertilize the bloom of pistillates. The former should, if possible, be a little earlier than the latter, to insure the fertilization of all early blossoms.

The yields are recorded in ounces, this having been found to be the most accurate method of recording results. The yield in boxes may be approximately ascertained by reckoning sixteen ounces to a box.

The abbreviations under the heading "*Firmness*" are :—F., firm ; V. F., very firm ; M., medium ; S., soft ; V. S., very soft.

Those under the heading "*Color*" are :—R., red, S., scarlet, C., crimson, and the qualifying adjective, L., light, D., dark.

The comparative size of the berries of the different varieties can be most accurately recorded by giving the weight of fifty average-sized berries. To ascertain this point the weighing of each variety was made at its midseason for fruiting, that is at its fourth or fifth picking.

In colums 2 and 3 are given the relative positions of those varieties fruited in 1896 and 1897, which had a full or nearly full stand of plants. The great change in position of many of these shows very clearly how little importance should be attached to the results of but a single test. It is only by the average of a number of trials that we can arrive at a reliable estimate of the value of a variety.

Early Varieties. In the following table a list is given of the ten varieties which gave the largest yield for the first week ending June 20th :

Rank.	Early Varieties.	Sex : P.—Pistillatte. B.—Bisexual.	Date of first picking.	Yield before June 20th.	Total yield.	Rank for total yield.
				ounces.	ounces.	
1	Sadie	P	June 13	71.75	198.00	6
2	Van Deman	B	" 13	65.25	108 00	83
3	Paris King	B	" 13	57.25	114 00	67
4	Splendid	B	" 13	53.75	169.75	20
5	Sparta	B	" 13	52 00	108.00	82
6	Kossuth	B	" 13	48.75	72.25	145
7	Beder Wood	B	" 13	46.00	119 25	57
8	Smeltzer	B	" 13	46 00	61 50	165
9	Glenfield	B	" 13	44.50	71.50	147
10	Sunrise	P	" 13	43.75	135.75	42

Late Varieties. In the following table a list is given of the ten varieties which gave the largest yields after July 1st :

Rank.	Late Varieties.	Sex : P.—Pistillate. B.—Bisexual.	Date of last picking.	Yield after July 1st.	Total yield.	Rank for total yield.
				ounces.	ounces.	
1	Edgar Queen	P	July 11	71.00	258.00	3
2	Scarlet Ball	P	" 8	60.75	92 75	108
3	Holland	P	" 8	58.50	153 50	32
4	Little's No. 30	P	" 8	57 50	144 25	33
5	Ridgeway	B	" 8	55 75	166.00	21
6	Dominion	B	" 11	54 00	162 50	23
7	Equinox	B	" 11	52.50	123.50	50
8	Belle	B	" 8	52.50	142.75	34
9	Buster	P	" 8	47.00	197.00	7
10	Timbrell	P	" 11	46.75	124.00	49

5. Vegetable Garden.

The plot of ground known as the vegetable garden is five and three quarter acres in extent. Formerly nearly all of this was required to produce vegetables enough to supply the needs of the College. Since, however, the garden has been underdrained, subsoiled, and a system of close cropping and rotation of crops adopted, we have been able to devote four-sevenths of this area to our strawberry tests, and still grow enough on the remainder to supply an increased demand from the College.

In order to carry on systematically a rotation of crops, the garden has been divided into seven equal-sized plots. The crops grown on each plot is mentioned below, with a few particulars as to its condition.

Plot No. 1. *Early Potatoes and Sweet Corn.* These crops are gross feeders and readily make use of the decaying vegetable matter left in an old strawberry bed, which they follow every year.

Plot No. 2. *Strawberries kept for the second crop.* On the 10th of July, immediately after the last picking of berries, the old bed was turned under, the ground worked fine, and the following mixture of seeds sown for a leguminous catch crop: 1 bus. horse beans, 1½ bus. Prussian blue peas, and 8 lbs crimson clover per acre. Before these were turned under in the fall they had grown as follows: Crimson clover, 6 to 8 inches; horse beans, 2½ to 3 feet; peas, 4½ to 5½ feet. The horse beans stood erect and held up the pea vines until they were about 3 feet high, thus enabling the clover to get a good start.

A heavy crop of this kind, obtained without the loss of any regular crop, should be an economical method of adding fertility and friability to the soil.

Plot No. 3. *Strawberries bearing the first crop of fruit.* It is upon this crop that our record of yields is reported.

Plot No. 4. *Strawberries, new plantation containing 220 varieties.* These were planted this year on the 3rd of May. An extra good stand of plants has been obtained, which promises well for our variety test next year.

Plot No. 5. *Vegetable crops grown for their bulbs or roots, such as onions, beets, carrots, parsnips, and salsify.* Upon this plot all seeds were sown as soon as the ground could be worked in the spring. All of these crops were excellent, the root crops in particular being heavier than they have been for years past.

Plot No. 6. *Cabbage, cauliflower and celery.* The plants for these crops are first grown in seed beds or frames and are transplanted later in the season. These crops afford an excellent opportunity of easily cleaning the land for the crops of the preceding plot, which will be grown here next year. The celery and cauliflower were, without exception, the finest this year that we have ever grown.

Plot No. 7. *Upon this crop were grown all of the vine crops*, such as peas, beans, cucumbers, citrons, pumpkins, squashes, and tomatoes. All of these crops this year were above the average.

Test of Varieties of Tomatoes.

In view of the growing importance of the tomato crop, not only for home use but for canning and export, we conducted this year a small variety test with tomatoes; and, although but eleven varieties were included in the test, yet these are among those most commonly grown.

The treatment given may be briefly outlined as follows: The seeds were sown in flats in the greenhouse about the 1st of April. When the seedlings were about two inches high they were transplanted into boxes 1 ft. x 2 ft. x 3 in. deep, twenty one plants being set into each box. Care was taken to give them plenty of light, moderate heat, and to avoid excessive watering. The plants were thus kept vigorous and healthy and were not spindly or sappy. Early in May the boxes were set out in cold frames, where the plants were gradually hardened off by exposure to outside conditions whenever the weather would permit of it. Thus hardened, they were ready for planting as soon as our cold climate would allow. Every week a sharp knife was used to cut the soil in the boxes into blocks, making each plant well rooted in its own block, so that very little earth fell away from the roots when the plants were set out.

Planting is not usually safe here before the first week in June, and even after that this year we had to lay the plants down and cover them with the boxes to protect them from frost. The plants were set five feet apart in rows six feet apart, and were cultivated frequently to stimulate a rapid growth. As soon as the branches were long enough they were spread out in every direction and pressed close to the ground, in order that they might obtain all the soil heat possible. This we consider an important factor in obtaining early ripening, as the soil is usually from ten to fifteen degrees warmer than the atmosphere.

Thirty-five plants were grown of each variety, seven of each being selected for the test. The yields recorded below are the average per bush from these seven plants.

Variety Test of Tomatoes.

Rank for yield.	Varieties of tomatoes.	Date of first picking.	Average yield per bush of ripe fruit.	Average yield per bush of green fruit.	Yield before Aug. 15.	Yield after Sept. 15.	Weight of 20 average sized tomatoes.	Color.	*Smoothness.	*Firmness.	Amount of rot. Scale, 1-10.
			oz.	oz.	oz.	oz.	oz.				
1	Paragon	Aug 20.	297.0	6 4	......	114.0	7.5	Red....	S .	M .	1
2	Atlantic Prize	July 29.	280.7	3.4	22.2	18.7	6.2	"	S ..	M .	2
3	Early Ruby	Aug. 1.	270.7	4.4	13.8	33.4	6.5	" ..	M .	M .	2
4	Golden Queen	" 22.	266.4	7.7	.....	103.1	8 0	Yellow.	M .	M .	2
5	Earliest of All	July 26.	241.4	5.2	24.7	13.2	5 2	Red....	R ..	S ..	4
6	Dwarf Champion	Aug. 10.	200 0	4.7	5.0	47.0	5.5	Pink ..	V.S	V.F	1
7	Aristocrat.	" 8.	172.2	4.5	3 8	46.0	5.2	Red....	V.S	V.F	1
8	Buckeye State	Sept 7.	149.1	7.1	.	75.2	7.5	Pink ..	S ..	F ..	2
9	Ignotum	Aug. 11.	124 8	4.2	1.2	40.5	6.7	Red....	S ..	M .	8
10	Livingstone's Beauty	" 25.	60 1	2.8	......	17 5	7.2	Pink ..	S ..	F ..	2
11	Honor Bright	" 22.	40.5	5.7	......	19.7	6 0	Red....	M .	S ..	10

*Abbreviations used:—R.—rough; S.—soft; M.—medium; S.—smooth; F.—firm; V. S.—very smooth, V. F.—very firm.

6. Lawn and Grounds.

Much has been accomplished during the past year in the way of permanent improvements on the lawn and grounds. A much-needed new drive has been made at the rear of the gymnasium; both sides of the long main drive on the east side of the grounds have been paved with cobble stones to prevent washing during heavy rains; screened gravel has been applied to main drives, to put them in good condition; a lot of levelling, grading, sodding, and seeding has been done about the new reservoir, at the back of the old greenhouses, over settled drains, and in a number of rough places on the grounds.

The concrete walk laid along the side of the front main drive has been a great convenience in getting from one building to another, particularly in wet weather; and it has been the means of materially improving the condition of the green sward surrounding the buildings by lessening the walking and wear upon it.

Some additional planting has been done in the shrubbery clumps; and a bed of roses was set out last spring, containing thirty of the leading varieties of the hardy hybrid perpetuals. This collection, it is hoped, will in time give students and visitors some idea of the most desirable sorts for the adornment of grounds.

Geraniums. In last year's report descriptive notes were given on about seventy varieties of geraniums for bedding. Since then our collection has been increased by about 200 varieties, obtained from some of the leading growers on this continent. All of these were grown side by side this year in our trial plots, and careful notes on them were taken throughout the season, a summary only of which can be given here, by mentioning some of the most desirable old sorts and some of the most promising new ones. Most of those mentioned in our last report as having given the best results have maintained the reputation there given them, and may again be mentioned here. These are as follows: *Scarlet*—General Grant, J. J. Harrison, Alfred Tennyson, Alfred Mame and Prokop Daubec. *Crimson*—S. A. Nutt and Sam Sloan. *Magenta Crimson*—Adrien Corret. *Pink*—Madonna and Mons de la Rue. *Salmon*—Mrs. E. G Hill and John Good. *White*—La Favorite and White Swan. *Bronze-leaved*—Marechal MacMahon. *Silver-leaved*—Mad. Saleroi. *Golden-leaved*—Crystal Palace Gem.

Among the most promising of the new varieties are the following: *Scarlet*—M. A. Bouleaus, Garden Director, Ville de Poitiers, W. P. Simmons, Aceton, Director Marmy, Raspail Improved, C. Morel, M. A. Borie Aine, Marvel, Wm. Kelway and W. A. Chalfant. *Rose*—Phalene, Comtesse de Castries and La Contable. *Salmon*—Mrs. A. Blanc, Rodrigue, Blanche Moulas, Ruy Blas, Beaute Poitevine and Robt. Roland-Gosselin. *Pink*—Mary Hill. *White*—Mad. Buchner and Alpine Beauty.

Coleuses. Out of thirty named varieties of coleuses, grown in our trial plots this year, the following dozen have proven the most satisfactory for bedding purposes: Alhambra, Beckwith's Gem, Blackbird, Burning Bush, Firebrand, Firecress, Golden Bedder, Mosake, Pink Gem, Paroquet, Rob Roy and Shah.

Gladioli. The gladiolus is seldom classed among the bedding plants; but, nevertheless, a good collection of these beautiful flowers in full bloom makes one of the most attractive sights to be seen out of doors. And as an open air cut flower the gladiolus is unsurpassed. Out of about 150 of these grown this year, the following were some of the most attractive: Diamant, E. Souchet, Jubilee, Magenta, Magician, Sunshine, The Queen, Abbe Roucourt, H. Veitch, M. de Vilmorin, Pacha, Dr. Regel, Goliath, Mrs. Beecher and S. Pellico.

7. Forestry.

The forestry experiment, in co-operation with the United States Department of Forestry, which was started last year, has been continued this year with seeds of nine different species, received from fourteen States.

Germination and Growth of Forest Tree Seedlings.

States.	Boxelder.	White ash.	Green ash.	Walnut.	Honey locust.	Hackberry.	Pecan.	Chestnut.	Burr oak.
Colorado	v.p. 5.		g. 4	n.					
Connecticut		n.		v.p. 5.		p. 4.4			
Dakato	v.p. 3.3		v.p. 3						n.
Indiana	n.			v.p. 3.					
Iowa	g. 7.1		n.	n.					
Kansas		n.	g. 7.1	n.	v.p. 3.7	v.p. 9.5	v.p. 3.		v.p. 2.
Missouri				v.p. 3.			n.		
Nebraska			m. 5.9	v.p. 3.					
Pennsylvania	g. 4.6	n.	m. 4.	n.	g. 5.8	v.p. 2.		n.	
South Carolina	v.p. 8		g. 6.3	n.	p. 7.6	p. 4.5		n.	
Tennessee		n.		v.p. 3.		v.p. 5.6			
Texas				m. 5.		v.p. 6.	p. 3.		n.
Virginia	p. 6.5	v.p. 6.8		v.p. 3.					
Vermont		n.							n.

Abbreviations used:—v. g.—very good, where seemingly all of the seeds sprouted.
g.—Good, " three-fourths "
m.—Medium, " one-half "
p.—Poor, " one-fourth "
v.p.—Very poor, " very few "
n.—None, " none "

The percentage of seeds which germinated was very low, owing, no doubt, to the drying which the seeds received before they were planted in the spring. If they could have been received and planted immediately after they were gathered much better results would have been obtained. The preceding table shows the States from which seeds were received, the species from each State, the amount of seed which germinated, and the average growth in inches of the seedlings the first year.

The seedlings of last season's growth were taken up early in the spring, and transplanted into nursery rows. The following table shows the average height of each species at the end of last season, and at the end of this. It will be seen that the walnuts, in most cases, were taller last season than this, which is due to their checked growth, after freezing down to the ground last winter.

States.	Box elder.		White ash.		Green ash		Black walnut.		Honey locust.		Hack-berry.	
	1897	1898	1897	1898	1897	1898	1897	1898	1897	1898	1897	1898
Alabama	....	....	....	....	....	..	8.4	8.0	5.2	13.2	..	....
California			....	..	....	....	8.2	7.4	....	...	....	....
Colorado	5.8	12.3	...	...	6 8	13.7	....	....	...	....	....	....
Connecticut	...	...	3.0	8.0	....	..	...	....	....	....	4.4	....
Iowa	11.7	29.0	..	....	...		....		...	....	5.2	5.5
Illinois	8.8	29.3	3.0	....	6.3	5.0	2.0	....	....	....	....	....
Kansas	8.2	23.9	....	..	6.4	20 4	....	....	4.6	9.5	5.2	6.0
Kentucky	....	...	5.6	7.0	...		8.4	8.5	4.6	12.5	5.8	7.1
Nebraska	8.2	24.3	..	...	5.3	16.0	..	....	...	....	....	....
North Carolina	....		...	....	...	....	8.6	9.3	...	....	....	....
Ohio	8.8	21.4	....	....	....	....	....	....	3.8	6.5	4.2	5.0
Oklahoma	7.0	....	....	....	....	....	....	....	.	....	3.6	6.5
Ontario	11.0	19.6	4 0	11.8	....	....	7.6	6.5	5.6	9.3	....	....
South Carolina	....	....	....	....	....	....	10.8	11.8	....	....	....	....
South Dakota	6.4	17.4	...	...	6.0	17.0	....	....	....	....	....	....
Texas	....	....	....	....	4.2	9.0	....	....	....	....	3.8	...

8. Greenhouses.

Our collection of greenhouse plants has been increased year by year by additions from various sources, until it is now one of the finest and most extensive in the country. And it affords students and visitors an excellent opportunity of becoming familiar with a great number of useful and ornamental species.

Probably the finest floral display of the year in the greenhouses, is during the Chrysanthemum season. Our Chrysanthemum collection now numbers about 225 varieties, and includes all of the most important types. With a view to getting a concensus of opinion as to the most desirable varieties of the different types, the students were asked to go carefully over the collection when it was in full bloom, and make out a list of the varieties they would prefer for a home collection. In the lists sent in, as many as 90 different varieties were mentioned, the following being the most popular :

Japanese.—Philadelphia, Harry Sunderbruch, Maud Dean, Heron's Plume, Mrs. W. H. Robinson, Viviand-Morel, O. P. Basset, the Queen, Mrs. L. Allen, Autumn Glow, Georgina Pitcher, Pitcher and Manda, Waban, and W. H. Lincoln. *Japanese Quilled*—Iora, L. B. Bird, Kentucky, Mrs. W. H. Rand, Helen Bloodgood, and Good Gracious. *Japanese Hairy*—Mrs. Alpheus Hardy, Leocadie Gentils, R. M. Grey, Louis Boehmer, and Beauty of Truro. *Chinese*—Mrs. L. C. Maderia, Ideality, Cupid, Mrs. Col. Goodman and Major Bonnaffon. *Anemone*—Antonius, Falcion, Surprise, Condor, Mad. Robt. Owen, John Bunyan and Descartes. *Pompons*—Rose Travena, Golden Fleece and Black Douglas. *Single.*—Eucharis and Framfield Beauty.

Inspection of Fruit Experiment Stations.

In addition to my College duties, I have been responsible for the inspection and oversight of the work of the thirteen Fruit Experiment Stations now established in various parts of the Province, all of which were visited this year and were reported upon to the Board of Control. These trips were made at different times during the summer from July to October, in order to visit each station at the most opportune time for seeing at maturity the particular kind of fruit grown there. At each station there is now an extensive collection of varieties of the fruits under test. The new plantations are becoming well established and valuable reports on the work are now being published, a full account of which may be found in the annual report of the Stations.

Co-Operative Fruit Testing.

The co-operative testing of small fruits, begun five years ago, in connection with the Experimental Union, has now become a work of considerable importance, and entails a lot of correspondence and office work upon this department. We have now on our books the names of about 500 persons to whom plants have been sent for co-operative testing during the past five years. During this time we have distributed 1,020 gooseberry bushes, 1,200 currant bushes, 1,560 blackberry bushes, 2,400 raspberry bushes, 2,400 black raspberry bushes, and 9,840 strawberry plants, making a total of 18,420 plants. The interest in the work is rapidly increasing, as may be judged by the constantly increasing number of applications for plants. For the past two years we have had twice as many applications as we could supply.

In order to give all a chance, and yet deal justly with all concerned, the circulars offering plants for trial last spring were sent out at intervals of about a week (1) to paid members of the Union, who are of course entitled to first choice; (2) to those whose applications arrived too late to entitle them to plants last year; (3) to all past experimenters who have duly reported on the plants sent them; (4) to any others who might wish to join in the work.

The plants were then furnished in the order in which the applications were received until the supply was exhausted. Instructions for conducting the various tests were sent to each experimenter before the plants were sent out from the nurseries, and blank forms were furnished upon which to report the results. The reports upon the growth of plants set out last spring, and also upon the yield of plants set out in previous years, were more satisfactory this year than they have ever been before, and it is to be hoped that they will improve from year to year as experimenters become more familiar with the work and realize the value of such tests.

A fuller account of this work with particulars as to the comparative yields of the varieties under test will be found in the annual report of the Experimental Union.

Meetings Attended.

During the month of January I attended Farmers' Institute meetings at the following places and delivered addresses on various horticultural topics: Jerseyville, Stony Creek, Smithville, Campden, St. Davids, Stevensville, Welland, Marshville, Rainham Centre, Nanticoke, and Vittoria.

Addresses on Floriculture and Window-gardening were given before the Orillia and Walkerton Horticultural Societies.

Two lectures were delivered before the teachers in training at the Normal School, Toronto—one on "Floriculture in the Home and School," and the other on "Beautifying School Grounds."

At the last annual meeting of the Ontario Fruitgrowers' Association, held at St. Catharines, I gave a report upon the "New and Seedling Fruits" received during the year. This will appear in the next annual report of that Association.

Just here I may add that I shall be pleased to receive samples of all promising new and seedling fruits, that they may be taken note of and be reported upon at the next annual meeting of the Fruitgrowers' Association.

Correspondence.

Tho extensive correspondence devolving upon the heads of the various departments of the College is one of the means by which the education of the College reaches out beyond the students in attendance. The questions asked by correspondents are increasing from year to year. Last year the correspondence of this department was nearly doubled on account of the vacancy in the Biological Department, and its falling to our lot to answer the numerous questions relating to all kinds of injurious insects. The answering of such questions requires a good deal of time, and often much thought and research; yet we hope this source of information will be more and more made use of by those interested, consequently we invite correspondence upon all branches of Horticulture, and we will endeavor to answer fully and clearly all questions sent to us. To do this work justice in the future, however, provision will soon have to be made for regular assistance in the office, which we trust will soon be arranged for.

Acknowledgements.

I beg to acknowledge with thanks the followings donations of this department:

F. W. Porter, Mount Forest, Ont.—Seedling gooseberry and currant bushes.

A. E. Sherrington, Walkerton, Ont.—Raspberry plants.

Geo. Nicol, Cataraqui, Ont.—Seedling dahlia.

Thos. Southworth, Toronto, Ont.—100 Burbank's "Royal Hybrid" walnuts.

The Spramotor Co., London, Ont.—Spramotor outfit No. 1.

Henry Gowling, Wandin Yallock, Victoria, Australia.—Strawberry plants.

W. O. Isaacs, Jamaica.—Seeds of several tropical species.

C. E. Farm, Ottawa, Ont.—24 varieties currants, 55 cannas, 13 coleuses, 9 hydrangeaus, and 5 hybiscuses.

A. W. Peart, Freeman, Ont.—Collection of currant cuttings.

R. B. White, Ottawa, Ont.—Plants of three seedling raspberries.

E. H. Shuttleworth, Guelph, Ont.—Pumpkin seeds.

F. N. Pitts, Welland, Ont.—New style of hand hoe.

E. Cunningham, Guelph, Ont.—Plant of Farfugium grande.

Dr. E. Bromley, Barkerville, B. C.—Seeds of British Columbia blueberry.

My thanks are also due to the heads of the other departments who have rendered kindly assistance in various ways, and to the foremen and men of this department who have faithfully contributed their share towards making the work of the year a success.

Respectfully submitted,

H. L HUTT,
Horticulturist.

Guelph, Dec. 31, 1898.

PART IX.

REPORT OF THE BACTERIOLOGIST.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my third annual report of the work done in my department.

TEACHING. Owing to the illness of Prof. Panton during the fall term of 1897, and his subsequent death, and also to the fact that all the special courses offered in the third year were filled, the teaching work of this department was exceptionally heavy during the session of 1897-98.

In brief, we may say that the instruction given was as follows:

Bacteriology. II. Year. A course of 26 lectures on bacteria and their relation to agriculture, dairying and the industrial arts; the disinfection of rooms, stables and buildings; the diagnosis of tuberculosis by tuberculin, etc.

Bacteriology. III. Year. Dairy Specialists. A course of 36 lectures on dairy bacteriology; the bacteriological analysis of milk, butter and cheese; pasteurization of milk; milk as an agency in the conveyance of disease, etc These lectures were supplemented by laboratory practice, fifteen hours a week being devoted to the practical work.

Bacteriology. III. Year. Specialists in Bacteriology. A course of 60 lectures on the life-history of the bacterial cell; form and classification, requirements and chemistry of bacteria; staining; preparation of culture mediæ; pathogenic and non-pathogenic micro-organisms; preparation of toxins; immunity and serum-therapy. Laboratory work two afternoons a week during the fall term, and every day from two to five hours during the winter and part of the spring term.

Bacteriology. Special Dairy Class. A short course of lectures, with demonstrations, diagrams and lantern slides, for the special dairy class which comes here in January. In this class no laboratory work is attempted, except in pasteurization.

Vegetable Histology. A course of fifteen lectures and two afternoons of laboratory work per week during the fall term for all third year students. In addition, the specialists in biology and horticulture had an extra afternoon per week and more lectures.

Animal Histology. A course of seven lectures on the cell, and fifteen on animal histology, for the third year specialists in biology and bacteriology, together with one afternoon a week during the winter term for laboratory work.

Cryptogamic Botany and Plant Pathology. A microscopic study of the diseases of plants induced by cryptogamic parasites, with instruction as to remedies, collection, etc. This course is taken by the specialists in horticulture and biology, involving two lectures a week and two afternoons per week of laboratory work during the winter and part of the spring term.

The horticultural specialists take up a little of this work and have special lectures on those fungi which affect farm crops. They devote but one afternoon a week to laboratory work.

Systematic Botany. II. Year. Two lectures and four hours' laboratory work per week during the spring term were devoted to morphology—the study of seeds and seedlings, description and analysis of plants, etc. As this was a large class we had to divide it into two sections, thus increasing the work.

Physiological Botany. One lecture per week during the spring term for second year students.

Plant Breeding. A course of fifteen lectures on the origin of cultivated plants, evolution of modern varieties, laws of heredity, causes of variation, influence of environment, function of sex, crossing and hybridizing, to specialists in horticulture.

Of the work above outlined, Mr. Wm. McCallum, B.S.A., Fellow in this department, has taken the physiological botany, plant breeding and a portion of the cryptogamic botany. The rest of his time has been fully occupied in preparing material for the practical classes in histology; and I hereby acknowledge his efficient assistance.

Two lectures were delivered to the Normal School teachers in Toronto in October—one on "Bacteria and their relation to agriculture and dairying," and the other on the "Collection and preservation of insects, and the life history of a typical insect, with hints how to make the subject interesting to children."

From the above outline it will readily be seen that very little time has been left for research work, consequently but little has been done. It is hoped, however, that hereafter we may be in a position to add something to the store of knowledge.

CORRESPONDENCE. A large amount of information has been given by means of correspondence during the year. Inquiries have been made on many subjects, such as disinfection, taints in milk, tuberculosis, the temperature reactions of animals inoculated with tuberculin, foul brood, etc. In all about 800 letters have been received and answered. In addition to the foregoing, I have answered many letters relating to weeds and insects for the botanical department.

EQUIPMENT. It was thought advisable this year to remove the incubators and other apparatus used in the manufacture of tuberculin downstairs, so as to have it at some distance from the students' laboratory. The room in which this work is now done is connected by a staircase (built by the College carpenter) with the back of the laboratory. Several new and much needed pieces of apparatus have been added during the year—for instance, a cool incubator for gelatine cultures and a centrifuge.

LABORATORY WORK. A number of examinations of milk, cream and cheese have been made for the Dairy department; and also of samples of various milk products, wax, blood, etc., sent or brought by different persons for examination and diagnosis. In such cases a written report has been sent to each inquirer, giving the results of the investigation. Nineteen samples of water have been bacteriologically analysed during the year.

SUMMER WORK. As director of the committee of economic botany of the Ontario Agricultural and Experimental Union, I was engaged during the summer vacation in gathering information on weeds, making photographs, collecting weed seeds, etc. The results of this work will be published in bulletin form.

FRUIT PRESERVATIVES FOR EXHIBITION PURPOSES.

Early in the year 1897 I was asked several times for information regarding the best preservative to use in putting up fruit for exhibition purposes. On inquiry I found that there was very little reliable information on the subject: and Mr. L. Woolverton, M. A., Secretary of the Fruit Growers' Association, thought it would be a good plan to undertake some experiments along this line.

Fruit was collected and placed in various mixtures during the month of June, 1897, and the report made of these results in November, 1898, a period of one year and four months afterwards. Gooseberries, (red and white). Raspberries, Strawberries, Currants, (red and white), were the fruits selected; and over 25 different mixtures were tried.

The mixtures were made up with tap water, and the metric system was used for measuring and weighing the different substances used. For instance, with solid substances, like Boracic Acid, 2 per cent. means 2 grams of Boracic Acid in 100 cubic centimetres of water, 2 per cent formalin means 2 cubic centimetres of formalin in 100 c. c. of water, and so on The syrup was made by dissolving 1 lb of sugar in a quart of water. The glycerine had a specific gravity of 1.260. The mixtures were not renewed in any case.

The formalin used was Schering's, as much of the formalin sold throughout the Province is not up to the required strength, and great care should be taken in ascertaining this important point.

It seems to be a very hard matter to find a mixture which does not take the color out of soft fruits, like strawberries or raspberries ; for the former, coal oil has been used very generally: but, judging from the exhibit in the experiment station's collection of fruits, we cannot speak of it as an ideal mixture, viz., a clear colorless liquid, which will preserve, for at least a period of one year, the color and shape of the fruit as it was when growing on the tree or bush. All the fruit herein referred to has been judged by the above standard as to color and shape.

The best mixtures for the different kinds are as follows :

For Raspberries,—Formalin 1 c.c. ; glycerine 10 c.c., and water 89 c.c. but this is not an ideal mixture as the color of the fruit changes somewhat.

For Strawberries.—Formalin 2 c.c., potassium alum 4 grains, glycerine 10 c.c., and water 100 c.c. The only objection to this mixture is the slightly yellowish tint of the liquid ; but the fruit in it is of a better color and firmer than fruit pickled in coal oil. For this fruit a saturated solution of common salt makes a fairly good preservative.

For Red Currants.—Several mixtures are fairly satisfactory, as may be seen by reference to the report in the following table. One of the best was 1 gram of mercuric chloride, 10 c.c. glycerine and 90 c.c. water.

For White Currants.—Two solutions did well ; one with mercuric chloride alone, and the other with mercuric chloride and common salt.

For Gooseberries.—A number of mixtures are satisfactory (see the detailed report in table) ; one per cent formalin gave very good results, as did also 2 per cent zinc chloride.

Further experiments are in progress with fruit grown in 1898.

Of course, it is hardly neccessary to add that fruit taken out of any of these mixtures is unfit for use ; many of the substances used, as mercuric chloride, are deadly poisons.

Fruit.	*Mixture.*	*Remarks.*
Raspberry— Cuthbert.	Acetic acid, 2 per cent. Gelatine, $\frac{3}{4}$ per cent. in water.	Shape, good. Color, bleached. Liquid, reddish.
	Boracic, 2 per cent. Gelatine, $\frac{3}{4}$ per cent. in water.	Shape, bad ; rather shrunken. Color, mottled. Liquid, murky.
	Formalin, 1 part. Chrome alum, 4 parts. Glycerine, 10 parts. Water, 100 parts.	Shape, good. Color, deep purple. Liquid, opaque. *Note.*—A good preservative, but opaque and therefore no good for exhibition.
	Acetic acid, 2 per cent. Glycerine, 10 per cent. in water.	Shape, good. Color, bleached. Liquid, pink but clear.
	Iodine in Potassium iodide, $\frac{1}{6}$ per cent. Glycerine, 10 per cent.	Shape, fair. Color, good. Liquid, dirty, with much deposit.
	Potass. alum, 2 per cent. Formalin, 2 per cent. Syrup, 5 per cent.	Shape, fair ; a little shrunk. Color, purple. Liquid, red wine color.
	Zinc chloride, 2 per cent. Glycerine, 10 per cent.	Shape, excellent. Color, bleached. Liquid, bright red and very clear.

Fruit.	*Mixture.*	*Remarks.*
Raspberry, Cuthbert	Boracic acid, 2 per cent. Glycerine, 10 per cent.	Shape, good. Color, bleached. Liquid, dirty red and liquid very bad.
	Formalin, 1 per cent. Glycerine, 10 per cent.	Shape, good. Color, purple red. Liquid, clear but red.
	Mercuric chloride, ½ per cent. Salt, 2 per cent.	Shape, shrunk. Color, bleached. Liquid, dirty.
	Salicylic acid, ½ per cent. Glycerine, 10 per cent.	Shape, good. Color, entirely bleached. Liquid, clear, yellowish re
	Chromic acid, 2 per cent. Glycerine, 10 per cent.	Shape, very fair. Color, bleached. Liquid, much deposit.
	Saturated salt solution	Shape, shrunk a little. Color, purple. Liquid, red but clear.
	Mercuric chloride, 1 per cent. Glycerine, 10 per cent.	Shape, good. Color, bleached. Liquid, clear but colored.
	Calcium chloride, 10 per cent.	Shape, a little shrunken. Color, purple. Liquid, dirty and very red.
	Mercuric chloride, 1 part. Acetic acid, 5 parts. Water, 300 parts.	Shape, fair. Color, dirty. Liquid, clear yellowish red.
	Formalin, 6 parts. Syrup, 100 parts. Water, 200 parts.	Shape, fair. Color, purple. Liquid, deep red.
	Alcohol, 30 per cent. Glycerine. 10 per cent.	Shape, fair. Color, bleached. Liquid, yellowish red.
	Mercuric chloride 1 : 500. Syrup, 33 per cent	Shape. fair. Color, bleached. Liquid, opaque.
Strawberry—Woolverton	Saturated solution of salt	Shape, somewhat shrunk. Color, fair, although some is ost. Liquid, yellowish red. *Note.*—A fairly good mixture.
	Acetic acid, 2 per cent. Gelatin, 1½ per cent.	No good at all.
	Acetic acid, 2 per cent. Glycerine, 10 per cent.	Shape, slightly shrunk. Color, bleached. Liquid, clear, but light red in color.
	Zinc chloride, 2 per cent. Glycerine, 10 per cent.	Shape, good. Color, a little bleached. Liquid, clear, but yellowish red.
	Mercuric chloride, 1 per cent. Glycerine, 10 per cent.	No good.
	Alcohol, 30 per cent. Glycerine, 10 per cent.	Shape, fair, Color, bleached. Liquid, clear, but reddish.
	Calcium chloride, 10 per cent.	Shape, fair. Color, fair but somewhat bleached. Liquid, clear, but reddish. *Note.*—A fair mixture.

Fruit.	*Mixture.*	*Remarks.*
Strawberry— Woolverton........	Salicylic acid, ½ gram. Glycerine, 30 c.c. Water, 200 c.c.	Shape, fair, but a little shrunk. Color, entirely bleached. Liquid, yellowish red, but clear.
	Chromic acid 2 per cent. Glycerine, 10 per cent.	A good preservative, but the mixture is opaque.
	Boracic acid, 4 grams. Gelatin, ¾. Water, 200 c.c.	Shape, good. Color, a little bleached. Liquid, somewhat precipitated.
	Formalin, ½ per cent. Chrome alum, 2 per cent. Glycerine, 10 per cent.	No good ; mixture is quite opaque.
	Formalin, 2 per cent. Potass. alum, 2 per cent. Glycerine, 10 per cent.	Shape, good. Color, darkened. Liquid, reddish, but clear.
	Formalin, 2 parts. Potass. alum, 4 grams. Glycerine, 10 parts. Water, 100 parts.	Shape, excellent. Color, very fair. Liquid, yellowish. *Note.*—This mixture is the best of the lot. Fruit has been in it 1 year and 4 months, and is still in a good state of preservation. It is better than coal oil, which is very generally used for preserving.
Red Currant— Victoria...........	Mercuric chloride, 1 gram. Acetic acid, 5 parts. Water, 300 parts.	Shape, somewhat shrunken. Color, bleached. Liquid, red.
	Iodine in potass. iodide ⅙ per cent. Glycerine, 10 per cent.	Shape, good. Color, very fair. Liquid, colorless and clear. A fairly good mixture.
	Formalin, 2 per cent. Potass. alum, 2 per cent. Syrup, 25 per cent.	Shape, shrunk. Color, very dark. Liquid, clear but reddish.
	Mercuric chloride, 1 part. Salt, 4 parts. Water, 200 parts.	Shape, good. Color, bleached. Liquid, yellowish but clear.
	Potass. bichromate, 1 per cent. Sulfate soda, ½ per cent. Glycerine, 10 per cent.	Shape. Color. Quite opaque. Liquid.
	Acetic acid, 2 per cent. Glycerine, 10 per cent.	Shape, good ; a few split. Color, bleached. Liquid, yellowish but clear.
	Boracic acid, 2 per cent. Glycerine, 10 per cent.	Shape, good. Color. very fair ; slightly bleached. Liquid, clear, but slightly yellow. A very good mixture.
	Alcohol, 30 per cent. Glycerine, 10 per cent.	Shape, good. Color, darkened. Liquid, clear but yellowish.
	Formalin, 2 per cent. Syrup, 25 per cent.	Shape, shrunken. Color, dark. Liquid, colorless and clear.
	Mercuric chloride, 1 per cent. Glycerine, 10 per cent.	Shape, good. Color, good. Liquid, quite clear. A very good mixture ; fruit is very natural.

Fruit.	*Mixture.*	*Remarks.*
Red Currant— Victoria	Lime chloride, 2 per cent	No good.
	Formalin, 1 per cent	Shape, good. Color, darkened. Liquid, clear and colorless. This mixture is all right, except that the fruit is much darker than it should be.
	Chloral hydrate, 1 per cent. Syrup, 25 per cent.	No good.
	Chromic acid, 2 per cent.	Shape, fair. Color, bleached. Liquid, slightly colored but clear.
	Formalin, 1 part. Chrome alum, 4 parts. Water, 200 parts.	Opaque, but a good preservative.
	Salicylic acid ½ per cent. Glycerine, 10 per cent.	Shape, good. Color, somewhat bleached. Liquid, reddish yellow but clear.
	Calcium chloride, 10 per cent.	Shape, good. Color, unnatural. Liquid, slightly tinted but clear.
	Formalin, 2 per cent. Patass. alum, 4 per cent. Glycerine, 10 per cent.	Shape, good. Color, deepened. Liquid, colorless and clear. A good mixture.
White Currant— White Grape.	Formalin, 1 per cent. Glycerine, 10 per cent.	Shape, good. Color, darkened. Liquid, perfectly clear.
	Mercuric chloride, 1 part. Syrup 10 per cent. Water, 500 parts.	Shape, shrunken. Color, dark. Liquid, clear.
	Salicylic acid, ½ per cent.	Shape, good. Color, slightly changed. Liquid, clear.
	Boracic acid, 2 per cent.	Shape, good. Color, fair. Liquid, clear.
	Mercuric chloride, 1 part. Salt, 4 parts. Water, 200 parts.	Shape, good. Color, good (natural). Liquid, clear. A good mixture.
	Mercuric chloride, 1 per cent.	Shape, good. Color, natural. Liquid, clear. A good mixture.
Gooseberry— Downing..........	Formalin, 2 per cent. Potass. alum, 2 per cent. Syrup, 25 per cent.	Shape, shrunken. Color, natural. Liquid, clear.
	Boracic acid, 2 per cent. Gelatin, ¾ per cent.	Shape, good. Color, slightly bleached. Liquid, slightly colored.
Houghton.........	Formalin, 2 per cent.	Shape, shrunk. Color, good. Liquid, clear.

Fruit.	*Mixture.*	*Remarks.*
Gooseberry—		
Downing	Boracic acid, 2 per cent	Shape, good. Color, good, natural. Liquid clear. A good mixture.
Houghton	Mercuric chloride, 1 per cent.	Shape, good. Color, good. Liquid, clear. A good mixture.
Downing	Formalin, 1 per cent	Shape, good. Color, natural. Liquid, clear. A good mixture.
Houghton	Mercuric chloride, 1 part. Salt, 4 parts. Water, 200 parts.	Shape, good. Color, slightly bleached. Liquid, clear.
Pearl	Zinc chloride, 2 per cent	Shape, good ; a few burst. Color, excellent. Liquid, clear. A good mixture.
Downing	Salicylic acid, ½ per cent.	Shape, good ; a few burst. Color good. Liquid, clear. A fair mixture.
White Currant—		
White Grape	Mercuric chloride, 1 part. Acetic acid, 5 parts. Water 300 parts.	Shape, good. Color, yellow. Liquid, clear.
	Formalin, 2 per cent. Syrup, 25 per cent.	Shape, shrunk. Color, yellow. Liquid, clear.
	Formalin, 2 per cent. Potass. alum, 2 per cent. Syrup, 25 per cent.	Shape, shrunk. Color, good. Liquid, clear.
	Zinc chloride, 2 per cent. Glycerine, 10 per cent.	Shape, good. Color, very natural. Liquid, clear. A good mixture.
Gooseberry—		
Pearl	Iodine in potassium iodide, 1 per cent.	Shape, good. Color, not natural. Liquid, clear.
Houghton	Saturated salt solution. Mercuric chloride, a trace.	Shape, shrunk. Color, natural. Liquid, clear.
	Calcium chloride, 10 per cent.	Shape, some burst Color, slightly darker. Liquid, clear.
Red Jacket	Acetic acid, 2 per cent. Gelatin, ¾ per cent.	Shape, good. Color, bleached. Liquor, slightly tinted.

Tuberculin.

During the year (1st December, 1897 to 1st December, 1898), 2,800 doses of tuberculin have been manufactured and distributed from our laboratory. The market price for the product is about 15c. per dose, and at this rate our tuberculin would have cost $420.

We now have facilities for making 15,000 doses a year ; and we have manufactured a small amount of mallein, but there has not been much demand for this product except from the North-west Territories.

This year our tuberculin has been sent out either concentrated or diluted at the option of the person applying. Many farmers seem to prefer it in the diluted form.

Water Analysis.

Recognizing the importance of both chemical and bacteriological methods of water analysis, we have thought it advisable to analyze by both methods all samples sent to the College, Therefore we wish to make the announcement that hereafter water will be analyzed in our laboratories both chemically and bacteriologically and no charge will be made for the analysis; but the sender will be expected to pay the express charges, and before any analysis is made a proper sample, taken according to the directions given below, must be sent; for unless excessive care is excercised in water-sampling, no faith can be placed on the analytical results.

Container. A large bottle of about half gallon capacity should be used, preferably one with a glass stopper. If a glass stopper is not used the bottle should at least be fitted with a *new* cork.

Preparation. The bottle should be thoroughly cleaned, scalded out with boiling water and then allowed to drain and cool.

Taking the Sample. If the sample is taken from a well the water should be pumped for about five minutes, or long enough to empty all the pump connections. If from a tap it should be allowed to run for ten minutes or so before the sample is taken. Water standing in pipes in a house is under very favorable conditions for the multiplication of bacteria, and if proper precaution is not taken an erroneous idea of the number present may be formed. If from a lake or stream, the sample must be taken some distance from the shore, by plunging the sampling vessel, say a foot and a half below the surface, so as to avoid surface scum, Samples should not be taken immediately after rain or a wind storm. Do not fill the bottle quite full, but leave a small space for possible expansion of the water. Cork and tie a piece of cloth over the neck to hold the cork in place. Do not use sealing wax.

Packing. The bottle should be packed in ice, if the weather is warm. During the winter, sawdust may be employed. The water should not arrive at the laboratory at any higher temperature than when the sample was taken.

Notification. Send a notice by mail, stating by what Express Co. you are sending the water and date when you shipped. Also give as fully as possible the history and source of the water, and remarks on the sanitary surroundings.

Note. On application a suitable bottle, properly prepared, will be sent to the applicant.

The Library.

The library is growing slowly, as I remarked last year, owing to the expense of most of the scientific works needed by the technical departments, the ever increasing number of journals and periodicals, and the small amount voted annually for the purchase of books. The library, especially, needs complete sets of periodicals; for instance, the Chemical department needs a set of Biedermann's Centralblatt für Aqukultur Chemie and a set of the Journal of the Chemical Society. The Botanical department needs sets of the Annals of Botany, the Journal of the Royal Microscopical Society, etc. The Bacteriological department sets of the Zeitschrift für Hygiene, Baumgeurten's Jarresbericht, etc.; and the Department of Physics, a set of Gebriete der Forschung in Aquiel Physik. The above and some other periodicals are greatly needed, as the reader meets many references to them which he is unable to verify. The change of the academic course from October-June to September-April and the lengthening of the three years to four, will have three effects on the different departments; and as they reflect on the library, I should like to point them out. Firstly. The heads of the departments will have a longer time for investigational or research work. During the summer experimental work will be done, and before any such line of work is undertaken the library will be consulted, and it will, I am afraid, be a case of Tekel, Tekel—weighed and found wanting. For research or experimental work, a good library is of as much importance as a well equipped laboratory.

Secondly. By lengthening of the course the educational standard is raised, and the extreme specialization along a few lines of study during the fourth year will necessitate the use of a larger literature and more advanced works to encourage greater depth of study by intending graduates.

Thirdly. The more advanced character of the work will mean that the teacher has to be of better scholarship and more widely read in the subjects he teaches.

These reasons all urge for a better library, and a more modern library; and I trust that these suggestions may be taken into consideration when the annual estimates are made out.

We would record our appreciation for all our exchanges, notably those from the United States Department of Agriculture, the various State Experiment Stations, and the publicatious of many of the departments of agriculture of the British colonies and possessions.

Papers and Periodicals. The following are provided by the College for the use of the students in the reading room:

Daily Globe, Daily Mail and Empire, Guelph Daily Mercury, Guelph Daily Herald, Farmers' Advocate, Journal of Veterinary Archives, Gardening, American Gardening, Florists' Exchange, Review of Reviews, Scientific American, Nature, The Canadian Magazine, Appleton's Popular Science Monthly, and Live Stock Journal.

The following are provided by the Students' Literary Society: Outing, Cosmopolitan, Pall Mall, Argosy, Harper's, Munsey, McClure's, and Standard Magazines, and The Illustrated London News.

The following gives the list of exchanges:

Religious Papers: Presbyterian Review, Congregationalist, Christian Guardian, Evangelical Churchman, Northern Messenger, Canadian Baptist, Choir Leader,—sent free by the publishers,

Weeklies: The Weekly Times (Melbourne, Victoria); Montreal Witness, Family Herald and Weekly Star, Acton Free Fress, and Weekly Sun.

Dairy: American Cheesemaker, Hoard's Dairyman, Chicago Produce, Dairy World (Chicago); The Dairy, Dairy World, (London, Eng); Molkerci-Zeitung, Milck-Zeitung, La Laiterie, Holstein-Friesian Register, Creamery Gazette, Jersey Bulletin, Jersey Hustler, Elgin Dairy Report, and The Canadian Cheese and Butter Maker.

Agriculture: Swine Breeders' Journal, American Swineherd, Farm Students' Review, Farm Journal, O. A. C. Review, Practical Farmer, Co-operative Farmer, Journal of Agriculture, Farmers' Gazette, American Cultivator, Farmers' Home, Livestock Report, American Agriculturist, American Horsebreeder, Skordemannen, Farm Stock and Home, Nor' West Farmer, Northwestern Agriculturist, American Sheep Breeder, Farmers' Review, American Fertilizer, American Fancier, Breeders' Gazette, Canadian Bee Journal, Canadian Entomologist, Canadian Horticulturist, Connecticut Farmer, Dakota Field and Farm, Farm, Field and Fireside, Farming, Field, National Single Tax, Nebraska Farmer, Ohio Farmer, Oregon Agriculturist, Practical Farmer, Prairie Farmer, Western Rural, Wisconsin Agriculturist, New South Wales Agricultural Gagette, Queensland Agricultural Journal, Agricultural Journal (Cape of Good Hope); Journal of the Jamaica Agricultural Society, Journal of Agriculture and Industry (South Australia); The Agricultural Gazette (Tasmania); The Journal of the Bureau of Agriculture (West Australia); and Bulletin des Séances de la Société Nationale D'Agriculture de France.

Books added to the Library During the Year.

Agriculture	65	Economics	2
Apiculture	15	Entomology	16
Bacteriology	24	Fiction	6
Biography	10	Forestry	2
Biology	23	Geology	17
Botany	37	Herdbooks	35
Chemistry	39	Hygiene	4
Dairying	3	Horticulture	29

Books added to the Library during the year.—Continued.

Literature	69	Reports	27
Mathematics	1	Sessional Papers	9
Ornithology	4	Theology	9
Poultry	13	Technology	3
Physics	13	Veterinary Science	18
Photography	2	Number of books bound	72

Some of the above were expensive works—for instance, Encyclopedia of Canada, (C. Hopkins); Warner's Library of the World's Best Literature, 30 vols.; Library of Historic Characters and Famous Events, 10 vols.; Queen Victoria, 5 vols.

In conclusion, I desire to acknowledge the meritorious services of A. T. Wianacko, B. S. A., and to testify to the fideiity and cheerfulness with which he has attended to his duties in the Library.

Respectfully submitted,

F. C. HARRISON.
Bacteriologist.

December 31st, 1898.

PART X.

REPORT OF THE EXPERIMENTALIST.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of herewith submitting for your consideration the report of the Experimental department for the year 1898.

I am pleased to state that the work of this department for the past year has, on the whole, been quite satisfactory. The experiments throughout have been conducted with great care and accuracy. The writer has much confidence in the reliability, and in the real practical value of the results herein submitted, and hopes that they will be carefully studied by those engaged in the practical agriculture of Ontario. I have reason to believe that the work of this department is being appreciated more and more by the farming community. Since submitting the last Annual Report of this department, I have come into personal contact with a good many thousand farmers, in delivering about forty addresses at meetings of Farmers' Institutes and Agricultural Conventions; in accompanying about 25,000 farmers through our Experimental grounds; and in explaining our work, and illustrating the results therefrom at the Industrial Exhibition in Toronto last autumn, and I do not remember hearing a single complaint from any farmer regarding either our system of practical field experiments or the condition of our experimental grounds during the growing season. The aim throughout has been to do good work, and it is sincerely hoped that the results may prove of real practical value to the farmers of Ontario.

THE WEATHER. Maximum and minimum thermometers and a rain gauge are read at 8 a.m. each day, in order to determine the highest and lowest temperatures and the total amount of rain-fall for each month. The following table indicates the extreme temperatures, and the amount of rain which fell in each of the months from April until October inclusive, for the past summer:

Months.	Minimum temperatures.	Maximum temperatures.	Total amount of rainfall.
	Above zero. Degrees.	Above zero. Degrees.	Inches.
April	13	65	1.47
May	32	77	2.29
June	41	84	3.39
July	34	93	1.36
August	44	87	1.90
September	32	92	2.62
October	24	83	4.20

The figures in the foregoing table show that the highest temperatures were reached in the months of July and September, when the thermometer, which was placed according to directions issued by the Meteorological Service of Canada, showed readings of 93 and

92 degrees above zero, respectively. On the night of July 10th, a cold wave passed over a considerable portion of the Province; and although the minimum thermometer indicatd two degrees above the freezing point at the College, nevertheless, the effects of frost were seen upon tender plants on lower portions of the farm. Not much damage, however, was done to the crops in the Experimental department, as only one or two experiments showed any marked effects from the frost. It will be observed that there was a difference in the extremes of temperature of 59 degrees in the months of July and October, and of 60 degrees in the month of September.

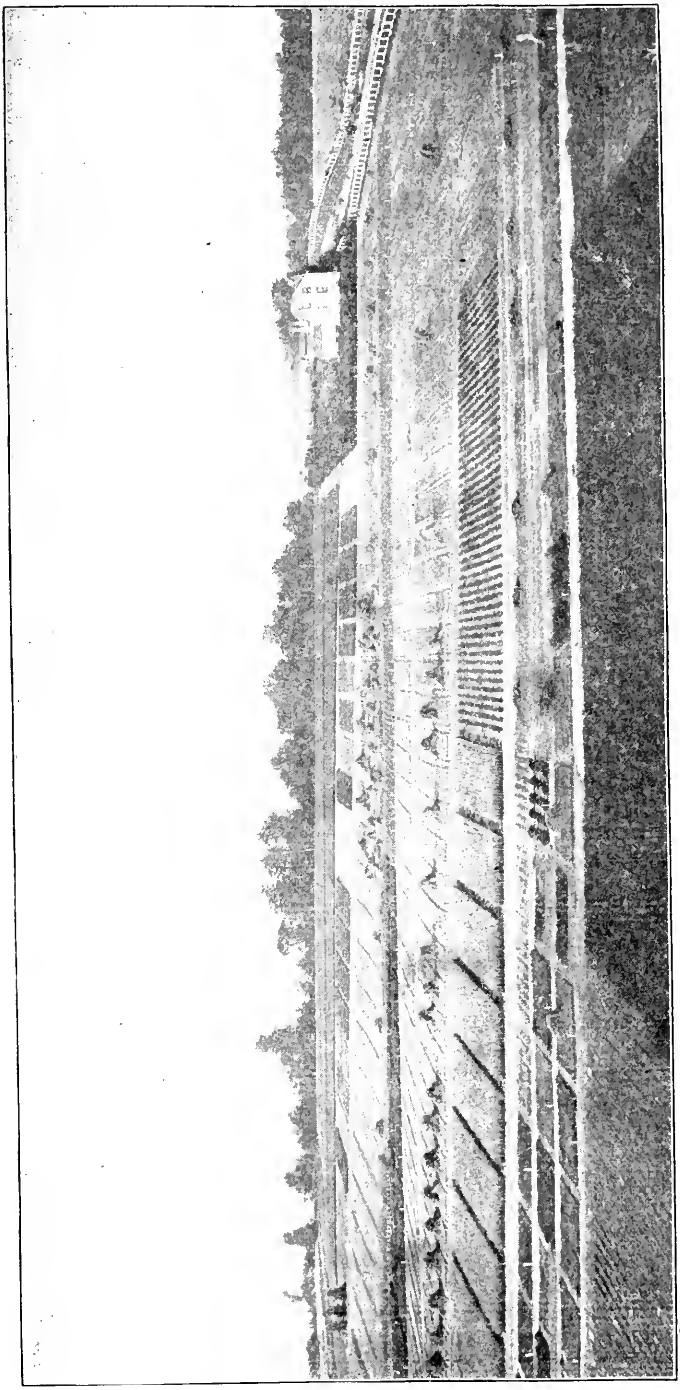
The smallest amount of rain-fall in any month during the summer was in July, when only about $1\frac{1}{3}$ inches of rain fell on the level, while in July of 1897 nearly five inches of rain fell. Hence it will be seen that the season was much more fovorable for harvesting the crops in good condition in 1898 than in the previous year: 6.7 inches of rain fell during the three summer months of this year, while upwards of 10 inches fell in the corresponding season of 1897.

Experimental Plots. The section of land now used for experimental plots consists of about fifty acres, which is located north-east from the main college building. The land has a gentle slope to the south-west, and the soil is what might be called an average clay loam. The plots used in 1898 varied in size from $\frac{1}{4}$ to 1.160 of an acre, but the majority of them were uniform in both size and shape, being 10 links wide by 100 links long, thus forming an area of 1-100 of an acre each. The paths, 5 links in width, separated the grain plots from one another. There were, in all, upwards of 2,000 plots devoted to experiments of various kinds in the experimental grounds in 1898. This included experiments with varieties, selection of seed, dates of seeding, application of fertilizers, methods of cultivation, etc.

Grain Experiments. In all instances the grain plots were of a rectangular form, and a stake was driven at each of the four corners of every plot. In most cases the grain was sown broadcast. A line was drawn around the outside of the plots, and the packages of grain, which had been previously weighed out in the experimental building, were sown upon their respective plots inside the enclosure made by the line. When the crops reached an average height of about two inches the line was again placed around each plot, and all plants outside of this line were cut off. All those inside of the line were allowed to remain growing. This made the area devoted to each plot an exact fraction of an acre, and also made the different plots belonging to the same experiment exactly uniform in both shape and size.

The growth and special characters of the various crops were watched throughout the season, and the necessary notes taken from time to time. When each variety of grain reached the proper stage of maturity it was cut with a cradle, and, in order to have the work done with uniformity, the cutting was nearly all done by one man. As soon as the grain became sufficiently dry it was hauled to the experimental barn in a wagon with a tight rack made especially for the purpose. The whole crop was immediately weighed and thrashed, great care being taken that no grain was lost and that no mixing occurred.

Several new varieties of grain were imported from foreign countries in the spring of 1898. Within the past twelve years we have received leading varieties of grain from France, Germany, Italy, Sweden, Russia, England, Scotland, Hungary, Greece, Austria, Egypt, Japan, New Zealand, Australia, Switzerland, and the United States. These have been grown under the same conditions as those secured throughout the Dominion of Canada. Most of these varieties have now been carefully tested in the Experimental department for several years in suscession. All varieties are grown for a period of at least five years, unless they show themselves very inferior within a shorter time. The ones which give the most satisfactory results are continued for a much longer period. In fact, a considerable number have now been grown for ten years in succession. Some of the varieties which have proved the most successful are now grown quite extensively throughout the Province, and are amongst the most highly prized grains under general cultivation. The leading varieties will be referred to when we are considering the results of the various experiments in the results to follow.



Experimental Plots at the Ontario Agricultural College Farm, Guelph.

EXHIBIT AT THE INDUSTRIAL FAIR. An exhibit from the Experimental department was placed in the Agricultural Hall at the Industrial Fair, Toronto, in the autumn of the present year, The chief objects of this exhibit were (1) To show in a general way the extent of our experimental work with varieties of grains at the Ontario Agricultural College; (2) To draw particular attention to the varieties which have given the best results; and (3) To illustrate the results from sowing seeds of different selections. The following quotations with reference to this exhibit are taken from two of our Agricultural papers:

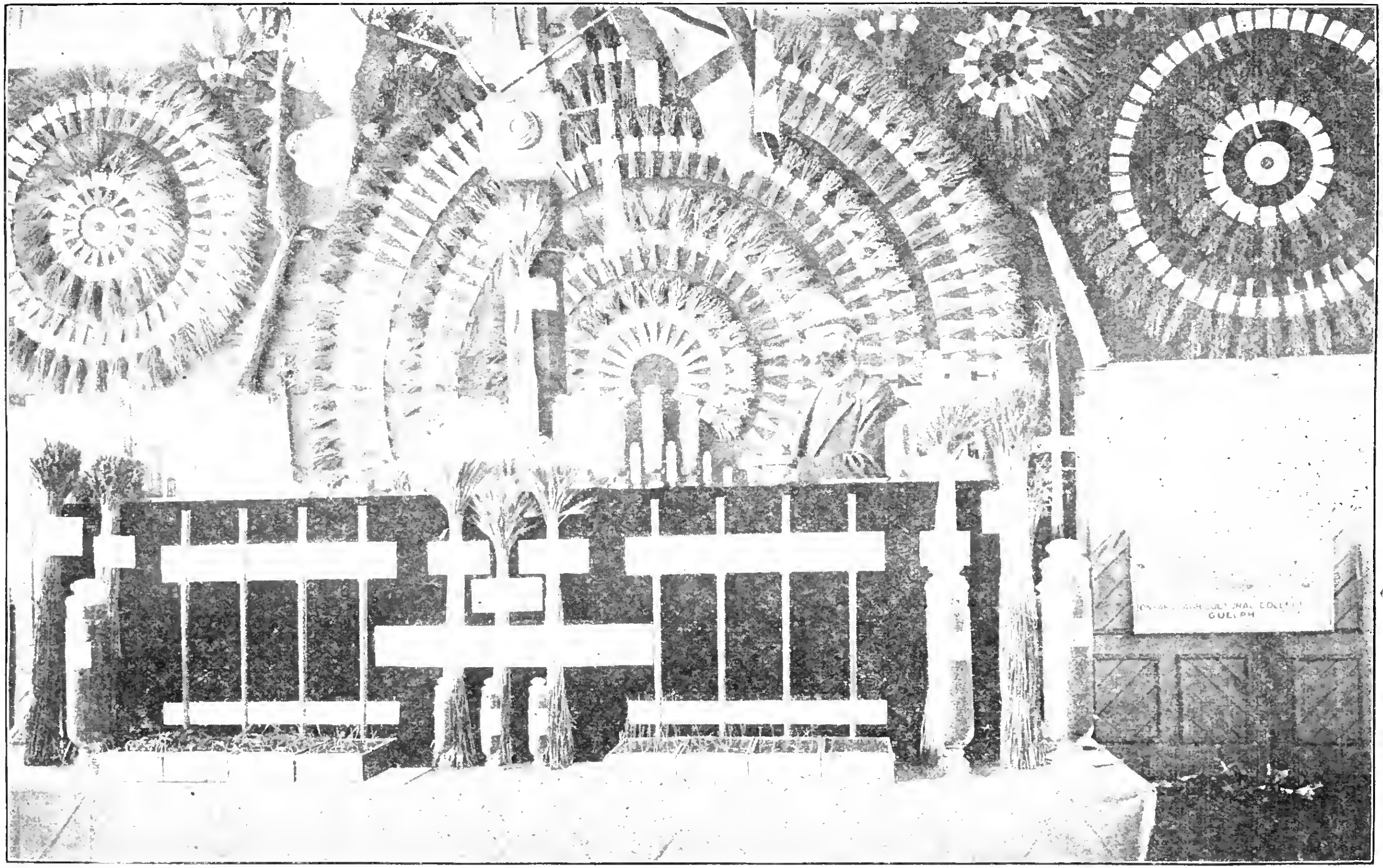
"Among the most interesting exhibits at the Fair were those of the Ontario Agricultural College. The exhibit in the Agricultural building was in charge of Mr. Zavitz, Experimentalist at the Farm, and consisted of an excellent display of grains in the straw, and arranged in the form of a circle at the south end of the building. In this display there were 160 varieties of spring and fall wheats, 80 varieties of oats, and 80 varieties of barley, and the arrangement of this was such as to make one of the most attractive exhibits on the grounds. . . . In addition to this, several tests were shown of the growth of good and poor seed, all proving conclusively that only the best quality of seed should be sown in any case."—"Farming," Toronto, Ont., Sept. 13th, 1898

"The authorities of the Ontario Agricultural College are preparing one of the most instructive exhibits ever seen in connection with modern agriculture. In Agricultural Hall, close to the Dufferin street entrance, there are being put up samples of practically all the grains sown in Ontario. In a place where they can be seen by all visitors, will be samples of the best varieties—as proven by tests at the College and through the Experimental Union—both in the ear and threshed. Not only this, but boxes of growing grain will be placed on view for the purpose of showing the relative value of good, bad and indifferent seed. Some of the boxes will show plants grown from plump seed; others from shrunken seed, and others again from broken grain, or grain injured by an insect. The boxes of growing plants in short, will show the relative value of all possible qualities of seed of the same variety. In addition there will be behind the boxes tubes giving the yeild per acre of the different qualities, and printed cards containing still more detailed information. The whole will be an object lesson in seed such as has never before been given in Ontario. The exhibit will be in charge of C. A. Zavitz, the College Experimentalist, one of the most efficient and enthusiastic exponents of modern agriculture in Ontario, and any information desired by visitors, in addition to that given by the exhibit itself, he will be glad to supply.—" "Farmers' Sun," Toronto, Ont., Sept. 1st, 1898.

BARLEY—COMPARATIVE TEST OF 34 VARIETIES.

In 1889, sixty-one varieties of barley, many of which were imported from foriegn countries, were grown side by side in the experimental grounds. The comparative tests of these varieties were repeated in each of the four following years. After the experiment had been carefully conducted for five years in succession, all the inferior varieties were dropped, and those which gave the best satisfaction were included in the experiments of the following years. Eight of these most promising varieties of barley were grown in the experimental grounds this year for the tenth season. Besides these, five leading varieties have been grown for nine years in succession, eight varieties for eight years, three varieties for seven years, four varieties for six years, three varieties for five years, two varieties for three years, and one variety for two years. The barley was all sowed broadcast at the rate of one hundred pounds of seed per acre on plots exactly 1-100 of an acre in size. Equal amounts were sowed on the different plots, and the seeding took place on April 16th of the present year. The land was manured in the spring of 1897, and produced a crop of turnips the same year.

The yield of barley per acre in 1898 was very large, the Mandscheuri producing as high as 77.6 bushels of grain per acre. The average yield of all the varieties was twenty-seven bushels per acre greater than in 1897, sixteen bushels per acre greater than in 1896, and eight bushels per acre less than in 1895. The weight of grain per measured bushel in 1898 was also high, the average being 53.3 pounds. This weight is over five pounds per measured bushel above the standard for barley, and is nearly four pounds per measured bushel greater than the average weight for 1897.



Ontario Agricultural College Exhibit of Cereals at the Toronto Industrial Exhibition, 1898.

The average yield per acre of the two-rowed varieties in 1898 was 65 bushels, and that of the six-rowed $67\frac{1}{2}$ bushels. This shows an average of $2\frac{1}{2}$ bushels per acre in favor of the six-rowed barleys. By examining the results of the two-rowed and six-rowed varieties for the number of years for which they have been grown, as indicated in the last column of the table, we find that, while some of the two-rowed varieties have given very good results, still, on the whole, the six-rowed barleys have given the best general satisfaction. In weight per measured bushel for the past year, the two-rowed barleys weighed on the average $1\frac{2}{3}$ pounds more than the six-rowed barleys.

Varieties of Barley.	Number of rows per head.	Results for 1898.			Average results for number of years grown.		
		Weight per measured bushel.	Yield per acre.		Weight per measured bushel.	Yield per acre.	
			Straw.	Grain.		Straw.	Grain.
Grown for Ten Years.		lbs.	tons.	bush.	lbs.	tons.	bush.
1. Mandscheuri	6	52.75	2.12	77.63	50.86	1.83	**65.02**
2. Oderbrucker	6	53.75	1.97	68.08	53.31	1.64	**57.14**
3. Scotch Improved	6	53.25	2.05	72.85	52.14	1.53	**55.57**
4. French Chevalier	2	54.75	2.27	66.02	52.38	1.93	**54.82**
5. Empress	2	54.25	2.30	67.90	52.36	1.74	**53.51**
6. Common Six-Rowed	6	54 00	1.74	62.90	52.53	1.44	**53.33**
7. Two-Rowed Italian	2	52.63	2.41	70.35	52.67	1.95	**49.70**
8. Kinna Kulla	2	52.50	2.28	68.08	51.79	1.78	**48.99**
Grown for Nine Years.							
9. New Zealand Chevalier	2	53.88	2.24	66.08	52.60	1.98	**54.52**
10. Mensury	6	53.75	1.99	70.08	51.73	1.43	**53.05**
11. Early Minting	2	54 25	2.35	66 56	52.50	1.88	**52.84**
12. Australian	2	53.75	2.34	67.29	52.99	1.80	**51.00**
13. Italian	2	52.75	2.19	67.02	53.42	1.77	**48.27**
Grown for Eight Years.							
14. Imperial Six-Rowed	6	53.13	1.99	70.42	51.99	1.49	**58.23**
15. California Brewing	6	48 88	2.00	64.58	46.55	1 51	**57.56**
16. Six-Rowed Baxter's Improved	6	54.00	1 97	61.79	52.00	1 56	**54.07**
17. California Chevalier	2	54.00	2.56	59.04	52.29	2.04	**52.40**
18. Highland Chief	2	54.00	2.25	58.27	52.56	1.71	**50.65**
19. Duckbill	2	53.38	2.30	66.67	52 30	1.64	**48.84**
20. Salzer's California Prolific	2	53.88	2.27	62.85	52.41	1.61	**48.54**
21. Carter's Goldthorpe	2	54.25	2.26	59.12	52.16	1.86	**47.90**
Grown for Seven Years.							
22. Gold Foil Hansfords	2	54 00	2 77	65.90	52.64	1.98	**53.60**
23. Two-Rowed Canadian	2	53.00	2.33	65.56	52.05	1.70	**49.15**
24. Selected Canadian Thorpe	2	53.88	2.08	62.31	51.84	1.62	**45.93**
Grown for Six Years.							
25. Four-Rowed	6	53.38	2.10	72 85	51.58	1.41	**57.57**
26. Vermont Champion	2	56.63	2.29	68.00	53.93	1.75	**52.79**
27. Jarman's Selected Beardless	2	56.50	2.35	69.75	53.05	1.78	**51.87**
28. Jarman's Golden Champion	2	53.88	2.33	59.21	51.50	1.73	**40.78**
Grown for Five Years.							
29. North-Western	6	51.88	2.13	73.90	50.55	1.54	**53.49**
30. Scotch	6	52.63	1.98	67.52	50.62	1.49	**53.27**
31. Success	6	48.88	1.62	55.54	46.73	1.25	**36.25**
Grown for Three Years.							
32. Silver King	6	52 50	2.13	73.77	50.81	1.46	**51.99**
33. Manitoba Six-Rowed	6	52.63	1 84	65 06	51.46	1.35	**47.28**
Grown for Two Years.							
34. Dakota Silver Beardless	6	50.13	1.76	55.67	47.76	1.46	**45.26**

By an examination of the foregoing table, it will be noticed that the best yields have been produced by some of the varieties which have been grown for the greatest length of time at the College. In 1898, the Mandscheuri variety gave nearly four bushels per acre more than the next highest yielding variety. The eight varieties standing at the top of the list have all been grown on the same farm for ten years in succession without changing seed from other localities, or from other soils. It will be noticed that the lightest weight per measured bushel produced from any of the eight varieties grown for ten years in succession is $52\frac{1}{2}$ pounds, which is $4\frac{1}{2}$ pounds over the standard for barley. The barley which gave the heaviest weight per measured bushel in 1898 was the Vermont Champion which produced a grain that weighed 56.6 pounds per measured bushel, and an average o 53.9 pounds per measured bushel in the experiments of six years. One of the mos important columns of figures is the one at the right hand side of the table, which gives the average yield of grain per acre for the number of years in which the varieties have been under experiment at the College. It will be seen from this column that the Mandecheuri has given decidedly the largest average yield, the average being a trifle over sixty-five bushels per acre for the ten years' experiments. The Oderbrucker, which is also a six-rowed barley, and stands second in the list of yield of grain per acre, has given an average of about eight bushels per acre less than the Mandscheuri; but, at the same time, it will be observed that the weight of grain per measured bushel is nearly $2\frac{1}{2}$ pounds greater than that of the Mandscheuri in the average results for ten years.

Hulless Barley—Comparative Test of Eleven Varieties.

Five varieties of hulless barley were sown in the spring of 1898 for the ninth season in succession. Besides these, six other varieties, which have been tested in our experimental grounds for a less number of years, were also sown. As in the case of the two-rowed and the six-rowed varieties, the seeding took place on April 16th, on plots of exactly the same shape and size as those used for the two-rowed and the six-rowed varieties.

Varieties.	No. of rows per head.	Results for 1898.			Average results for number of years grown.		
		Weight per measured bushel	Yield per acre.		Weight per measured bushel.	Yield per acre.	
			Straw.	Grain.		Straw.	Grain.
Grown for nine years:		lbs.	tons.	bush.	lbs.	tons.	bush.
1 Black Hulless	6	66.50	1.87	50.28	63.33	1.51	40.41
2 Guymalaya	6	62.00	1.91	48.07	58.46	1.44	38.70
3 Hungarian	6	62.00	1.85	46.67	59.29	1.53	38.48
4 Large Skinned	2	63.75	1.88	44.07	59.74	1.54	33.64
5 Three-Rowed	6	63.13	2.12	46.13	60.56	1.34	28.87
Grown for six years:							
6 Guy Mayle	6	64.13	1.59	50.47	61.45	1.37	44.69
7 Purple	6	66.50	1.84	50.48	63.32	1.64	41.99
8 Smooth hulless	6	63.00	1.85	41.67	60.28	1.57	33.66
Grown for five years:							
9 Winnipeg No. 2	6	63.00	1.96	44.68	60.07	1.71	38.
Grown for three years:							
10 New White Hulless	6	63.00	2.10	43.48	59.09	1.56	29.88
Grown for two years:							
11 Hog	2	63.88	2.25	50.97	60.19	2.02	41.

The grain of the hulless varieties of barley resembles that of wheat or rye, weighing on the average about sixty pounds per measured bushel. We have therefore adopted sixty pounds as the standard weight per measured bushel in calculating the yields per acre. It will be observed from the foregoing table that all of the varieties produced grain in 1898 which weighed upwards of sixty pounds per measured bushel, and that two of the varieties produced grain which weighed sixty-six and a half pounds per measured bushel. These weights are certainly high. In the average results for the number of years grown, it will be seen that the Black Hulless and the Purple varieties each produced grain which weighed an average of sixty-three pounds per measured bushel. The average yield per acre of the eleven varieties grown in 1898 was nearly twenty-four bushels per acre greater than the average yield of 1897, and twelve bushels per acre greater than that of 1896. The Black Hulless variety, which stands at the head of the list in the yield of grain per acre, produces a grain which weighs remarkably well, but possesses a straw which is very weak, and is apt to become badly lodged in many localities. The Hungarian variety possesses a straw which usually stands up well, and in that respect is a much more satisfactory variety to grow than the Black Hulless.

Barley—Broadcasting and Drilling at Six Different Dates.

An experiment has been conducted for four years in succession by sowing barley, peas, spring wheat, and oats on six different dates; and for three years the grain was broadcasted and also sown with a grain drill on each of these dates. The plots were all similar in size, and the same quantity of seed was used in all cases. The land used for this experiment in 1898 was manured at the rate of twenty tons of farm yard manure per acre in the spring of 1897, after which it produced a crop of potatoes in the same year. The crop on each plot was harvested when it reached its proper stage of maturity. The following table gives the average results of the experiments conducted for four years in succession with barley, and also the results of the experiment conducted in 1898.

Date of Seeding	Average results from different methods of seeding		Average Results from Different Dates of Seeding.			
	Broadcasted or Drilled	Yield of grain per acre. Average 3 years 1896-98	Weight per measured bushel		Yield of grain per acre	
			1898	Average 4 years 1895-8	1898	Average 4 years 1895-8
		bus.	lbs.	lbs.	bus.	bus.
April 18—19....	Broadcasted..	43.87	53.94	51.52	34.67	**46.27**
	Drilled...	47 09				
April 22—25....	Broadcasted..	48.61	53.38	51.66	40.04	**46.97**
	Drilled.....	45.46				
May 1—4.......	Broadcasted..	35.47	52.97	50.25	30.04	**37.96**
	Drilled.......	37.29				
May 9—11 ...	Broadcasted..	28 36	50.69	47.59	23.80	**32.80**
	Drilled.......	33.68				
May 18.........	Broadcasted..	23.09	49.19	46.36	24.91	**25.54**
	Drilled.......	22.97				
May 25—29.....	Broadcasted..	12.09	48.28	43.33	11.24	**14.45**
	Drilled.......	10.07				

The average yield of grain per acre produced from broadcasting the seed on six different dates is 31.9 bushels, and that from sowing the grain with a grain drill is 32.8 bushels, which is an advantage of about 1 bushel per acre in favor of sowing barley with the grain drill. The largest individual yield, however, was produced from sowing barley broadcast on the 25th of April, the yield in this instance being 48.6 bushels per acre. The lowest yield was produced by sowing the grain with a grain drill on the last date of seeding.

The results from sowing grain at six different dates for four years in succession showed the advantage of early seeding in the case of barley. In three out of the four years, there were only three or four days between the first and the second dates of seeding. The average results from the two first dates of seeding are quite similar, but a marked decrease both in yield per acre and in quality of grain took place as the season advanced from the second date of seeding. The yield of grain from the last date of seeding is less than one-third of that produced from the seeding which took place on the 18th and 19th of April. In the average of four years' experiment the best all-round results were reached from sowing barley on or about the 22nd of April.

Peas—Comparative Test of 52 Varieties.

Of the 52 varieties of peas which were grown in the experimental grounds in 1898, 41 varieties have been grown for at least five years in succession, and the remaining 11 varieties have been grown for a less number of years. Five new varieties were obtained in the spring, and were sown in the experimental grounds in 1898 for the first time. The land upon which the peas were grown in the past season was an average clay loam, which was manured at the rate of twenty tons of farmyard manure per acre in the spring of 1897, and produced a crop of corn the same season The seed of the different varieties was sown on April 27th, except that of the Crown, Lakefield, and Baltimore, which was sown two days later. The plots were exactly 1-100 of an acre in size throughout. The grain was sown with an ordinary grain drill having ten tubes—the tubes being 7.92 inches apart. The amount of seed used was regulated according to the size of the grain and the manner of growth of the various kinds, and varied from 2 to 4½ bushels per acre.

The fifty-two varieties of peas grown in 1898 gave an average yield of 24.4 bushels per acre, and an average weight per measured bushel of sixty pounds. This record is somewhat below the average of the past few years The highest yields produced this year were by the following varieties: Waterloo 31.9 bus, Early Frame 31.1 bus., White Wonder 30.5 bus., and Tall White Marrowfat 30.2 bus. In the average results of eight years' experiments it will be seen that the White Wonder stands at the head of the list in yield of grain, producing an average of a little over thirty seven bushels per acre. The grain of this variety weighs very heavy; the average for the eight years being over sixty-three pounds per measured bushel. The White Wonder variety is best suited to a comparatively rich soil, as the straw is not so long as that of many other varieties. The seed was originally imported by the College from New Zealand. The Early Britain, which stands second on the list in yield of grain per acre among the varieties grown for eight years, was imported from England, and is giving very good satisfaction in the comparative results. It has been distributed throughout Ontario, in connection with the co-operative experiments, along with three other varieties in each of the past three years. When the returns were received from the different experimenters and the results of the successfully conducted experiments were summarised, it was found that the Early Britain gave the highest yield per acre of the four varieties sent out in each of these three years. As the Early Britain variety is slightly wrinkled, it does not give so large a weight per measured bushel as some of the smooth varieties. The foregoing results show that the Early Britain weighs 3½ pounds per measured bushel less than the White Wonder. It will be noticed that the Mummy variety, which stands fourth on the list in yield per acre, produced grain which weighed over sixty-four pounds per measured bushel in the average of eight years. The Chancellor variety of peas has now been grown in the experimental grounds for six years in succession, and stands at the head of the list in yield per acre among the varieties which were grown for the first time in 1893. It is a small white pea, and ripens about ten days earlier than the Golden Vine, and about two weeks earlier than the Prussian Blue variety. In the co-operative work throughout Ontario in 1898, the Chancellor came second in the list in the yield of grain per acre, the highest place being taken by the Early Britain.

Special attention is drawn to the first column of figures in the following table, as the injury caused by the ravages of the pea weevil (bruchus pisi) are enormous in some parts of the Province. In order to glean such information as we can regarding the injury caused by the pea-weevil to the different varieties of peas when sown side by side, we have closely examined the peas for the last two years, in order to find out the percentage of each variety which had been injured by the pea-weevil. The figures in the column give the exact percentage of peas which were infested with the pea weevil. From general appearance the peas would not indicate nearly so much injury done as is recorded in the foregoing table, as in many instances the weevil was still located in the central part of the peas, owing to the pea having been treated with carbon bisulphide as soon as possible after harvest, and before the weevil had done much damage. Among all the varieties of peas that have been grown during the last two years, the Oddfellow variety has been the freest from the ravages of the pea-weevil in each of these years. By a close examination of all the varieties of peas which we grow from year to year, we hope to obtain valuable information regarding the extent to which they are injured by the weevil. From our present knowledge, the Oddfellow and the Mummy are among the least, and the Nimble Taylor among the most affected

Peas—Comparative test of 52 varieties.

Varieties of Peas.	Results for 1898. Percentage of peas injured by weevil.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Average weights for number of years grown. Number of days from time of seeding until maturity.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for Eight Years:		lb.	tons.	bush.		lbs.	tons.	bush.
1 White Wonder (New Zealand)	20	62 75	1.49	30.45	92	63.38	1.16	**37.09**
2 Early Britain	49	58.63	1.36	26.30	98	59.89	1.24	**36.11**
3 Field (New Zealand)	29	60.50	1.13	29.95	124	61.83	1.25	**35.91**
4 Mummy	11	63.25	2.17	24.32	96	64.01	1.56	**34.93**
5 Brown (New Zealand)	44	55.75	1.32	24.20	98	59.16	1.45	**34.27**
6 Blue (New Zealand	36	60.25	1.57	26.10	92	62.28	1.18	**32.45**
7 Prussian Blue	40	60.38	1.54	25.27	100	62.19	1.55	**32.29**
8 Glory	36	61.00	1.02	26.07	96	61.34	1.19	**31.94**
9 Princess Royal	35	58.75	1.26	21.20	96	60.15	1.18	**31.68**
10 White-Eyed Marrowfat	43	61.38	1.58	25.55	100	62.14	1.43	**31.20**
11 Early Race Horse	45	58.50	1.39	28.67	98	61.28	1.21	**30.72**
12 Black-Eyed Marrowfat	50	60.13	1.42	24.20	98	61.43	1.34	**30.16**
13 Multiplier	42	60.25	1.97	21.12	107	61.79	1.61	**28.26**
Grown for Seven Years:								
14 Tall White Marrowfat	54	58.88	1.65	30.15	98	61.50	1.58	**34.51**
15 New Canadian Beauty	36	61.00	1.45	26.58	97	62.09	1.38	**31.03**
16 Canada Cluster	23	61.25	1.53	25 75	96	62.88	1.48	**30.87**
17 Golden Vine	33	62.38	1.50	27.55	104	62 25	1.23	**30.05**
18 Centennial White	43	60.75	1.55	24.30	104	61.53	1.33	**29.93**
19 Potter	40	60.13	1.60	28 43	96	61.40	1.31	**29.82**
20 Cleveland's Advancer	46	61.25	1.74	27 03	104	61.33	1.40	**29.24**
21 Royal Dwarf Marrowfat	39	60.38	1.45	22.40	104	61.40	1.40	**29.22**
22 McLean's Advancer	40	61.13	1.24	25.33	96	56.44	1.04	**28.81**
23 Sword	49	59.75	1.42	22.78	104	61.73	1.38	**28.31**
24 Scotchman	34	61.50	1.19	16.28	104	62.44	1.71	**27.56**
25 Canada Field	45	61.25	1.78	23.07	105	61.55	1.41	**27.02**
26 Prince Albert	45	60.75	1.57	17.65	107	61.92	1.55	**26.85**
27 Striped Wisconsin Blue	42	61.00	1.70	17.63	104	62.51	1.56	**24.44**
28 Oakshott Field	62	53.00	1.90	15.93	105	54.30	1.67	**22.53**
29 Pride of the North	37	59.00	.87	6.77	98	59.65	.98	**19.30**
Grown for Six Years:								
30 Chancellor	54	57.50	1.29	20.37	96	62.35	1.30	**32.35**
31 Common Grey	29	59.13	1.67	23 52	98	58.84	1.42	**31.62**
32 William 1st	64	56 38	1.29	19.63	100	58.56	1.09	**31.54**
33 Nimble Taylor	65	54.88	1.26	18.83	100	58.59	1.31	**31.40**
34 D'Auvergne	36	60.25	1.72	29.32	98	61.77	1.22	**31.09**
35 Nine Pod	41	58 00	1.60	20.15	100	59.31	1.41	**31.05**
36 White Imperial	34	61.38	1.74	28.60	98	61.33	1.38	**29.28**
37 Early June	36	61.13	1.44	22.82	100	62.11	1.36	**29.11**
38 Tall Turkish	40	60.63	1.64	24.62	96	60.91	1.26	**28.91**
Grown for Five Years:								
39 Improved Grey	55	57.63	1.61	27.13	98	59.16	1.18	**32.17**
40 Crown	34	60.13	1.68	26.57	96	60.09	1.34	**29.73**
41 Coffee	32	60.13	1.72	17.77	99	60.11	1.48	**23.00**
Grown for Four Years:								
42 White Hundredfold	39	59.50	1.58	28.13	100	61.38	1.47	**35.60**
Grown for Three Years:								
43 Lindsay	54	55.13	1.75	29.85	96	55.60	1.28	**26.50**
44 Waterloo	44	55.13	1.72	31.90	96	55.21	1.18	**24.27**
Grown for Two Years:								
45 Harriston Glory	37	60.63	1.47	26.15	99	62.07	1.29	**29.63**
46 Elephant Imperial Blue	41	59.25	1.52	27.63	99	61.38	1.16	**27.57**
47 Oddfellow	10	64.75	1.53	19.02	98	65.07	1.25	**18.00**
Grown for One Year:								
48 Early Frame	27	62.00	1.04	31.12	99	62.00	1.84	**31.12**
49 California Creeper	25	62.00	1.95	26 82	104	62.00	1.95	**26.82**
50 Bismark's Hog Food	21	62.50	2.03	26.63	104	62.50	2.03	**26.63**
51 Lakefield	13	64.00	1.85	25.75	98	64.00	1.85	**25.75**
52 Baltimore	30	60.88	1.72	22.96	101	60.88	1.72	**22.96**

For three years in succession the peas grown in the Experimental department have been treated for the pea weevil as soon as possible after harvesting. We used carbon bisulphide for this purpose in each of the three years, and as the results proved very satisfactory, and a number of our readers may not have seen any bulletin on this subject, I give a very concise summary of the treatment of weevily peas which is simple in method and effectual in results. The treatment which we recommend from our three years' experience is as follows: The peas containing the weevil should be placed in a comparatively air-tight box, barrel, bin, or room, either in bulk or in cloth bags. Flat dishes should then be placed on top of the grain, and after the carbon bisulphide is poured into them, the compartment containing the peas should be closed and allowed to remain undisturbed for forty-eight hours, in order that the vapors, which are 2½ times heavier than air, may penetrate every portion of the receptacle and do effective work. The weevil can be destroyed at any stage of their growth; but the treatment should not be attempted when the thermometer stands lower than ten degrees below zero, as it is claimed that the liquid would not vaporize sufficiently to work satisfactorily. I would strongly recommend treating the peas immediately after they are harvested and threshed in the autumn, to destroy the weevil when they are small and entirely enclosed in the peas. The vapors of the carbon bisulphide will penetrate the skins of the peas and destroy the weevil before they have completed their work of destruction and made their escape. Peas which are not treated in the autumn should be treated in the warm days of the winter or in the spring, to check the spread of this troublesome insect.

Carbon bisulphide is a clear liquid which volatilizes very rapidly, and, as the vapors are very inflammable, great care should be taken to keep fire away from them. Carbon bisulphide can be purchased in small quantities from most druggists, or in larger quantities from the manufacturers. It has been estimated that 1½ pounds of the liquid is sufficient for each ton of the grain to be treated, if used to the best advantage possible. We usually, however, use about one pound of the liquid to each ten bushels of grain, as it is important to have the work thoroughly done without the necessity of repeating it.

Peas—Broadcasting and Drilling at Six Different Dates.

As in the case of barley, peas were sown in the spring of 1898 by hand and with a grain drill on six separate dates. The plots were all 1-100th of an acre in size, and equal quantities of seed were used for the various plots.

Date of seeding Peas.	Average results from different methods of seeding.		Average results from different dates of seeding.			
	Broadcasted or drilled.	Yield of grain per acre. Average 3 years 1896-98.	Weight per measured bushel.		Yield of grain per acre.	
			1898.	Average 4 years 1895-98.	1898.	Average 4 years 1895-98.
		bus.	lbs.	lbs.	bush.	bush.
April 18-19	Broadcasted	22.66	61.54	58.94	14.05	**25.72**
	Drilled	24.21				
April 22-25	Broadcasted	28.80	60 97	58.83	25.11	**30.81**
	Drilled	29.59				
May 1-4	Broadcasted	22 85	60.32	59.55	20.93	**27.73**
	Drilled	23.27				
May 9-11	Broadcasted	18.12	59.00	59.36	13.29	**24.69**
	Drilled	18.59				
*May 18	Broadcasted	10.05	57.78	58.35	9.58	**19.87**
	Drilled	10.90				
*May 25-26	Broadcasted	7 88	53.88	58.19	6.74	**17.97**
	Drilled	8.54				

* The average results from the seeding of May 18th and of May 25th and 26th are for one year less than for those of the seeding of the first four dates.

The grain which was sown with a drill gave an average of one bushel per acre more than that which was sown broadcast with the hand. When the average results of the six dates of seeding are taken into consideration, it will be observed that the largest average yield for three years was produced by sowing the peas with a grain drill on or about the 22nd of April. It will also be observed that the smallest average yield for three years was produced from the peas which were sown broadcast on the last date mentioned.

In comparing the results from sowing peas on the different dates enumerated in the foregoing table, it will be seen that the largest average yield per acre for four years was secured from the second date of seeding, and also that there was a larger yield of peas per acre from sowing on the first three or four days of May than from sowing on the 18th or 19th of April. As the seedings advanced beyond the 4th of May, however, the decrease in the yield of grain per acre was quite marked. The average results of these experiments seem to indicate that the best returns have been secured from sowing peas with the grain drill, on, or shortly after, the 22nd of April.

Spring Wheat—Comparative Test of Forty-Eight Varieties.

Eighty-seven varieties of spring wheat have been tested in the trial grounds within the past ten years After five years careful experimental work, however, a number of the poorest varieties were dropped from the experiments, and only the most successful ones were retained. In 1898, forty-eight varieties were tested. Four of these were grown in 1898 for the first time. The soil on which the experiments with wheat were conducted was situated in the northern portion of the experimental grounds, and was quite uniform in character. It was manured in the spring of 1897 with twenty tons of farm yard manure per acre, and produced a crop of roots in the same year. The seed was sown broadcast on April 15th, with the exception of the Thick Set variety, which was sown one week later, and the Imperial, which was sown about the 22nd. The grain was sown broadcast at the rate of two bushels per acre, excepting the large coarse varieties, as Bart Tremenia, Wild Goose, Medeah, Sorentine, Algiers and Ontario, which were sown at the rate of two and a half bushels per acre.

The average yield of the forty-eight varieties of spring wheat grown in 1898 was thirty-two bushels per acre, which was double that of the previous year, and about equal to the average yield of 1894. The quality of spring wheat grown in the plots in the last season was good, the average weight per measured bushel of the forty eight varieties being 60.17 pounds. But little interest has been taken in the spring wheat crop of Ontario for a good many years. The interest, however, has revived considerably during the past two or three years, as shown by the greatly increased number of applications for the best varieties of spring wheat. When it is seen that varieties of spring wheat which are grown in experimental plots give a yield of from twenty-eight to thirty four bushels per acre in the average of nine and ten years' experiments, and at the same time produce grain which weighs from 60 to 62½ pounds per measured bushel, it seems evident that spring wheat can still be grown quite successfully in some parts of Ontario at least. Those varieties of spring wheat which give the best satisfaction under varied conditions, extending through several years' experiments, are the varieties from which we may hope to receive the most satisfactory results in general cultivation.

In weight of grain per measured bushel, it will be observed from the foregoing table that the Medeah, Bart Tremenia and Sorentino gave the largest number of pounds. These, however, are coarse wheats, somewhat resembling the Wild Goose variety in character. It will be observed, however, that the Herison Bearded gave 63¼ pounds per measured bushel, and this is a wheat recommended by the Dominion Millers' Association as being one possessing good milling qualities. When driving through the county of Prince Edward in July of the present year I observed several fields of the Herison Bearded variety, and some of the farmers of that county informed me that the millers would pay the highest price for that wheat. I understand that the variety is giving good satisfaction The Herison Bearded has given an average of forty one bushels per acre in our plots this year, and has produced an average of twenty-eight bushels per acre for the past ten years. When we realize that the weight per bushel of the Herison Bearded for

Spring wheat—Comparative test of varieties.

Varieties of Spring Wheat.	Nature of heads.	Results for 1898.			Average results for number of years grown.		
		Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.
Grown for ten years:		lbs.	tons.	bush.	lbs.	tons.	bush.
1. Bart Tremenia	Bearded	64.63	1.79	37.17	62.40	1.71	**28.89**
2. Herison Bearded	"	63.75	2.22	41.07	62.50	1.82	**28.02**
3. Pringle's Champion	"	62.50	2.21	37.12	60.05	1.72	**25.37**
4. Saxonka	"	63.25	2.11	37.23	60.51	1.68	**25.10**
5. Konisburg	"	62.13	1.82	31.77	61.10	1.57	**24.39**
6. Holben's Improved	Bald.	59.63	1.85	30.68	58.15	1.66	**22.62**
Grown for nine years:							
7. Wild Goose	Bearded	62.13	2.38	48.29	61.23	1.96	**34.13**
8 Red Fern	"	62.88	2.14	36.02	60.68	1.91	**30.04**
9. Medeah	"	65.00	2.00	42.55	60.91	1.74	**29.78**
10. Sorentino	"	64 13	1.92	38 62	59.78	1.83	**28.14**
11. White Russian	Bald.	59.88	2.11	36.25	58.13	1.80	**28.09**
12. Algiers	Bearded	63 38	1.87	36 02	58.13	1.80	**26.99**
13. Red Fife	Bald.	61.00	1 95	34.22	60.12	1.79	**26.85**
14. White Fife	"	61.13	2.24	37.72	55.99	1.64	**25.34**
15. Colorado	Bearded	63.25	2.21	38.72	59.22	1.67	**24.31**
Grown for eight years:							
16. Rio Grande	Bearded	61.00	2.15	31.67	59.23	1.82	**25.67**
17. McCarlin	"	62.00	1.88	28.90	59.04	1.83	**25.07**
18. Manitoulin	Bald.	61.13	1.77	30.10	58.66	1.55	**24.06**
19. Okanagan Valley Velvet Chaff	"	57.88	2.09	32.88	54.96	1.68	**23.83**
Grown for seven years:							
20. Wellman Fife	Bald.	61.00	2.32	37 83	58.52	1.84	**27.14**
21. Lost Nation	"	60.50	2.20	37.50	58.09	1.72	**25.38**
22. Velvet Chaff Blue Stem	"	57.38	2.02	32.55	56.31	1.65	**23.85**
23. New York	Bearded	59.50	1.92	31.75	57.44	1.58	**22.26**
24. Dakota Marvel	Bald.	57.88	2.01	33.90	56.13	1.64	**21.73**
25. Hayne's Blue Stem	"	59.00	1.89	31.90	55.96	1.63	**21.51**
26. Manitoba Red	"	60.63	1.62	28.37	58.38	1.54	**21.39**
27. Campbell's White Chaff	"	60.00	1.68	28.18	54.63	1.32	**16.36**
Grown for six years:							
28. Blue Democrat	Bearded	61.13	2 34	32.83	59.15	1.87	**25.18**
29. Champion bearded	"	61.38	1.96	29.55	59 00	1.64	**21.68**
30. French Imperial	Bald.	61.00	2.03	33.90	58.29	1.45	**21.19**
31. Amethyst	"	60.63	1.76	28.90	58.14	1.43	**20.91**
32. Ontario	Bearded	59.00	2.47	34.40	57.18	1.85	**20.83**
33. Early Scotch Bearded	"	60.25	2.31	27 92	57.32	1.59	**18.54**
34. Scotch Fife	Bald.	60 50	1.81	29.80	57.86	1.24	**17.52**
35. Canadian Club	"	61.00	1.35	20.73	56.27	1.35	**15.38**
36. Niagara	"	59.00	1.42	19.38	54.23	1.15	**12.95**
Grown for five years:							
37. Salzer's Marvel	Bald.	57.38	1.85	32.40	56 07	1.32	**20.[illegible]6**
38. Red North Dakota	"	61.00	1.50	31 70	57.95	1.19	**19.74**
39. May's Early Wonder	"	60.88	1.72	30.37	59.88	1.19	**18.52**
Grown for four years:							
40. Manitoba Hard	Bald.	60.50	1.51	26.33	57.14	.98	**14.99**
Grown for three years:							
41. Preston	Bearded	61.88	1.67	32.83	56.94	.98	**17.01**
42 Percy	Bald.	61.63	1.75	27.65	56.38	1 05	**14.26**
43. Stanley	"	60.88	1.55	26.75	56.55	.94	**14.07**
44. Seven Headed	"	56.25	1.99	24 67	53.00	1.34	**11.20**
Grown for one year:							
45 Speculation	Bearded	63.00	1.76	27 87	63.00	1.76	**27.87**
46. Warren	"	62 13	1.74	27.08	62.13	1.74	**27.08**
47. Thick Set	"	62.88	1.55	25.68	62.88	1.55	**25.68**
48. Imperial	"	60.63	1.60	18.47	60.63	1.60	**18.47**

ten years is 62½ pounds, we are forced to the conclusion that this variety should receive the attention of the farmers who are still interested in the production of spring wheat upon their own farms. The Red Fern variety of spring wheat proves to be one of the very best of all the varieties in yield per acre, although it weighs about two pounds per measured bushel less than the Herison Bearded. The greatest fault with many of the varieties of spring wheat is their light weight per measured bushel. It will be observed that the White Russian, which has been grown quite largely throughout Ontario, weighs only a little over fifty-eight pounds per measured bushel in the average of nine years' growing. The last four varieties mentioned on the list were all grown this year for the first time, and the seed was obtained from different parts of Ontario. These wheats are all very similar in their characteristics, and might be classed as one variety. The Imperial gave much poorer results than any of the other three, but this no doubt occurs from its being sown about one week later than the rest of the varieties.

Spring Wheat—Broadcasting and Drilling at Different Dates.

Spring wheat was sown with an ordinary grain drill and was broadcasted by hand on six different dates in the spring of 1898. The plots used for this experiment were each 1-100 of an acre in size, and the soil was very uniform throughout in regard to elevation, previous cropping and previous manuring. The seed was sown at the rate of two bushels per acre in every instance, and the yields given in the following table were determined from the actual yields of the plots.

Date of seeding Spring Wheat.	Average results from different methods of seeding.		Average results from different dates of seeding.			
	Broadcasted or drilled.	Yield of grain per acre. Average 3 years 1896 8.	Weight per measured bushel. 1898.	Weight per measured bushel. Average 4 years 1895-8.	Yield of grain per acre. 1898.	Yield of grain per acre. Average 4 years 1895-8.
		bush.	lbs.	lbs.	bush.	bush.
April 18-19	Broadcasted	18.70	61.28	59.99	16.66	**20 21**
	Drilled	18.89				
" 22-25	Broadcasted	17.44	60.91	58.92	19.13	**17.42**
	Drilled	17.66				
May 1- 4	Broadcasted	12.73	60.51	58.59	12.20	**14.23**
	Drilled	14.06				
" 9-11	Broadcasted	10 90	60.60	58.28	12.18	**11.60**
	Drilled	9.58				
" 18	Broadcasted	6.05	60.56	54.41	10.47	**7.35**
	Drilled	5.46				
" 25-26	Broadcasted	3.56	59.32	53.65	5 90	**6.04**
	Drilled	2.87				

The average yield from the two methods of seeding, when the results of three years are taken into consideration, do not vary more than ten pounds per acre. It must be understood that the land was in a good state of cultivation when the seeding took place. Had the land been very rough and poorly worked, it is likely that there would have been a much more decided difference between the methods of seeding.

The great advantage of the early seeding of the spring wheat shows itself in this experiment. It will be seen from the foregoing results that the largest yield per acre and the best quality of grain were produced from the first date of seeding; and as the season advanced there was a decrease in both quantity and quality of the grain produced.

Winter Wheat Experiments.

Bulletin 108 was issued in August giving the results of experiments with winter wheat As this bulletin was distributed in large numbers it will not be repeated in this report. The conditions of the experiments and the conclusions therefrom will be briefly stated.

A good deal of attention has been given to the testing of winter wheat in the Experimental department of the Ontario Agricultural College. Varieties obtained from the United States, England, Scotland, Germany, France and Russia have been carefully tested along with those secured from the wheat-growing sections of Canada. Besides variety tests, there have been experiments conducted in different dates of seeding, methods of soil preparation, methods of seeding, selection of grain for seed, quantities of seed per acre, application of fertilizers, treatment of smut-infested seed, the yield and quality of wheat cut at different stages of maturity, and the value of seed from wheat cut at different stages of maturity. These experiments have occupied over twelve hundred plots within the last nine years.

The two hundred and three plots used for the experiments with winter wheat in 1898 were situated in the southern portion of the large experimental field which lies at the rear of the main College building. The land used for one of the experiments had a gentle slope towards the south, and that used for the other experiments was comparatively level. No manure had been applied to the land since the spring of 1896, when it received a dressing of twenty tons of farmyard manure per acre. Commercial fertilizers had not been used for at least ten years. The land produced a crop of spring grain in 1895, a crop of roots in 1896, and a crop for green manuring in 1897, which was plowed under during the first week in August of that year. No other plowing was done, but the land was well stirred on the surface up to the time of sowing the winter wheat. The land was very carefully measured and divided into plots, which were made exactly uniform in size and shape for the separate experiments. The smallest plots were each 1-100 of an acre in size, and were used for the smut-infested grain, which had been treated in different ways; and the largest plots were each 1-28 of an acre in size, and were used for the different preparations of soil for winter wheat.

Ninety-two varieties of winter wheat were sown in the autumn of 1897. The plots were situated side by side, and were separated from each other by paths three feet wide. All the plots were sown by hand at the rate of two bushels per acre. The varieties were sown on September 3rd, with the exception of two which were sown on September 4th and one which was sown three days later. The ripening of the varieties took place between the 14th and the 21st of July, which was about eight days earlier than in 1896, and four days later than in 1895. The crops were all harvested separately.

Conclusions.

1. The average results of winter wheat growing on the experimental plots for nine years in succession are as follows: weight of grain per measured bushel, 60.2 pounds; yield of straw per acre, 2.7 tons; and yield of grain per acre, 39.5 bushels.

2. Dawson's Golden Chaff gave the largest average yield of grain per acre among seventy varieties of winter wheat grown at the Ontario Agricultural College for five years; also among eleven leading varieties tested over Ontario in 1893, nine varieties in 1894, 1895 and 1896, and seven varieties in 1897.

3 The Early Genesee Giant variety of winter wheat was a close rival of the Dawson's Golden Chaff variety in the small plots in the Experimental department, and in the large fields of the Farm department of the College, and also in the Co-operative experiments conducted throughout Ontario.

4. Winter wheat which did not lodge until cut produced a crop more than double the value of that which became lodged before it was ripe.

5. In the five years' experiments with varieties of winter wheat the American Bronze, Dawson's Golden Chaff, and Early Genesee Giant varieties produced the stiffest straw of all the large yielders of grain.

6. Seed consisting of large, plump kernels of winter wheat gave much better results than that consisting of small, plump, shrunken, or broken grains.

7. In the average of six years' experiments in sowing winter wheat at different dates, it was found that when the wheat was sown later than September 9th the crop was usually much poorer than when the seeding took place on or before that date.

8. As a crop for green manure to plow under in preparation for winter wheat, peas gave the best, and buckwheat the poorest results.

9. In an experiment in cutting winter wheat at different stages of maturity for several years in succession, it was found that the largest yield of grain and the best quality of seed were produced from the crop which was allowed to ripen fully before cutting.

10. Winter wheat badly infested with "stinking smut" has been very effectually treated for three years in succession by the use of either copper sulphate or hot water, as was briefly described in Bulletin 108.

Comparative Hardness of Winter Wheat.

Varieties of Winter Wheat.	Comparative pressure required to break the grain. 100 greatest pressure.			Average result for 5 years.			Color of grain.
	1896.	1898.	Average 2 years.	Percentage of crop standing.	Weight per measures bushel.	Yield of grain per acre.	
					lbs.	bush.	
1. Dawson's Golden Chaff	57	70	63.5	83	59.7	52.6	White.
2. Early Genesee Giant	66	78	72.0	81	59.8	48.7	"
3. Egyptian	70	76	73.0	58	60.6	48.6	Red.
4. Imperial Amber	71	80	75.5	58	59.8	48 5	"
5. Early Red Clawson	66	71	68.5	59	58.9	48.5	"
6. Reliable	68	74	71.0	56	61.2	48.0	"
7. Golden Drop	68	70	69.0	61	61.2	46.9	"
8. Russian Amber	74	76	75.0	61	60.9	46.7	"
9. Egyptian Amber	66	87	76.5	59	61.4	45.3	"
10. American Bronze	72	72	72.0	96	60.1	44 8	"
11. Poole	68	78	73.0	62	60 9	44.7	"
12. Tasmania Red	78	89	83 5	42	61.6	44.4	"
13. Early Ripe	72	88	80 0	67	61.2	43.8	"
14. Tuscan Island	85	86	85.5	55	60 6	42.8	"
15. Rudy	80	81	80.5	58	60 6	42.8	"
16. Red May	70	78	74.0	71	62.2	42.5	"
17. Arnold Hybrid	72	77	74 5	72	61.8	42.4	"
18. Bulgarian	70	69	69.5	74	60.2	42.3	White.
19. Pride of Genesee	83	100	91.5	70	60.8	42.1	Red.
20. Emporium	79	89	84.0	65	59.8	41.9	"
21. Siberian	79	..	79.0	63	61.8	41.5	"
22. Stewart's Champion	76	81	78.5	84	59.0	41.4	White.
23. Red Velvet Chaff	84	83	83.5	70	58.3	41.3	Red.
24. Zimmerman	78	81	79.5	78	61.4	41.2	"
25. Standard	67	73	70.0	80	58.5	41.1	White.
26. Geneva	77	86	81.5	60	62.4	41.0	Red.
27. Bissell	78	81	79 5	54	61.6	40.8	"
28. New Columbia	73	87	80 0	80	59.4	40.6	"
29. McPherson	83	88	85 5	73	62.1	40.3	"
30. Bonnell, or Landreth	76	76	76 0	76	58.4	40.2	White.
31. Golden Tankard	83	72	77.5	58	60.8	39.8	Red.
32. Longberry Red	88	73	80.5	37	60.3	39.8	"
33. Golden Cross or Volunteer	83	86	84.5	65	59.5	39 5	"
34. Andrew's No. 4	81	92	86.5	74	60.1	39.3	"
35. Kentucky Giant	89	85	87.0	59	60.0	38 8	"
36. Hindostan	78	74	76.0	58	61.1	37 7	"
37. Soules	60	76	68.0	82	57.8	37 5	White
38. Simcoe Red	69	82	75.5	84	59.2	37 5	Red.
39. Treadwell	63	72	67.5	85	60.1	37.3	White.
40 Jones' Winter Fife	73	80	76.5	67	58.7	37.0	Red.
41. Currell	81	87	84.0	64	61.3	37.0	"
42. Turkish Red	100	100	100 0	56	61.5	36.8	"
43. Penquit's Velvet Chaff	79	84	81.5	83	61.7	36.1	"
44. Velvet Chaff	77	88	82.5	86	62 5	36.0	"
45. Surprise	59	72	65 5	70	57.3	35.6	White.
46. Early White Leader	67	68	67.5	79	56.1	33.8	"
47. Jones' Square Head	72	77	74.5	79	57.9	33.2	"
48. Bullard's Velvet Chaff	82	82	82.0	76	60.4	31.9	Red.

In order to ascertain the best variety of winter wheat to grow it is necessary to take many things into consideration. The power to withstand the cold winters of Ontario, the character of growth of the plants during the spring months, the freedom from rust, the strength of straw, the yield of grain per acre, the weight per measured bushel, and the quality of grain, are all important items in determining the varieties best suited to general cultivation. The bulletins issued from the Experimental department have given a large amount of information in reference to most of these points. The comparative hardness of some of the varieties has been referred to in one or two instances.

Some attention has been given to the comparative hardness of the different kinds of winter wheat since the publication of the bulletin last autumn. Mr. G. H. Clark, B S.A., who completed his course in the College in the summer of 1898, took for the subject of his thesis "The hardness of wheat and its relation to milling qualities." With the assistance of Mr. F. C. Harrison, B.S.A., College Bacteriologist, an apparatus was made for determining the power required to break the grains of wheat under direct pressure, and the Experimental department furnished Mr. Clark with the seed of a large number of varieties which were grown in the experimental plots in 1896, in order that he might determine the comparative pressure required to break the grain of the different varieties. Mr. Clark is now employed in the Experimental department, and we have recently tested all the varieties grown in 1898 with the same apparatus. As this appears to give some useful information in regard to the comparative hardness of the different varieties, we have embodied in the foregoing table the comparative results in this respect, as well as the strength of the straw, the weight per measured bushel, the yield of grain per acre, and the color of the grain of the different varieties which we have grown in our experimental plots for five years in succession.

The fifteen hardest wheats produced an average of seven and one-fifth bushels per acre less than the average of the fifteen best yielding varieties, and two and nine-tenths bushels per acre more than the average of the fifteen poorest yielding varieties. The average yield per acre of the fifteen softest wheats was between four and five bushels greater than the average of the fifteen hardest varieties, according to the results presented in the foregoing table. Among the ten varieties of wheat which have given the largest yield of grain per acre in the average of five years' experiments, it will be observed that the Egyptian Amber possesses the hardest grain, the hardness being represented by the numbers 76.5. It will be noticed, however, that this variety is surpassed in point of hardness by twenty-four other varieties which come below it in yield of grain per acre. The grain of the Turkish Red variety will be seen to be the hardest of any of the varieties mentioned in the above table in the crop of 1896, and the grain of the Turkish Red and Pride of Genesee varieties the hardest in the crop of 1898. The Turkish Red variety, however, stands forty-second in average yield per acre among forty-eight varieties grown for five years in succession, producing an average yield of 36.8 bushels of grain per acre. In comparison with this the Dawson's Golden Chaff, which is a white wheat with softer grain but very much stiffer straw, gives an averages of sixteen bushels per acre more. The Pride of Genesee, which stands nineteenth in the list in yield of grain per acre for five years, possesses grain which stands in point of hardness in the average of two years' crops. This variety has been distributed throughout Ontario in connection with the co-operative experiments for four years in succession. In yield of grain per acre it stood fourth among nine varieties tested in 1895 on one hundred Ontario farms; third among nine varieties in 1896 on ninety farms; fourth among seven varieties tested in 1897 on two hundred and thirty one farms; and sixth among seven varieties in 1898 on one hundred and ninety-one farms. As a rule, the grain of the red wheats is harder than that of the white wheats. This, however, will not apply to all varieties, as the Early Red Clawson, which is the softest of the red wheats, is not so hard as the Stewart's Champion, which is the hardest of the white wheats. From an examination of the foregoing table, and from what has already been said, it will be quite clear that there is no one variety which possesses all the desirable qualities of a good wheat. It appears that many of the varieties which yield the greatest amount of grain and possess the stiffest straw, furnish a grain which is softer than many of the other varieties, and that these varieties which furnish the hardest grain are, as a rule, light yielders and possess a light straw. Some millers are anxious to get red wheat that will produce a strong flour, while others are anxious to get white wheat to mix with the dark colored, hard, flinty, western wheat, in order to secure a flour of a lighter shade. The varieties which the farmers are likely to grow are those which they can usually harvest with the least amount of labor, and that will produce the greatest financial returns for the time and labor in growing the crop. The requirements of the market, however, should be closely watched, and the aim should be to grow those varieties which will give the best results, and at the same time furnish that quality of grain for which there is the greatest demand. A careful study of the results of our experiments with winter wheat will greatly aid in this selection. Work is now being done in the Experimental department with the object of improving the best varieties of winter wheat by means of careful selection and cross fertilization.

Oats—Comparative Test of Ninety-one Varieties.

Varieties of Oats.	Nature of head.	Color of grain.	Results for 1898.				Average results for number of years grown.		
			Percentange of hull.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.
				lbs.	tons.	bush.	lbs.	tons.	bush.
Grown for ten years:									
1 Joanette	Spreading	Black	22	32.72	3.84	106.85	35.30	2.88	**88.16**
2 Siberian	"	White	29	35.08	3.25	107.65	34.63	2.75	**82.69**
3 Oderbrucker	"	"	33	33.19	2.92	101.59	31.46	2.57	**81.52**
4 Probsteier	"	"	32	34.13	2.89	104.79	32.33	2.50	**80.31**
5 Waterloo	"	"	31	30.00	3.76	93.76	31.17	2.66	**79.22**
6 Improved Besthorne	"	Yellow	32	32.48	3.38	106.85	32.49	2.29	**77.92**
7 Danebrog	"	White	34	34.20	3.10	95.91	32.70	2.51	**77.64**
8 Bavarian	"	"	37	27.48	4.31	97.62	30.98	2.87	**77.22**
9 Poland White	"	"	31	35.66	3.76	108.18	36.69	2.63	**76.25**
10 Georgian	"	"	42	29.16	3.99	87.35	32.21	2.83	**72.25**
11 Egyptian	Mane	"	36	36.63	3.36	89.29	35.23	2.83	**71.38**
12 Yellow Gigantic	"	Yellow	35	27.31	2.22	84.32	28.68	2.62	**71.26**
13 Black Poland	"	Black	38	24.88	3.53	79.32	28.76	2.89	**67.01**
14 Victoria White	Spreading	White	31	41.58	2.75	80.82	39.26	2.53	**66.25**
15 Rosedale	Mane	"	35	37.14	2.65	77.79	34.71	2.74	**66.16**
16 Black Champion	"	Black	35	30.69	2.75	79.50	29.15	2.55	**65.90**
17 Black Tartarian	"	"	34	32.13	2.30	77.00	30.65	2.62	**64.03**
Grown for eight years:									
18 Vick's American Banner	Spreading	White	34	32.41	3.06	108.26	30.89	2.38	**82.76**
19 White Schonen	"	"	31	34.88	2.58	98.35	32.20	2.30	**82.26**
20 Holstein Prolific	"	"	32	33.61	2.83	105.41	31.96	2.22	**79.86**
21 Danish	"	"	32	32.14	2.69	96.41	25.46	2.28	**79.44**
22 White Mane	"	"	31	32.44	2.76	99.32	31.59	2.58	**79.39**
23 Wide Awake	"	"	33	33.91	2.88	93.79	33.06	2.34	**78.85**
24 Early Calder	"	"	32	33.35	2.66	89.24	32.07	2.36	**75.55**
25 Golden Giant	Mane	Yellow	31	28.14	2.97	87.09	28.05	2.50	**75.07**
26 Early Gothland	Mane	White	34	36.70	3.02	91.44	35.68	2.44	**68.90**
27 Clydesdale	Spreading	"	34	40.08	2.77	80.97	38.09	2.48	**66.53**
Grown for seven years:									
28 White Baltic	"	"	31	35.31	2.47	92.91	34.61	2.24	**71.46**
29 Abyssinian	Mane	"	34	39.06	2.65	74.85	36.42	2.51	**64.21**
30 Thousand Fold	"	"	32	38.11	2.99	96.09	35.57	2.43	**63.61**
31 American Beauty	"	"	33	39.55	2.46	78.85	30.53	2.37	**63.35**
32 Badger Queen	Spreading	"	36	39.56	2.70	79.35	39.39	2.30	**59.63**
33 New Wonderful	"	"	35	41.94	2.63	77.85	39.38	2.17	**58.48**
Grown for six years:									
34 New Zealand	"	"	31	34.92	2.44	97.44	31.86	2.33	**75.23**
35 Improved American	"	"	34	33.88	2.23	92.65	31.64	2.21	**75.19**
36 Green Mountain	"	"	33	32.50	2.52	99.03	30.94	2.09	**73.80**
37 Black Beauty	"	Black	29	31.73	3.06	95.18	32.34	2.21	**70.19**
38 Lincoln	"	White	34	35.22	2.02	76.71	33.25	2.07	**68.47**
39 High Bred	"	"	31	36.16	3.24	74.59	36.92	3.24	**67.29**
40 Royal Prize Cluster	"	"	34	42.98	2.27	72.12	38.99	2.19	**61.29**

OATS—COMPARAVITE TEST OF NINETY-ONE VARIETIES.

Varieties of Oats.	Nature of head.	Color of grain.	Results for 1898. Percentage of hull.	Results for 1898. Weight per measured bushel.	Results for 1898. Yield of straw per acre.	Results for 1898. Yield of grain per acre.	Average results for number of years grown. Weight per measured bushel.	Average results for number of years grown. Yield of straw per acre.	Average results for number of years grown. Yield of grain per acre.
				lbs.	tons.	bush.	lbs.	tons.	bush.
Grown for five years:									
41 Peerless	"	"	32	33.16	2.91	96.50	31.00	2.62	**85.03**
42 Bolton	"	"	33	33.27	2.66	93.29	31.28	2.30	**79.34**
43 Bonanza King	"	"	31	36.39	2.49	87.50	32.86	2.17	**76.39**
44 Surprize	"	"	32	36.70	2.03	73.47	32.96	2.38	**75.15**
45 Improved White Russian	Mane	"	33	34.19	1.95	81.09	32.09	2.35	**73.08**
46 Negro Wonder	Spreading	Black	28	31.72	2.76	70.68	31.55	2.40	**72.34**
47 White Swede	Mane	White	30	34.75	2.42	78.50	32.50	2.62	**69.80**
48 Pride of America	"	"	35	36.64	2.51	77.21	36.04	2.55	**69.77**
49 Hull	"	"	30	32.66	2.57	72.44	30.87	2.59	**68.97**
50 Australian Square Head	"	Yellow	31	30.03	2.32	72.53	29.22	2.42	**67.25**
51 Lousinee	Spreading	White	32	34.61	2.03	91.12	31.54	1.76	**65.08**
52 Salzer's Great Northern	"	"	29	35.59	1.88	83.82	32.02	1.70	**61.51**
53 Mammoth Cluster	Mane	Black	34	31.53	2.00	69.38	28.56	2.37	**60.47**
54 Red Tamworth	Spreading	Dun	32	26.70	1.40	51.38	26.09	1.76	**46.89**
Grown for four years:									
55 Salzer's Silver Mine			32	34.91	1.92	78.21	30.86	2.14	**77.62**
56 New Electric	Spreading	White	32	34.48	1.75	76.41	31.08	2.07	**77.27**
57 Daubeney	"	"	27	33.09	1.91	84.47	34.62	1.61	**76.02**
58 White Bedford	"	"	32	34.64	1.86	70.26	28.39	2.25	**73.57**
59 Black Diamond	"	Black	38	31.67	2.27	69.18	32.36	2.27	**73.08**
60 Mexican Grey	"	Mixed	27	32.92	2.47	81.06	31.86	2.23	**71.80**
61 White Superior Scotch	"	White	35	40.94	2.43	71.97	40.17	2.10	**64.57**
62 Prolific Side	Mane	"	35	36.38	2.16	64.29	35.55	2.33	**60.09**
63 Royal Doncaster	Spreading	"	34	40.17	2.03	74.91	36.20	2.15	**59.34**
Grown for three years:									
64 Illinois	Mane	"	30	34.39	1.62	67.91	32.32	1.70	**62.49**
65 Early Golden Prolific	Spreading	"	31	34.95	1.54	66.91	31.99	1.74	**60.77**
66 Danish Island	"	"	31	33.25	1.60	64.94	29.75	1.78	**59.17**
67 Abundance (O.A.C.)	"	"	31	34.70	1.47	63.32	30.40	1.76	**58.52**
68 Michigan University	"	"	33	34.64	1.87	70.85	31.90	1.87	**57.87**
69 Abundance (D.E.F.)	"	"	32	33.31	1.44	62.27	28.94	1.76	**56.77**
70 Pearce's Black Beauty	"	Black	38	30.88	1.83	60.23	31.13	1.82	**56.12**
71 White Star	"	White	33	33.14	1.71	64.03	31.94	1.85	**56.02**
72 Improved Ligowa	"	"	31	35.88	1.62	69.44	30.94	1.98	**55.93**
73 White Dutch	"	"	36	41.94	1.94	60.88	38.13	2.00	**49.78**
74 Fife	Mane	"	35	37.13	2.33	61.21	32.29	2.12	**47.06**
75 Black Irish	"	Black	35	31.15	1.43	50.97	28.01	1.91	**42.18**
Grown for two years:									
76 Tyrolian	Spreading	White	37	34.09	1.79	65.18	32.11	1.67	**57.55**
77 Salzer's Gold Mine	"	"	33	34.20	1.48	60.06	29.85	1.63	**55.36**
78 Newmarket	"	"	31	35.66	1.63	67.18	31.96	1.63	**54.78**
79 Golden Tartarian	Mane	Yellow	32	28.23	1.85	60.06	25.62	1.87	**48.97**
80 New Seizure	"	"	31	29.42	1.76	56.79	25.96	1.80	**46.65**
81 Whiteside	Spreading	White	33	42.46	1.84	57.82	38.42	1.63	**45.87**
82 Mortgage Lifter	"	"	35	41.72	1.97	60.77	38.36	1.64	**45.58**
83 Washington	"	"	38	40.51	1.89	59.41	36.00	1.74	**45.08**
Grown for one year:									
84 Early Blossom		"	37	33.52	2.03	77.47	33.52	2.03	**77.47**
85 Carter's Golden		Yellow	34	30.36	1.94	74.27	30.36	1.94	**74.27**
86 Black Mesdag		Black	34	33.45	2.04	73.94	33.45	2.04	**73.94**
87 White Giant		White	32	32.23	1.85	71.79	32.23	1.85	**71.79**
88 Unknown		"	33	34.72	2.14	71.32	34.72	2.14	**71.32**
89 Early Dawson		"	35	41.31	2.28	63.06	41.31	2.28	**63.06**
90 French Hybrid		Yellow	34	28.42	2.02	60.79	28.42	2.02	**60.79**
91 New Nameless		White	34	32.95	1.80	58.74	32.95	1.80	**58.74**

Two hundred and ten varieties of oats have been grown in our experimental grounds within the past ten years. More than half of these varieties were dropped before the spring of 1898. Very few, however, were dropped in our experiments until we had given them a thorough test for five years in succession. After five years' testing, the least promising varieties were discarded, and those which gave the best all round results were retained for future growing. In this way all the best varieties were retained, and the poorer ones were gradually dropped from the list. The number of varieties grown in 1898 was ninety-one. Of this number seventeen were grown this season for the tenth year in succession; and these seventeen were the chief varieties among eighty-one kinds which were grown from 1889 to 1893 inclusive. Eight new varieties were tested in the plots in 1898 for the first time.

The grain was sown broadcast at the rate of seventy-five pounds per acre, and the seeding took place on the 26th and 27th of April. The plots were exactly the same in size and shape—each plot being ten links wide by one hundred links long, thus making 1-100 of an acre. The land on which the oats were sown was an average clay loam, which was manured in the spring of 1897 with twenty tons of farm yard manure per acre, after which it produced a crop of corn.

It will be observed that the yield of oats in 1898 was higher than usual. Seven of the varieties yielded upwards of 100 bushels per acre on the plots. The average of the ninety-one varieties for 1898 was a little over 79 bushels per acre, and the average weight per measured bushel 34.4 pounds. The quality of the grain, therefore, for the past year was slightly above the standard.

The reader's attention is directed to the three columns to the right of the table, which represent the average results for the number of years that each variety has been grown in the Experimental department. These results should carry with them much weight, as they are from experiments conducted each year on plots which are the same in cultivation, state of fertility, etc. If a person has a soil which naturally produces a large amount of straw, it will be well for him to select a variety which produces a straw somewhat below the average in yield per acre. Any person having a soil which naturally produces a smaller amount of straw will be wise in selecting a variety which the average results show to be capable of producing straw in abundance.

The varieties keeping the highest place on the list in the average results for ten years are the Joanette and Siberian—the Joanette giving an average of 88.16 bushels, and the Siberian 82.69 bushels per acre. The Joanette, however, is a very short-strawed variety, and not well adapted to a soil which naturally produces a small amount of straw. Upon rich land, however, it frequently gives excellent results, when sown at the rate of about four pecks per acre early in the season. The Siberian variety has given the best all round results of the different varieties of oats tested at this place, and also among the varieties grown in the co-operative experiments throughout Ontario. For seven years in succession from five to six varieties of oats were sent to about three hundred farmers, about one-third of whom reported the results of satisfactorily conducted experiments in each of the seven years; and when the results were averaged, it was found that the Siberian occupied the highest place in yield per acre throughout Ontario in each of five years, and second place in each of the other two years. In the two years in which the Siberian occupied second place, the Oderbrucker made the highest record in yield. The Oderbrucker seems very well adapted to some sections of Ontario, but on the whole is not giving quite so good satisfaction as the Siberian. It weighs about four pounds per measured bushel less than the Siberian, and is much weaker in the straw. It will be noticed that the Vick's American Banner stands the highest among the varieties grown for eight years in succession. If we drop off the results of the first two years in which the Siberian was grown, in order to get an exact comparison between the Siberian and the American Banner, it will be found that the Siberian surpasses the Banner in yield per acre of about five bushels, and in weight per measured bushel of about three pounds.

With the exception of the Joanette variety, it will be noticed that comparatively few of the black oats rank high in the average results. As the Black Tartarian has been grown over Ontario for a good many years, and as it has not given so good results as many of the varieties in our experiments, we sent out, in connection with the co-operative work this year, both the Joanette and the Black Tartarian varieties, and the results of carefully conducted experiments on one hundred and eight Ontario farms show that the Joanette gave an average of about two bushels per acre more than the Black Tartarian variety. Among the five varieties used for this experiment the Black Tartarian came lowest on the list in yield of grain per acre; and it will also be noticed that it stands the lowest in yield per acre among seventeen varieties grown in our experimental grounds for ten years in succession.

The reader's attention is also directed to the column of figures under the heading of "Percentage of Hull" in the results for 1898. For these results, one hundred grains of each variety were carefully selected, and the hulls and inside portions or kernals were carefully separated and then weighed with fine chemical balances. It will be noticed that there is a great difference in the amount of hull in the different varieties of grain. For instance, one hundred pounds of grain of the Joanette variety would have twenty-two pounds of hull, while that of the Georgian variety would have forty-two pounds of hull, a difference of about twenty pounds. It will be observed also that the Joanette has the smallest percentage of hull of all the varieties, and that the Siberian, Black Beauty, Negro Wonder, Salzer's Great Northern, Daubeney, and Mexican Grey varieties have all less than thirty per cent. of hull.

It will be seen from a study of the foregoing table that the Victoria White, Clydesdale, New Wonderful, Royal Prize Cluster, White Superior Scotch, Royal Doncaster, White Dutch, Whiteside, Mortgage Lifter, Washington, and Early Dawson, each produced grain which weighed upwards of forty pounds per measured bushel. It will also be noticed that the Black Poland and Red Tamworth varieties produced grain which weighed less than twenty-seven pounds per measured bushel.

As there are about two and a half million acres sown with oats in Ontario each year, it is of the utmost importance that the varieties best suited to the different soils and localities be secured. Information is placed in the foregoing table in such a way that any person can glean a large amount of valuable information regarding the characteristics and the results of the different varieties of oats therein mentioned. It has been stated that the part which the College has taken in the importation, testing and distribution of varieties of oats, has added much more to the wealth of the Province than the entire amount of the annual expenditure; and we do not hesitate to say that the statement is correct. An average increase of one bushel per acre for the Province means a total increase of 2,500,000 bushels of oats for Ontario; and this, valued at twenty cents a bushel, amounts to $500,000, or about the entire cost of the College in all its departments for a period of ten years.

Oats—Broadcasting and Drilling at Different Dates.

This experiment has occupied twelve plots this year, and has been conducted in a smaller way for four years in succession. The oats were sown by hand and with a grain drill on six different dates in each of the four years. The plots were 1/100 of an acre in size in every instance, and the seed was sown at the rate of seventy five pounds per acre. The land produced a crop of potatoes in 1897, after receiving a dressing of twenty tons of farm yard manure per acre in the spring of the same year.

Without a single exception the oats sown with the grain drill on six different dates, for three years in succession, gave a larger yield of grain per acre than that which was sown broadcast with the hand. The average yield from the broadcast seeding of 1898 was 48 3 bushels per acre, and that from the drilled grain was 51.6 bushels per acre, or a little over three bushels per acre in favor of the drill, as compared with the broadcast seeding.

In comparing the results from sowing oats on six different dates, with an average of about eight days between the different periods, it will be seen that in the average of four years' experiments, the largest yield of grain per acre and the heaviest weight per measured bushel were produced from the seed sown on or about the 22nd of April. After this date there was a considerable decrease in both quantity and quality of grain.

Date of seeding Oats.	Average results from different methods of seeding.		Average results from different dates of seeding.			
	Broadcasted or Drilled.	Yield of grain per acre. Average 3 years 1896 98.	Weight per measured bushel.		Yield of grain per acre.	
			1898.	Average 4 years 1895-98.	1898.	Average 4 years 1895-98.
		bush.	lbs.	lbs.	bush.	bush.
April 18-19	Broadcasted.	68.75	33.89	33.37	67.18	**79.01**
	Drilled.	74 02				
April 22-25	Broadcasted.	76.72	35.82	33 40	71.78	**85.32**
	Drilled.	77.93				
May 1-4	Broadcasted.	59.36	30.90	30.78	59.15	**70.36**
	Drilled.	61.77				
May 9-11	Broadcasted.	39.31	26 91	28.05	41.25	**54.86**
	Drilled.	45.45				
May 18	Broadcasted.	30.34	24.45	25.54	39.50	**39.66**
	Drilled.	30.68				
May 25-26	Broadcasted.	15.47	18.14	21.34	18.02	**31.63**
	Drilled.	19.97				

That which was sown on May 25th and 26th gave a yield of only 31.6 bushels per acre, and an average weight of only a little over 21 pounds per measured bushel. These results are very marked, and worth a good deal of attention, as the experiments have been very carefully conducted for four years in succession, and should give a good index of the comparative averages of sewing oats at different periods in the spring of the year. When we compare the results from the first and second dates of seeding, it seems to indicate that it is better to let the land get fairly well settled before the seed is sown; but just as soon as it is sufficiently warm and in a condition for the best cultivation, the oats should be sown. It will be noticed that the first seeding in May produced about 15 bushels per acre and about 2½ pounds per measured bushel less than that of the last seeding in April. There was about the same reduction in both quantity and quality between the first two seedings in May; in fact, the results between several of the dates show that there is a decrease of nearly 2 bushels per day in yield, and ¼ of a pound per day in weight per measured bushel as the dates of seeding advanced after the 22nd of April.

Spring Rye—Comparative Test of Three Varieties.

Varieties of Spring Rye.	Results for 1898.			Average results for number of years grown.	
	Weight of grain per measured bushel.	Yield per acre.		Weight of grain per measured bushel.	Yield of grain per acre.
		Straw.	Grain.		
Grown for four years:	lbs.	tons	bush.	lbs.	bush.
1 Dakota Mammoth	60.75	2.30	42.11	58.49	**35.46**
2 Prolific Spring	59.38	2.56	39.93	57.14	**35.42**
Grown for two years:					
3 Colorado Giant	57.75	1.89	27.07	55.35	**21.69**

Two varieties of Spring Rye have been grown for four years in succession in the Experimental department, and one variety has been grown for only two years. The varieties were all sown upon plots 1/100 of acre in size, on April 15th. The grain was sown broadcast at the rate of two bushels per acre on land which was manured in the spring of 1897 with twenty tons of farmyard manure per acre, after which a crop of roots was grown in the same season.

In the average yield per acre of the Dakota Mammoth and the Prolific Spring Rye grown for four years in succession, it will be observed that there is practically no difference in yield of grain per acre, and only a little more than one pound in weight per measured bushel, the little difference there is in these two respects being in favor of the Dakota Mammoth. The Colorado Giant Rye, also sometimes called Polish Wheat, has been grown for two years in succession. This variety possesses a very large head; and the grain, when well developed, is also very large. It will be seen, however, that the yield is less than twenty-two bushels per acre, and the weight per measured bushel about three pounds less than that of the Dakota Mammoth. The St. John's variety of rye has also been grown, but is not mentioned in the above list. This variety is spoken of as being suitable for either spring or summer sowing. The spring sowing, however, has so far given very unsatisfactory results, as less than five bushels per acre have been produced in each experiment.

Winter Rye—Comparative Test of Three Varieties.

Three varieties of winter rye were sown in the autumn of 1897 on plots similar in size, cultivation, etc., to those used for the winter wheat. Although winter rye has been grown in our plots for several years, still the results of only the three varieties grown in 1898 are here presented in tabulated form, as the varieties have changed considerably from one year to another, and it has been found difficult to give the average results in the table. The following table gives one year's results from growing the three varieties:

Varieties of Winter Rye.	Weight of grain per measured bushel.	Yield of straw per acre.	Yield of grain per acre.
	lbs.	tons.	bush.
Grown for one year:			
1. Mammoth Winter Rye	60.69	4.3	57.50
2. Monster Winter Rye	59.88	4.0	57.02
3. Common Rye	59.63	4.1	52.57

There is practically no difference in the results from the Mammoth winter rye and the Monster winter rye; and these two varieties may be considered as really the same variety There was, however, some difference in the height of the rye represented by the two names. It will be seen by the foregoing results that the Common rye gave about 5 bushels per acre less than either the Mammoth or the Monster varieties, and that the weight per measured bushel was also less than that of either of these kinds. These three plots of rye were greatly admired by the many excursionists who visited the grounds in the month of June, as some of the rye stood over six feet and the plots certainly had a very handsome appearance.

Winter Barley.

We have grown winter barley more or less in our experimental grounds for the last ten years, the seed of which was obtained from Germany and the United States. It is found, however, that it is not a reliable crop at this station. In favorable years it usually produces a very large yield, but in severe winters the crop is generally very badly winter-killed—in fact, so badly that some years there are practically no plants alive in the spring of the year. The variety sown in the spring of 1897 was the Nevada Six-Rowed winter barley, which gave a yield about the same as the average of thirty-four spring varieties. The average weight per measured bushel this year was about forty-eight pounds, or nearly five pounds per measured bushel less than the average of the spring varieties. Although the winter barley looked so very promising when the excursionists visited the College in 1898, still we wish to emphasize the fact that, taking one year with another, it is not a very safe crop to grow in a temperature similar to that of Guelph.

Winter Oats.

A good deal has been said in the past regarding the advisability of growing winter oats. No doubt this has been said owing to the success attained in growing the winter oats in some of the States in the American Union to the south of us. We have secured the seed of winter oats on several occasions and have sowed them in our plots, but I have never had the pleasure of seeing a live plant of this class of grain in the spring of the year. It is quite likely that winter oats would come through the winter season successfully some years, as we have frequently noticed that where spring oats have been grown one year, plants are sometimes seen to thrive the following season. The fact remains, however, that we have not yet found any variety of winter oats which is likely to give good satisfaction in Ontario.

Beans—Comparative Test of Thirty Varieties.

Varieties of Beans.	Stage of maturity.	Results for 1898.		Average results for two years.	
		Weight per measured bushel.	Yield of grain per acre.	Weight per measured bushel.	Yield of grain per acre.
		lbs.	bush.	lbs.	bush.
1. White Wonder	Early	65.38	18.15	66.38	**27.46**
2. Schofield Pea	"	66.57	19.38	67.04	**25.48**
3. Burlingame Medium	"	64.63	15.18	66.32	**25.21**
4. Pearce's Improved Tree	"	66.31	17.92	67.03	**24.57**
5. Medium, or Navy	Medium to early	65.50	15.05	66.50	**24.24**
6. Snowflake	Early	66.63	13.75	67.69	**22.61**
7. Wisconsin Tree	"	66.25	14.53	66.94	**22.13**
8. Boston Pea	Medium	65.00	12.68	66.00	**21.41**
9. Day's Improved Leafless	Medium to early	65.13	14 77	65.94	**21.36**
10. Great Western	Medium to late	66 13	10.78	66.51	**20.29**
11. Buckbee's Electric Tree	"	66 50	17.23	66.82	**20.23**
12. Marrowfat	"	60 50	4.67	64.00	**17.80**
13. Small White Field	Late	59.75	8 90	63.75	**16.64**
14. Boston Favorite	Medium to late	49.38	3.88	53.51	**15.83**
15. Zealand Haricots	"	62.13	10.00	63.26	**15.65**
16. Extra Early Field	Early	60.06	8.13	63 47	**15 64**
17. Dwarf Horticultural	"	59 00	8 47	60 82	**15.14**
18. Eureka	Medium to late	66 63	8.43	66 82	**14.68**
19. Russian Horticultural	Early	55 00	5.88	58.38	**14.56**
20. Prolific Dwarf Tree	Late	68.63	11.52	67.41	**14.54**
21. Golden Wax	Early	60 00	8 00	61.57	**13.26**
22. Wilson's Yellow Eye Pea	Medium	65.25	6 98	65.50	**13.01**
23. Giant Dwarf Wax	Medium to early	53 00	6 17	55.25	**13.00**
24. White Valentine	Early	63 63	7 30	64.88	**12.98**
25. Yellow Eye, or "Boston Favorite"	Medium	61.63	4.73	63.26	**12.62**
26. Red Kidney	"	54 38	8.28	56.76	**12.29**
27. Crimson Beauty	Early	54 25	6 17	56.88	**11.54**
28. Mexican Tree	Late	68.38	7.78	66.88	**10.31**
29. Large White Haricots	"	45.25	5 32	52.07	**8.96**
30. Dwarf Kidney	Medium to late	61.25	4.82	61.25	**8.77**

For two years in succession, thirty varieties of beans have been grown under similar conditions in our experimental grounds. As the growing of beans is of considerable importance in some portions of Ontario, it was thought advisable to secure a considerable number of the most promising varieties in the spring of 1897 for systematic experimental work in order to find out which ones would be the best suited for general cultivation. In 1897 the beans were sown on the 10th of June, but in 1898 they were not sown until June 17th, owing to the rains which occurred between the 8th and the 14th of the month. The plots were of an acre in size, there being three rows of each variety four rods in length. The different varieties of horse beans and Soya beans will be reported on elsewhere.

It will be seen from the foregoing table that the yield of beans was very light in 1898; in fact it was only about one-half as much as in the previous year. The experiment, however, was quite satisfactory, and the results now show the average of the different varieties for two years, which varied considerable in weather conditions. The highest yield of beans in 1897 was 37 bushels per acre, and the highest yield in this year was only about 19½ bushels per acre. The average yield of all the varieties for 1898 was 10.16 bushels per acre, and the average weight per measured bushel was 61.74 pounds. It will be observed, however, that nine varieties gave a weight per measured bushel of upwards of 66 pounds; and two of the varieties produced grain which actually weighed over 68 pounds per measured bushel. It will also be observed that two varieties produced grain which weighed less than 50 pounds per measured bushel. The White Wonder variety, which stood first in yield per acre in 1897, comes second in the results of the present year; the largest amount of grain being produced in 1898 by the Schofield Pea variety. The variety of beans under the name of Dixon's White Field was grown in 1898 for the first time, and gave very good results indeed—the yield per acre being 19.47 bushels, and the weight per measured bushel 65.63 pounds. As this variety has been grown for only one year it is not included in the foregoing table. Three varieties of beans, under the name of Zealand Hericots, Giant Hericots, and Large White Hericots, which were reported by an English firm in the spring of 1897 as likely to give excellent results in Canada, have so far given very poor results. A quantity of each of these varieties was imported from England in the spring of 1897, and the seed was sown in each of the past two years. The Giant Hericots, however, did so very poorly in the experiments of the present year that the results are not given in the foregoing table; and it will be seen that the Large White Hericots stand second last in yield of grain per acre, producing only about 9 bushels in the average of two years, and the grain weighing only 52 pounds per measured bushel. The Zealand Hericots gave the best results of these varieties, but at the same time stands fifteenth in yield per acre among the thirty varieties grown for two years in succession. It will be observed that the best of these three English beans has given an average of about 12 bushels per acre less than the White Wonder variety. The three English varieties were also tested in Kent County last year, and the report shows that they did not give satisfactory results because of their lateness in maturing. These results go to show the great importance of thoroughly testing different varieties under Ontario conditions before growing them in large areas for commercial purposes. We find it very necessary to test carefully all foreign crops, in order to find out whether those varieties which give good satisfaction in other countries will prove to be a success or a failure in this Province.

Besides giving results of the thirty varieties grown for two years, we also present the results from growing seven varieties for five years in succession, which are as follows:

Varieties of Beans.	Weight per measured bushel		Yield of grain	
	1898	Average 5 years	1898	Average 5 years
	lbs	lbs.	bush.	bush.
Medium or Navy	65.50	65.10	15.05	19.73
Boston Pea	65.00	65.32	12.68	19.34
Small White Field	59.75	64.35	8.90	17.62
Prolific Dwarf Tree	68.63	66.05	11.52	16.70
Marrowfat	60.50	63.78	4.67	13.25
Yellow Eye, or "Boston Favorite."	61.63	62.01	4.73	11.59
Giant Dwarf Wax	53.00	53.96	6.17	11.55

The California Pea bean made a high record for three out of the five years which it was grown, but the results from this variety were dropped in 1897, owing to poor germination of the seed The results of this variety, therefore, are not included in the foregoing table. It will be seen that the medium, or Navy variety of beans, keeps the highest place in yield per acre among the seven varieties grown for five years in succession; and this variety is very closely followed by the Boston Pea variety. The heaviest average weight per measured bushel was produced by the Prolific Dwarf Tree, which is sixty-six pounds in the average of five years' experiments, and was 68.6 pounds in the experiment of the present year. The Marrowfat variety has large white beans, but it will be seen that it is a light cropper, producing about 6½ bushels per acre less than the Medium or Navy in the average for the number of years during which these beans have been grown. The varieties which give the best satisfaction over a number of years are the ones which are likely to give the best all round results in general cultivation.

Buckwheat—Comparative Test of Four Varieties.

Four varieties of buckwheat were sown this year, but the crop was a very poor one and the tabulated results are not given here. As three of the varieties were grown for three years previous to 1898, it might be proper to mention that the Japanese produced an average of 22 bushels, Silver Hull, 18, and Common Grey 15.7 bushels per acre. In average weight per measured bushel Silver Hull went 50.8 pounds, the Common Grey 49.5 pounds, and the Japanese, 45.8 pounds. Thus it will be seen that the Japanese has given the best yield of grain per acre, but the Silver Hull has produced a grain which weighs the heaviest per measured bushel.

Grain Grown in Mixtures for the Production of Grain and Straw.

For six years in succession a very interesting experiment has been conducted by growing oats, spring wheat, barley and peas separately and in various combinations for the production of grain and straw. Six mixtures, having two classes of grain in each mixture, four having three classes of grain in each mixture, and one having all four classes of grain in combination have been used each year. This would make in all eleven mixtures, besides the four grains grown separately, forming in all fifteen plots. This experiment was conducted in duplicate, thus making thirty plots each year, or 180 plots in the six years. The plots were 1/100 of an acre in size in every instance. In 1898, the seed for one set was sown on April 28th, and for the duplicate on April 29th. The varieties were cut when they reached the proper stage of maturity, and, when dry, were taken to the experimental barn and threshed. The grain was then cleaned; and the results are placed in tabulated form, which gives the number of pounds of grain, instead of the number of bushels per acre, owing to the grain being in various combinations.

Varieties of grain grown in mixtures.	Yield of straw per acre.		Yield of grain per acre.	
	1898.	Average six years.	1898.	Average six years.
	tons.	tons.	lbs.	lbs.
1. Barley and oats	1.83	1.74	2,575	2,261
2. Barley, peas and oats	1.91	1.67	2,379	2,101
3. Barley, wheat and oats	2.00	1.72	2,546	2,067
4. Peas and oats	2.10	1.77	2,419	1,988
5. Barley, peas, wheat and oats	1.82	1.71	2,114	1,955
6. Wheat and oats	1.97	1.68	2,269	1,921
7. Peas, wheat and oats	1.99	1.73	2,172	1,860
8. Barley and peas	1.94	1.56	2,122	1,760
9. Barley, peas and wheat	1.79	1.57	1,750	1,665
10. Wheat and barley	1.63	1.41	1,856	1,558
11. Peas and wheat	1.42	1.37	1,257	1,322

The foregoing results show that a mixture of barley and oats gave an average of 2,261 pounds of grain, and that a mixture of peas and wheat gave a yield of only 1,322 pounds; or a yield of 939 pounds of grain less than that produced by the mixture of barley and oats. Three of the mixtures produced upwards of one ton of grain per acre. In yield of straw per acre in the average of the six years' experiments, it will be seen that the peas and oats produced the greatest yield and the peas and wheat the lightest. From the general results it will appear that the different classes of grain exert an influence upon the yield of grain in the following order, namely: oats, barley, peas, and wheat, the oats having the greatest influence, and the wheat the least. When a comparison is made between the different grains grown separately, and the same grains grown in mixture, it is found, in about ninety per cent of the experiments, that the mixtures produced a larger yield per acre than the same grains grown separately.

Grain—Selection of Seed.

Within the last six years a large amount of very careful work has been done in order to determine the influence of different selections of seed upon the resulting crop. The reader's attention is directed to the results of these experiments, which are becoming more valuable from year to year, owing to the increasing length of time during which the experiments have been conducted. The Mandscheuri barley, Herison Bearded spring wheat, Siberian oats, and Prussian Blue peas were the varieties used for this experiment. Fresh seed has been taken each year from the grain grown in the farm department. It will, therefore, be understood that what ever difference there is from the influence in the selection of seed, that difference is attributed purely to the size and the selection of the seed. For the large plump seed none but well developed grains were selected; for the small plump sample the grains selected were of a uniform character; and for the shrunken sample none but shrunken grains were used—the last selection being made regardless of the size of the kernels. The sample of cracked grain in the case of barley contained nothing but grains which were broken crosswise, as is frequently done by the grain separator in threshing. In the selection of the large plump seeds, one-half pound was carefully weighed from each class of grain. The number of large plump seeds of each kind of grain was then counted, and a corresponding number was taken of the medium sized grain, the small plump grain, the shrunken grain, and the broken grain. The different selections were sown upon plots exactly one rod square. The following table gives the results of this experiment in 1898, and also the average results for three, four, five, and six years in succession, as indicated in the table.

Class of grain.	Selection.	Number of years tested.	Weight per measured bushel.		Yield per acre.			
					Straw.		Grain.	
			1898.	Average for number of years grown.	1898.	Average for number of years grown.	1898.	Average for number of years grown.
			lbs.	lbs.	tons.	tons.	bush.	bush.
Mandscheuri barley...	Large plump seed...	4	48.81	48.63	1 61	1.47	56.27	**46.73**
	Small plump seed...	4	49.13	47.61	1.58	1.50	52 50	**43.30**
	Shrunken seed......	4	47.69	47 56	1.58	1.42	47.40	**39·30**
	Cracked seed.......	4	47.00	46.80	1.47	1 33	45 57	**36·45**
Herison bearded spring wheat.	Large plump seed...	6	59.00	58.68	1.43	1.36	18.96	**21.25**
	Small plump seed...	6	57 88	57.93	1.25	1.20	14.45	**17.27**
	Shrunken seed...	6	57.69	56.07	1.16	1.19	14.80	**17.14**
Siberian oats.........	Large oats..........	5	28.98	31 60	1.75	1.81	54.49	**52.38**
	Medium oats.......	5	29.23	30.73	1.65	1.76	39.44	**46.61**
	Small oats..........	5	26.14	30.37	1.42	1.74	29.69	**37.96**
Prussian blue peas...	Large seed.........	3	60.19	59.73	1.53	1.27	19 68	**24.03**
	Small seed.........	3	61.56	59.65	.75	.94	8.45	**17.88**

On examining the average results for the number of years during which this experiment has been conducted, the reader will see that the large plump seed gave the largest yield of grain per acre with barley, spring wheat, oats, and peas; and also that large plump seed produced grain which weighed more per measured bushel than any other selection with each of the grains under experiment. The large plump seed produced an average of 7.4 bushels per acre more than the shrunken seed in the case of barley, 4.1 bushels more in the case of spring wheat, and 6.15 bushels in the case of peas. The large plump oats gave an average yield of about fourteen bushels per acre more than that produced from the small oats.

Sound and Cracked Peas for Seed.

A large quantity of the peas grown throughout the Province is threshed with a machine, which in many instances cracks a considerable portion. More or less of the peas thus cracked are used in the seed the following year, and, in order to obtain information regarding the influence of the splitting of the peas upon germination of the same, experiments have been conducted for six years in succession, and the results show that the whole peas give more than three times the yield per acre that the seed which was split in the threshing gives. In many instances, the germ becomes separated from the split peas, and the grain is thus made useless for seed purposes.

Seed Peas Injured by the Weevil.

There seems to be a great difference of opinion in regard to the value of weevily peas for seed, as seedsmen and others, who have seed for sale, sometimes claim that weevily peas will grow nearly as well as sound ones. In some parts of Ontario, especially in the south-western portion of the Province, the injury by the pea weevil is considerable. Careful experiments have been made by using weevily and sound peas of two leading varieties, namely, the Marrowfat and the Golden Vine. The results of the tests have been very uniform, and the average results go to show that about 59 per cent. of weevily peas of the Marrowfat variety and 87 per cent. of weevily peas of the Golden Vine variety do not grow. Those of the Marrowfat variety, being larger in size than those of the Golden Vine, were not injured so much. Taking the average results of all the experiments with the two varieties, we find that only about one-quarter of weevily peas will grow.

Selections of Seed for Five Years in Succession.

Different qualities of seed of oats, barley, and spring wheat, were very carefully selected in 1894. The selections made were sown on plots of exactly the same size, which were situated side by side. From the crop produced in 1894 seed was again selected in the same manner, and was sown on similar plots in the spring of the following year. From the crops produced from the different selections of seed in 1895 a similar selection was again made in the spring of 1896 The selection was repeated in each of

Selections.	Average number of grains per ounce of crop.										
	Barley.			Spring wheat.				Oats.			
	1895. 2nd yr.	1896. 3rd yr.	1897. 4th yr.	1895. 2nd yr.	1896. 3rd yr.	1897. 4th yr.	1898. 5th yr.	1895. 2nd yr.	1896. 3rd yr.	1897. 4th yr.	1898. 5th yr.
Large plump	600	782	621	958	1,043	949	795	1,143	1 874	1,309	1,253
Small plump	704	844	724	1,137	1,147	1,112	1,028	1,161	1,845	1,292	1,325
Shrunken	807	897	842	1,161	1,306	997	830	1,196	1,917	1,434	1,291

the next two years, and the selections of seed thus secured were sown upon plots each of which was one rod square. Exactly the same number of grains were used on the plots with the experiment of each class of grain. As this experiment is especially concerned with the quality of grain produced, a table has been arranged giving the number of grains per ounce, and the crop produced from the different selections of barley, spring wheat, and oats, in each of the past three years. The smallest number of grains per ounce, of course, means the largest sized grains. The following table does not indicate the exact selection made in the case of oats, as the experiment was, in this case, large plump grains, medium-sized grains, and small-sized grains. This fact should be considered in examining the table.

Owing to a mixture which occurred in connection with the experiment with barley, we are unable to give the results of this class of grain for 1898. It will be observed that the results of spring wheat for 1898 show that it took about two hundred and thirty-three more grains grown from the small plump seed to weigh an ounce, than it did of those produced from the large plump grains; and it will be seen, from an examination of the foregoing table, that, with two slight exceptions, large plump seed produced larger grains than those produced by either small or shrunken seed.

Selection of Seed Oats for Six Years in Succession.

For six years in succession an experiment has been conducted with Joanette oats, by selecting large plump well-developed seeds, light-weighing and light-colored seeds, and also seeds from which the hull had been removed by the separator. The experiment was begun in the spring of 1893 by selecting seed from the general crop of the Joanette oats of the previous year. The selection made in each of the following years was from the product of the selected seed of the previous year. The number of grains used on each plot was carefully counted, and an equal number was used of each selection in each of the years in which this experiment was conducted.

Selection.	Number of grains per oz. 1898.		Weight of grain per measured bushel.						Yield of grain per acre.				
	Total.	Hulled.	1893.	1894.	1895.	1896.	1897.	1898.	1893.	1894.	1896.	1897.	1898.
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	bush.	bush.	bush.	bush.	bush.
Dark plump ..	1,474	120	32.3	34.5	32.9	27.9	34.8	35.9	45.7	67.3	43.4	53.4	80.1
Light	1,601	34	30.2	32.8	31.1	24.0	32.4	31.3	38.0	50.9	28.7	49.3	73.7
Hulled	1,494	160	33.8	34.9	33.4	26.6	33.0	36.2	34.4	57.4	41.5	57.9	78.5

On examining the comparative size of kernels produced in the crop of 1898, we found that the light seed produced the smallest grain, the hulled seed the next smallest, and the large plump seed the largest and the heaviest grain. The seed which was hulled by the separator, produced good results in yield of grain per acre, but the table shows that there were a greater number of hulled grains from this selection than from any of the others in the crop of 1898. In weight per measured bushel, the crop produced from the hulled grain was the heaviest, and that produced from the light grain was the lighest in the results of the past year.

It will be noticed that the hulled grain has given very good results throughout. This seems a little strange; but when it is considered that it is only well developed seed having a large kernel and thin hull that will be hulled in the threshing, and that the hulling seems to have but little injury upon the germination of seed, the good results from the hulled seed appears to be quite reasonable.

Spring Grain—Different Dates of Seeding.

For seven years in succession, barley, spring wheat, and oats, and for six years in succession peas, have been sown on three dates, beginning on April 21st and ending on May 11th. The experiments were conducted in duplicate in each case. The plots in every instance were 1/100 of an acre in size, and the seeding was done broadcast with the hand. The following table gives the average weight per measured bushel and yield of straw and grain per acre for each of the crops for six and seven years.

Date of seeding.	Average weight per measured bushel.				Average yield of straw per acre.				Average yield of grain per acre.			
	Barley 7 years.	Peas 6 years.	Spring wheat 7 years.	Oats 7 years.	Barley 7 years.	Peas 6 years.	Spring wheat 7 years.	Oats 7 years.	Barley 7 years.	Peas 6 years.	Spring wheat 7 years.	Oats 7 years.
	lbs.	lbs.	lbs.	lbs.	tons.	tons.	tons.	tons.	bush.	bush.	bush.	bush.
April 21-25	50.55	59.02	59 46	33.44	1.23	1.15	1.14	2 01	40.62	31.48	17.99	71.93
May 1-4..............	49 08	59.97	58.84	31.48	1.17	1.09	.99	1.80	35.62	29.67	14.09	63.19
May 9-11	46.75	60.16	58.04	28.85	1.04	.98	.87	1.57	28.25	25.93	10.76	51.73

The results of an experiment, such as the one under consideration, which has been conducted for seven years in succession, should be of much value in showing the real difference in sowing grain at different dates in the spring of the year through a variety of seasons. Some years this experiment commenced earlier than the 21st of April; but the results are not here given owing to the impossibility of having the experiment conducted in full at a much earlier date than the 22nd of April in all of the years. If the results from earlier sowing appear to be more satisfactory than those from later sowing, by an increase in both the yield and the quality of grain in the county of Wellington, it is quite likely that the same will hold good in other sections of the Province, although the exact dates may not be the same in all cases. In average weight per meausured bushel it will be seen that the barley, spring wheat, and oats produced the heaviest grain from the seeding of the first date, the second heaviest from that of the second date, and the lightest from that of the third date. In the case of the peas, however, such was not the case, as exactly the reverse was true. As the season advanced from April 21st to May 11th, the quality of peas improved.

On examining the yields per acre from sowing the different grains on the three dates it will be found that, without a single exception, the yield of grain decreased as the dates of seeding advanced. In a period of only about two weeks, there was a decrease in the yield of grain per acre by $12\frac{1}{2}$ bushels in the case of barley, $5\frac{1}{2}$ bushels in the case of peas, $7\frac{1}{8}$ bushels in the case of spring wheat, and $20\frac{1}{10}$ bushels in the case of oats. These results are too striking to be allowed to pass by unheeded. Taking all things into consideration, the reader will see that *oats*, *spring wheat*, and *barley* give decidedly the best results from the earliest dates of seeding; while in the case of *peas* the returns were about equal for the first two dates, when both yield and weight per measured bushel are taken into account.

Spring Grain—Drilling vs. Broadcasting.

For five years in succession, peas, spring wheat, oats and barley have been sown with the grain drill, and also have been broadcasted with the hand. The experiment was conducted in duplicate in each of these years. It should be clearly understood that the land was in a good state of cultivation when the seeding took place in every instance. Had the land been left in a rough, poorly cultivated state, the result might have been quite different. The plots were 1-100 of an acre in size in every case. The following table gives the average results of the four kinds of grain for each year during which the experiment has been conducted :

Method of seeding.	Yield of straw per acre.						Yield of grain per acre.					
	1894.	1895.	1896.	1897.	1898.	Average	1894.	1895.	1896.	1897.	1898.	Average
	tons.	tons.	tons.	tons.	tons.	tons.	bush.	bush.	bush.	bush.	bush.	bush.
Broadcasted	1.88	2.03	1.23	1.21	1.07	1.48	45 60	53.23	45 02	25.63	26.72	39.24
Drilled	1.95	1.86	1.40	1.24	1.02	1.49	46.30	51.07	48.13	27.03	25.64	39.63

In a yield of grain per acre, the seeding which was done with a grain drill, produced the best results in 1894, 1896, and 1897; and the seeding which was done by hand, produced the highest yields in 1895 and 1898. When the average of the five years results was taken into consideration, it was seen that seeding with the grain drill produced about 2/5 of a bushel per acre more than the seeding which was done by hand. In connection with the results of the foregoing table, the reader should also consider the results of sowing the different classes of grain with the drill and by hand on each of six different dates. These results will be found after the variety test of each class of spring grain.

Spring Grain—Different Preparations of Soil.

Land which grew potatoes, turnips, and carrots in 1897 was cultivated in the autumn of the same year, but was left unplowed. In the spring of 1898 half the land devoted to each crop of the previous year was plowed, and the remaining half was cultivated, but left unplowed. Oats, spring wheat, barley, and peas were each sown upon potato ground, turnip ground, and carrot ground which had been plowed previous to sowing; and also upon land which received a good cultivation but was not plowed. There were in all twenty-four plots ; each crop on the potato and turnip ground being 1/40 of an acre in size, and each plot on the carrot ground 1/80 of an acre in size. The grain was sown on the potato ground on May 4th, on the turnip ground on May 5th, and on the carrot ground on May 6th. The crops were all harvested when they reached the proper stage of maturity, and were carefully taken to the experimental barn, where they were weighed and threshed. The following table gives the results of this experiment for the year 1898 :—

Previous cropping.	Method of cultivation.	Weight per measured bushel.					Yield of grain per acre.				
		Siberian Oats.	Oderbrucker Barley.	Pringle's Champion Spring Wheat.	White Wonder Peas.	Average.	Joanette Oats.	Two-rowed Italian Peas.	Herison Bearded Spring Wheat.	New Zealand Field Peas.	Average.
		lbs.	lbs.	lbs.	lbs.	lbs.	bush.	bush.	bush.	bush.	bush.
Potatoes	Plowed.	35.91	51.75	60.32	60.38	52.09	54.61	44.07	15.50	16.53	**32.68**
	Cultivated.	36.36	51.88	60.44	61.38	52.52	55.86	38.54	17.63	14.94	**31.74**
Turnips..........	Plowed.	32.09	51.19	60.00	60.13	50.85	78.88	46.83	18.31	32.20	**44.06**
	Cultivated.	33.92	52 25	60.50	59.38	51.51	74.09	50.28	18.82	33.15	**44.09**
Carrots	Plowed.	35.44	52.88	60.00	58.13	51.61	63.98	29.17	21.51	21.63	**34.07**
	Cultivated.	35.61	52.50	59.88	58.50	51.62	57.36	27.45	21.15	21.11	**31.77**

It must be understood that this experiment extends for a period of but one season, and that it will likely be continued for at least four years to come. It will be seen from an examination of the above figures that the results are very similar for the two methods of working land. In quality of grain there seems to be a slight advantage from the unplowed land, and in the yield of grain per acre a slight advantage from the land which was plowed. It will be understood that the land which was cultivated took less time and labor in preparation than that which was plowed. It is important to know that the sections of the experimental grounds used for the potatoes, turnips, and carrots in 1897 were quite widely separated, although all were in the experimental grounds; it is, therefore, unfair to compare the different sections which were devoted to the root crop in 1897 with one another as grain-producers in the following year, owing to their being somewhat differently located.

Experiments with Potatoes and Field Roots.

In 1898 experiments with potatoes were conducted in the south-western portion of the experimental grounds, on land which had a gentle slope towards the south-west. The greater number of the root experiments were conducted in the same division of the experimental grounds, while others were conducted in different portions. Nearly all the land used for the potatoes and the roots had a grain crop in 1897, after which it was plowed, and in the spring of the present year was thoroughly worked. For the variety experiments, the plots were 1·100 of an acre in size; but for the experiments for different methods of cultivation, the plots varied somewhat according to the individual experiments. Under the heading of "Roots," experiments were conducted with fall turnips, swede turnips, mangels, sugar beets, carrots, parsnips, and kohl-rabi.

Potatoes.—Comparative Test of One Hundred and Eighty-three Varieties.

Varieties of Potatoes.	Results for 1898.			Average for three years.		
	Per cent. of whole crop marketable.	Weight of 30 largest potatoes on each plot.	Yield of potatoes per acre.	Per cent. of whole crop marketable.	Weight of 30 largest potatoes on each plot.	Yield of potatoes per acre.
	%	lbs.	bushels.	%	lbs.	bushels.
1 Convoy	86.92	10.50	222 92	87.73	12.75	**226.19**
2 Empire State	88.87	12.00	202.08	90 30	12.83	**224.58**
3 Rural New Yorker No. 2	90 95	11.50	184.17	92.26	14.08	**220.42**
4 Ohio Junior	89.98	15.50	207.92	91.19	12 00	**217.92**
5 Dakota Red	83 74	10.50	169 17	88.78	12.92	**217.22**
6 Early Rose	86.49	14.00	231.25	87.00	13.67	**217.22**
7 Early May Flower	87.02	13 00	218.33	85.61	12.17	**216.94**
8 Dempsey's Seedling	81.53	12.75	196.25	82 01	12.67	**215.14**
9 Ideal	84 63	12.75	214.17	81.01	11.58	**215.14**
10 Silver King	83.16	11.00	200.42	84.90	13.33	**215.14**
11 Early Oxford	80.67	10.25	187 50	85.90	13.42	**215.00**
12 Early Rochester	88.94	12.50	173.33	90.77	15.00	**213.96**
13 Thunderbolt	90.22	12 75	212 92	90.06	14.67	**211.95**
14 Governor Foraker	83.14	9.25	217.50	76.92	9.83	**211.11**
15 Irish Daisy	85.82	8.00	235.00	79.29	9.33	**210.83**
16 Landreth's Farmers' Alliance	79.81	12.75	214.58	81.92	13.25	**210.41**
17 Pearl of Savoy	88 68	11.25	224.58	86.96	12.83	**210.28**
18 Montana Bluff	87.19	14.50	250.42	81 76	11.25	**209.10**
19 Bruce's White Beauty	83.30	13 00	204.58	81.88	12.33	**209.03**
20 Red Australian	82.23	9.50	194.58	84.95	11.92	**209.03**
21 Watson's Seedling	83.19	11.50	240.42	83.04	11.83	**208.89**
22 Munro County Prize	87 88	12.25	192.50	84.97	13.33	**208.89**
23 Halo of Dakota	84.92	12.50	201.67	82.14	11.42	**208.33**
24 Vick's Perfection	84.11	12.50	215.00	82.04	12.67	**208.19**
25 Early Harvest	75.26	9.50	198.75	74.47	10.17	**207.78**
26 Crown Jewel	85.29	11.75	170.00	84.55	12.00	**206.94**
27 Summit	84.63	11.50	208.75	87.85	13.50	**206.80**
28 Sweet St. Vernal	85.88	10.25	176.67	85.24	12.17	**204.86**
29 St. Patrick	86.65	13.00	202.92	83.67	11.83	**204.86**
30 Manitoba Rose	82.57	10.25	191.25	86.95	12.08	**204.17**

POTATOES.—COMPARATIVE TEST.—*Continued.*

Varieties of Potatoes.	Results for 1898. Per cent. of whole crop marketable.	Results for 1898. Weight of 30 largest potatoes on each plot.	Results for 1898. Yield of potatoes per acre.	Average for three years. Per cent. of whole crop marketable.	Average for three years. Weight of 30 largest potatoes on each plot.	Average for three years. Yield of potatoes per acre.
	%	lbs.	bushels.	%	lbs.	bushels.
31 Reed's Eighty-Six	83.61	11.50	251.67	77.71	10.25	**203.92**
32 Steele's Earliest of All	80.00	11.75	225.00	72.15	10.25	**203.75**
33 Rose's New Invincible	88.64	12.00	187.08	88.97	13.92	**203.47**
34 Nebula	77.02	10.50	237.58	75.00	10.75	**202.66**
35 American Wonder	87.80	11.50	205.00	86.92	12 75	**202.64**
36 Early Gem	87.78	13.25	245.42	88 15	13.00	**202.64**
37 Halton's Seedling	81.65	12.25	231 67	83.90	12.17	**202.64**
38 Clark's Nonsuch	89.07	15.25	205.83	87 24	12.92	**202.08**
39 Timpe's No 4	87.45	11.50	215.83	84.14	11.17	**201.80**
40 Hotel Favorite	87.80	12.50	208.33	85.26	11.42	**201 53**
41 The Daisy	85.42	13.00	200.00	87.12	13 92	**201.39**
42 P. E. I. Early Rose	83.51	10.75	194.58	83.39	12.00	**201.25**
43 Paris Rose	82.26	10.50	220.83	79.82	11.83	**201.11**
44 Island McDonald	82.97	12.00	232.50	80.72	12.50	**200.56**
45 Molly Star	82.07	13 25	211.67	84.50	12.83	**200.56**
46 Stray Beauty (Wilson's)	77.06	10 00	187.08	79.93	9.33	**200.00**
47 Hoffman	81.53	11.75	223.33	82.84	12.58	**199.44**
48 Burpee's Extra Early	81.04	11.00	184.58	79.36	11.08	**198.61**
49 Rochester Rose	81.08	13.75	246.67	81.74	12.83	**198.20**
50 May's Imperial	87.50	10.00	173.33	85.73	11 83	**198.19**
51 Woodbury White	83 41	10.00	175.83	87.05	13.58	**197.92**
52 White Elephant	91.71	15.00	180.83	88.54	14.75	**197.64**
53 Early Six Weeks	86.36	13.50	241.25	85.06	12.83	**197.64**
54 Early Dominion	89.26	13.50	186.25	89.84	15.25	**197.64**
55 State of Maine	90 95	13.25	179.58	90.66	13.42	**197.50**
56 Rural Blush	82.98	10.25	159.17	84.97	11.58	**197.08**
57 Early Puritan	89.28	15.00	190.42	88.47	14.75	**196.67**
58 Pootaluck	88 62	12.00	205.00	85.49	13.58	**196.67**
59 Advance	82.99	11.50	161.67	85.11	13.42	**196.11**
60 Vaughan	78.39	9.75	212.08	82.47	11.67	**196.11**
61 Burpee's Superior	85.29	10.50	209.58	83.96	11.92	**195.97**
62 Early Maine	82.24	12.00	241.67	84.03	12.67	**195.77**
63 New Queen	87.34	11.75	200.83	86.27	11.67	**195.66**
64 Bill Nye	93.42	11.25	183.75	84.09	11.25	**195.35**
65 Badger State	83.33	11.50	190.00	84.28	12.42	**195.14**
66 Thorburn's Extra Early	81.15	11.25	245.42	83.31	12.00	**195.00**
67 Vick's Champion	91.09	14.25	205 83	88.38	12.92	**194.86**
68 Green Mountain	89.32	11.25	152.08	94.45	13.92	**194.58**
69 Parson's Prolific	88.72	14.75	221.67	88.11	13 50	**194.03**
70 Arizona	84.56	11.50	226.67	83.07	11.33	**193.89**
71 Mount Carbon	90.76	13 50	198.33	88.50	12.92	**193.61**
72 Extra Early Vermont	79.29	12.25	223.33	75.25	10 50	**193.61**
73 Alexander's Prolific	87.73	12.00	203.75	88 08	13.67	**193.47**
74 Polaris	84.50	12.00	225.83	82.89	12.08	**193.47**
75 Brown's Prolific	84.71	11.00	231.67	74.06	9.25	**193.27**
76 Pride of the West	80.77	10.75	216.67	83.41	11.25	**193.06**
77 Rosy Morn	86.87	11.50	206 25	90.19	12.58	**192.92**
78 Tonhocks	91.43	10.50	116.67	89.18	12.58	**192.64**
79 Early Sunrise	80.10	10.50	167.50	84.53	12.25	**192.50**
80 The Dandy	84 14	11.75	223.33	84.42	10.83	**191.81**
81 Scotch Regent	83.23	12.50	193.75	81.08	12.00	**190.83**
82 Mammoth Pearl	90.32	14.00	193.75	88.72	13.67	**190.56**
83 Burnaby Mammoth	86.87	13.50	241.25	81 02	11.25	**190.56**
84 Great Divide	79.49	8.75	181.67	77.93	9.67	**190.28**
85 Wilson's First Choice	88 34	11.50	185.83	86.05	11.83	**189.88**
86 Morning Star	85.65	11.50	174.17	84.96	11.08	**189.86**
87 King of the Roses	86.08	10.25	197.50	82.98	11.33	**189.58**
88 Early Yorker	84.45	13.00	217.08	84.19	12.50	**189.44**
89 Golden Harvest	78.54	10.00	211.67	74.13	9.75	**189.17**
90 Sunlight Star	87.65	12.00	212.50	86.76	12.58	**189.17**
91 Montana Wonder	85.53	11.50	190.00	79.57	12.08	**189.03**
92 Restaurant	91.71	14.50	236.25	85.93	11.42	**189.03**

POTATOES —COMPARATIVE TEST.—*Continued.*

Varieties of Potatoes.	Results for 1898. Per cent. of whole crop marketable.	Results for 1898. Weight of 30 largest potatoes on each plot.	Results for 1898. Yield of potatoes per acre.	Average for three years. Per cent. of whole crop marketable.	Average for three years. Weight of 30 largest potatoes on each plot.	Average for three years. Yield of potatoes per acre.
	%	lbs.	bushels.	%	lbs.	bushels.
93 Everett's Seedling	80.04	11.50	206.67	81.29	11.25	**188.75**
94 Garnets	84.25	11.75	203.75	83.09	11.67	**188.61**
95 English Bumpers	89.37	12.25	219.58	82.84	9.50	**188.61**
96 Earliest Known	84.47	11.00	201.25	82.90	10.00	**188.40**
97 Granger	85 33	11.00	187.50	83.34	11.42	**188 19**
98 Keiser	91.02	12.50	176.25	90.18	12.42	**187.92**
99 Early Everett	88 76	13.25	217.08	86.10	13.00	**187.92**
100 Early June Eating	88.98	13.75	204.17	86.07	13.25	**187.22**
101 Early Northern	83.67	10.75	204.17	77.41	10.17	**187.22**
102 The Freeman	83.34	10.00	235 83	73.94	9.67	**186.67**
103 Kosh Konong	89.93	12.50	190.42	88.79	13.83	**185.14**
104 Late Rose	83.47	12.00	196.67	85.69	13 75	**184.31**
105 Delaware	86 99	12 25	172.92	89.32	12.58	**184.17**
106 Howe's Premium	86.42	10.50	190.42	85.96	9.58	**183.92**
107 Hopeful	87.79	12 75	197.92	89.24	13.83	**183.89**
108 Brown's Elephant	86.67	11.25	212.50	79.10	9.58	**183.75**
109 Six Weeks	89.96	12.50	228.33	87.75	11.33	**183.19**
110 Salzer's Prize Taker	83.16	10.00	202.92	79.38	9 92	**181 88**
111 Pride of Ireland	90.46	14.50	209.58	89.66	13.83	**181.39**
112 Great West	86.20	12.00	220.42	87.82	12.42	**180.33**
113 Early Pride	78 87	10.00	236.67	72.92	9.08	**180.00**
114 Burbank's Seedling	82.11	11.00	142.08	82.46	11.50	**179.72**
115 Woodhull	84.76	12.25	194.17	76.49	10.33	**179.72**
116 Eureka	85 66	9.75	197.08	80.00	9.92	**179.30**
117 Russel's Seedling	85.82	13.75	223.33	85.56	11.42	**179.30**
118 Van Orman's Earliest	81.27	11.00	229.17	79.17	10.00	**179.17**
119 Napoleon	80.89	10.25	215.83	72 20	8.83	**179.03**
120 Putnam	80.78	13.25	171.25	82.86	11.83	**178.89**
121 New Satisfaction	81.15	11.00	203.33	79.18	10.42	**177.92**
122 Chicago Market	82.63	11.75	208.75	82.42	11.00	**176.67**
123 General Gordon	83.33	11 25	192 50	86.62	12.17	**176.53**
124 Adirondack	82.19	11.00	182.50	84.62	11.42	**176.53**
125 Chas. Downing	71.89	7.75	154 17	71.31	10.00	**175.97**
126 Snow Queen	85.00	13.50	216.67	79.75	18.83	**175.00**
127 Hartzell's Seedling	89 29	12.25	186 67	88.69	12.17	**174.72**
128 White Lily	83 87	11.50	167.92	82.62	12.17	**174.58**
129 Minister	88.82	10.25	137.92	90.35	12.50	**174.10**
130 Fillbasket	88.11	15.00	213.67	82.53	12.00	**173.52**
131 Columbus	85.84	13.00	194.17	84.62	13.17	**173.47**
132 Early White Prize	83.79	11.50	210.83	80.81	10.00	**171.94**
133 Troy Seedling	75.15	11.50	142.50	68.29	8.92	**170.14**
134 Boley's Northern Spy	91.25	13.25	200.00	92.14	13.25	**170.00**
135 Pride of the Table	81.03	10.75	217.50	80 61	9.00	**169.86**
136 Negro	45.68	6.00	135.00	51.31	7.42	**169.58**
137 North Pole	78.35	10.00	202.08	73.88	9.25	**169.30**
138 The Rosedale	80.77	10.25	216.67	81.78	11.17	**168.61**
139 Flower City	80.28	9.75	177.50	66.36	8.50	**168.54**
140 Snow Drop	84.94	15.25	237.92	82.16	12.17	**168.10**
141 Early Pontiac	80.70	10 75	142 50	79.64	11.33	**168.05**
142 Vanguard	74.89	9.75	194.17	70.47	9.00	**167.05**
143 Rot Proof	63.68	7.75	176.67	61 77	7.67	**166.81**
144 Bell's Stray Beauty	72.58	8.25	155.00	76.79	8.33	**166.67**
145 Ontario	81.60	10.75	192.50	79.58	10.42	**166.39**
146 White Star	84 61	11.50	143.75	85 72	11.42	**165.14**
147 Clay Rose	76.85	10.25	185.42	78.84	9.92	**164.79**
148 N. B. & G. Co's Grand Mogul	88.59	11.25	172.67	89.70	11.75	**164.43**
149 Pride of the Market	82.81	12.25	174.58	82.82	11.17	**163.89**
150 McIntyre	83.66	12.00	188.75	79.88	11.42	**162.78**
151 Governor Rusk	71.29	9.00	171.25	66.73	8.00	**161.11**
152 Early Market	87.70	13.25	179 25	84.53	13.50	**160.12**
153 Snowflake	69.58	9.00	167.08	68.44	8.25	**159.16**
154 The Peoples	89.55	13.00	167.50	87.05	12.00	**159.03**

POTATOES.—COMPARATIVE TEST.—*Concluded.*

Varieties of Potatoes.	Results for 1898.			Average for three years.		
	Per cent. of whole crop marketable.	Weight of 30 largest potatoes on each plot.	Yield of potatoes per acre.	Per cent. of whole crop marketable.	Weight of 30 largest potatoes on each plot.	Yield of potatoes per acre.
	%	lbs.	bushels.	%	lbs.	bushels.
155 Improved Rose	86.71	11.25	216.25	80 91	10.83	**158.99**
156 Early Essex	82.62	11.25	203.75	80.73	11.17	**158.20**
157 Lee's Favorite	76.01	9.25	175 42	73.73	9.50	**156.53**
158 Vick's White Gem	82 04	11 25	220.42	72.97	9.67	**155.83**
159 World's Fair	70.78	10 75	175.42	71.85	9.83	**155.42**
160 Acme	89.98	10.75	174.50	84.32	9.75	**154.21**
161 Victor Rose	83.80	12.00	192 92	85 56	11.50	**153.89**
162 Seneca Beauty	84.03	11.25	190.42	87.86	12.17	**149 31**
163 Early Advancer	74.75	8.75	166.67	74.27	9.08	**147.71**
164 Landreth's Garfield	69.46	8.25	139.17	70.16	9.42	**145.69**
165 Potentate	86.09	12.25	143.75	89.49	13.00	**144.03**
166 Rose Seedling	83.64	10.50	180.83	87.66	11.58	**142.92**
167 Chautauqua	77.90	9.25	182.92	76.62	9.33	**139.17**
168 Silver Dollar	78.73	9.50	150.83	73.47	8.83	**139.17**
169 Browell's Seedling	77.58	9.50	182.08	74.29	9.75	**138.06**
170 Beauty of Beauties	90.13	13.25	194.17	88.57	11.58	**134.03**
171 Harbinger	69.12	9.50	180.83	64 40	9.83	**133.19**
172 Dreer's Standard	76.23	10.50	135.00	79.59	10.17	**130.90**
173 Maggie Murphy	83 82	10.00	172 50	85.79	11.25	**130.00**
174 Rose of Erin	79.37	10 50	145.42	86.58	11.25	**127.43**
175 Lady Finger	25.40	5.75	157.50	31.11	5.33	**125.83**
176 Michigan Blues	85 00	10.75	125.00	87.79	11.00	**125.28**
177 California Red	66.40	8 25	158.75	61.91	7.42	**125.07**
178 Prince Albert	79.42	8.00	172.08	75 87	8.83	**117.64**
179 Manhattan	86.96	10.25	143.75	86 05	8.72	**116.04**
180 Weld's Orange	62.29	4 25	149.17	49 50	4.50	**101.18**
181 Columbia Peach Blow	68.65	7.50	77.08	68.09	4.92	**98.05**
182 Irish Cups	78.66	10.25	173.75	63 60	7.50	**96.32**
183 Eyeless	36.84	4.25	23.75	40.16	6.00	**67.64**

Thirty-nine varieties of potatoes have been grown in the experimental plots for seven years in succession, sixty four for six years, forty-six for five years, and the rest of the varieties for a less number of years. In order to secure a large number under similar conditions, the average results for only the last three years are included in the report here presented. The seed of the different varieties which we now have under experiment, was obtained from Nova Scotia, Prince Edward Island, Quebec, United States and Ontario. In 1898 the varieties were planted on the 17th, 18th, 19th, 20th, and 21st of May. Each plot consisted of three rows four rods in length, the rows being a little less than twenty-seven inches apart. Fifteen pounds of each variety were used in every instance, and the plots were so divided that there were one hundred and ninety-eight sets of each kind planted. The land was drilled with a double mouldboard plow, and the potatoes were planted four inches below the surface of the land. Flat cultivation was used throughout, and the application of Paris green with water was used three times to destroy the potato beetles. The crop was removed from the ground with a two horse potato digger. The marketable and unmarketable potatoes were divided by means of a "Pease potato sorter." The potatoes mentioned as unmarketable were those which were less than about one and one-half inches in diameter. The potatoes were weighed very soon after being dug.

By an examination of the results of the different varieties of potatoes here presented, it will be seen that no less than eighty-six varieties gave a yield of upwards of 200 bushels per acre in 1898, and that fourteen varieties produced potatoes over ninety per cent. of which were marketable. In the average of three years' experiments, forty-six varieties gave 200 bushels or over per acre, and three varieties gave less than 100 bushels per acre. The Rural New Yorker No. 2, Ohio Junior, Green Mountain, and Boley's Northern Spy produced potatoes which had upwards of ninety-one per cent. of the total crop marketable, and quite a large number had between ninety and ninety-one per cent. It will also be noticed that only 31.1 per cent. of the Lady Finger variety, 40.16 of the Eyeless, and 49.5 per cent. of the Weld's Orange were marketable.

The Convoy, Empire State, and Rural New Yorker No 2, which occupied the highest place in yield of potatoes per acre among one hundred and eighty-three varieties grown for three years in succession, are all comparatively late potatoes. A special experiment has been conducted which gives additional information regarding eleven varieties of the earliest varieties of potatoes, the results of which will be found under another heading. The Landreth's State of Maine variety, in fact gave the largest yield per acre of all the varieties in the average of the three years; but as this high average was caused by an exceptionally high yield in 1897, it was thought that perhaps some mistake might have occurred in the harvesting of that variety in that year, and it was thought best to draw special attention to this variety in this way, rather than by embodying it in the foregoing table. The Beauty of Hebron made a fairly high record in 1896 and in 1897, but unfortunately was missed from the experiments in 1898; and this omission was not noticed until it was too late to embody it in the experiments of the present year. The Convoy variety, which stands at the head of the list, has given an average of about two and a half bushels per acre more than the Empire State in the average results here presented for the three years. In the average of thirty nine varieties grown for seven years in succession, however, the Empire State came first in average yield of potatoes per acre, and the Convoy came fifth; so that, all things taken into consideration, the Empire State is one of the most substantial varieties of potatoes which we have ever grown at this place, as a cropper for general use. It will be seen that the Early Rose variety still occupies a prominent place, being sixth in yield of potatoes per acre among the one hundred and eighty-three varieties grown for three years in succession.

Potatoes—Comparative Test of Eleven Early Varieties.

As there is usually much interest taken in early potatoes, it was thought advisable to select the eleven varieties which have proved to be the earliest in our experiments of the past few years, and test them under different conditions. An experiment has, therefore, been conducted for three years in succession by planting six rows of each variety in the spring, and digging two rows of each at the end of nine weeks, two rows of each at the end of twelve weeks, and two rows of each at the end of fifteen weeks after the seed was planted, in order to ascertain which variety of potatoes would give the best results in the shortest possible time after planting. The soil in which this experiment was conducted, was quite low-lying in 1898, and was somewhat elevated in 1897 and in 1896. A dressing of twenty tons of manure was applied to the land in the spring before the potatoes were planted. One-half bushel of seed of each variety was planted each year. The following table gives the average results of this experiment for three years:

Varieties of Early Potatoes.	Percentage of potatoes over one inch in diameter. Average three years.			Yield of potatoes per acre. Average three years.		
	9 weeks.	12 weeks.	15 weeks.	9 weeks.	12 weeks.	15 weeks.
				bush.	bush.	bush.
Tonhocks	70.47	89.47	95.20	82.08	164.78	223.70
Early Rose	59.78	88.83	95 15	76.90	143.20	214.50
Stray Beauty	71.76	87.50	92.70	124.06	173.50	200.59
Chas Downing	56.42	83.64	93.77	74.50	143.43	195.95
Steeles' Earliest of All	68.12	88.15	95.32	88.55	148.38	195.53
Early Dominion	80.64	93.77	96.53	94.28	151.68	192.42
Howe's Premium	75.53	90.02	92.61	107.92	155.21	192.40
Burpees' Extra Early	68.89	88.49	95.31	92.21	160.72	183.07
Early Ohio	80.52	93.91	93.80	111.98	170.83	180.83
Snowflake	56.11	85.68	92.83	79.18	142.60	179.17
Early Sunrise	56.93	86.76	96.63	51.06	121.60	158.35

It will be seen by an examination of the figures here presented, that the Stray Beauty, Early Ohio, and Howe's Premium, produced the greatest yield per acre on the first date of digging. Each of these varieties produced upwards of 100 bushels per acre at the end of a period of nine weeks from the time the seed was planted. The Stray Beauty is one of the very earliest varieties in which the tops die, and it will be seen that it is the variety which gave the largest yield per acre at the time of the first digging. The record of the Early Ohio is certainly a good one, as it produced about 112 bushels per acre at the end of nine weeks, over 80 per cent. of which measured more than one inch in diameter. The potatoes of this variety seem to develop very early, as do also those of the Early Dominion. Although the Tonhocks stand at the head of the list in yield of potatoes per acre at the end of fifteen weeks, still as a very early potato they do not make so good a record as some of the other varieties; as at the end of nine weeks the yield was only 82 bushels per acre, and only 70 per cent. of the potatoes were over one inch in diameter. The Early Sunrise produced an average of only 51 bushels per acre at the end of nine weeks, and only about 57 per cent. of this crop were potatoes which measured over one inch across.

Potatoes—Selection of Seed for Three Years in Succession.

In 1894 an experiment was conducted by planting three selections of potatoes, namely, large marketable potatoes, medium-sized marketable potatoes, and small marketable potatoes. In 1895, large, medium, and small whole potatoes were selected from the potatoes produced from the large, medium, and small potatoes planted the previous year. We thus had large-sized potatoes selected from the produce of large potatoes, medium-sized potatoes selected from the produce of medium potatoes, and small-sized potatoes from the produce of small potatoes. Besides this, a selection was also made of very small, unmarketable potatoes from the produce of small potatoes grown in 1895. In 1896, 1897, and 1898 similar selections were made each year from the crop produced in the year previous. The term "small potatoes" in this experiment means those one and one-half inches in diameter, and the term "very small potatoes" means those of an average of about three quarters of an inch in diameter.

Seed Potatoes Selected.	Average amount of seed per acre.	Percentage of wholecrop marketable.				Weight of 30 largest potatoes	Yield of potatoes per acre.			
	'95-6-7-8	1895.	1896.	1897.	1898.	1898.	1895.	1896.	1897.	1898.
	bush.	%	%	%	%	lbs.	bush.	bush.	bush.	bush.
Large whole potatoes	60 60	85.8	79.3	87.7	75.1	7.6	129.7	168.8	283.5	222 5
Medium whole potatoes	38.65	88.0	79.1	83.0	75.5	7.1	112.2	143.8	257 5	196.3
Small whole marketable potatoes	17.71	89 3	79 9	81.0	74.8	6.3	49 7	105.6	215.6	156.3
Very small whole potatoes	10.03	84.4	80.8	80.7	67.0	5.8	14.1	65.0	170.8	98.8

It will be seen that without any exception the largest potatoes produced the largest crop; and as the size of the seed diminished, the resulting crop was less. It will also be seen in the results of 1898, the fourth year after this experiment was started, that the crop produced from the small potatoes had only 67 per cent. of the crop marketable, while those produced from the large potatoes had 75 per cent. of the crop marketable.

POTATOES—PLANTING SETS OF DIFFERENT SIZES WITH ONE EYE IN EACH SET.

Weight of potato sets planted.	Percentage of whole crop marketable.		Average weight of 30 largest potatoes on each plot.		Yield of potatoes per acre.	
	1898.	Average 4 years. 1895-6-7-8.	1898.	Average 4 years. 1895-6-7-8.	1898.	Average 4 years. 1895-6-7-8.
	%	%	lbs.	lbs.	bush.	bush.
Each set containing 1-16 ounce and 1 eye.	64.4	75.7	5.0	6.6	42.5	**44.2**
" " 1-8 " 1 "	81.5	87.3	7.4	5.6	83.1	**83.7**
" " 1-4 " 1 "	89.4	89.1	8.0	9.5	112.5	**107.6**
" " 1-2 " 1 "	86.3	88.0	8.9	9.8	136.9	**125.8**
" " 1 " 1 "	86.0	88.9	8.8	10 0	164 4	**152.5**
" " 2 ounces 1 "	83.3	87.5	8.9	10.1	180.0	**177.4**

In 1895, 1896, 1897, and 1898, an experiment was conducted in which pieces of potatoes one-sixteenth ounce, one eighth ounce, one-quarter ounce, one-half ounce, one ounce, and also two ounces in size were planted side by side. No piece contained more than one eye. The object of this experiment was to ascertain the influence of the size of the potato seed on the crop produced. The experiment has been conducted in duplicate in each of the four years. The potato sets were planted to a depth of about four inches, and flat cultivation was used throughout the season.

The results of the experiment in planting different-sized pieces of potatoes are very striking and are of much practical value. The average yield per acre for four years indicate very clearly that the yield of potatoes depends quite largely upon the size of the pieces which are planted, the smallest pieces giving the smallest yields, and the largest pieces the largest yields without any exception. The yields per acre for the different pieces in 1898 are very similar to those in the average of four years. The comparative amount of marketable potatoes does not seem to depend so much upon the size of the pieces planted as does the yield of the crop per acre.

POTATOES—PLANTING PIECES OF EQUAL SIZE WITH A VARYING NUMBER OF EYES.

In order to obtain some information in regard to the influence of the number of eyes on pieces of potatoes in affecting the succeeding crop, an experiment has been conducted for four years in succession. Potato sets of one ounce in size were used throughout the experiment, and, in every instance, for number one plot, the seed contained one eye in each piece; for number two plot, two eyos; for number three plot, three eyes; for number four plot, four eyes; and for number five plot, five eyes. The experiment was conducted in duplicate each year. Great pains were taken to have all the pieces of exactly the same weight—in fact. every piece was weighed by itself on an accurate balance; and each plot consisted of one row four rods in length. There were, therefore, 40 rods of potatoes in this experiment each year.

Number of eyes in the seed of potatoes.	Average yield of potatoes from each		Average yield of potatoes per acre, 4 years, 1895-6-7-8.
	Set. Average 4 years, 1895-6-7-8.	Eye. Average 4 years, 1895-6-7-8.	
	ozs.	ozs.	bush.
Each potato set containing 1 ounce and 1 eye	7.20	7.20	**136.41**
" " 1 " 2 eyes..............	7.74	3 87	**145.47**
" " 1 " 3 "	8.06	2.70	**153.13**
" " 1 " 4 "	8.31	1.97	**162.82**
" " 1 " 5 "	8.35	1.68	**164.37**

It will be seen that the number of eyes in each set of potatoes planted has some influence in the yield of the crop ; but, at the same time, the difference in yield per acre resulting from the different number of eyes is not nearly so marked as that resulting from pieces of different sizes, having one eye in each piece, as shown in the previous experiment. Seed having one eye in each set produced 136 bushels per acre, while exactly the same amount of seed of the same variety, but the pieces having five eyes in each, produced 164 bushels per acre, or an increase of twenty-eight bushels per acre. It will be understood that some of the eyes of the potatoes were carefully removed with a knife in order to get the exact number to comply with the requirments in this experiment.

Potatoes—Methods of Cultivation.

In 1896, an experiment was conducted for the first time by planting potatoes in rows twenty-six and two-fifths inches apart, with the potato sets one foot apart in the row, and in comparison with planting thirty-three inches apart each way. Another feature in connection with the experiment was that part of the potatoes, which were planted thirty-three inches apart, were cultivated on the flat and part were hilled up. This experiment has now been conducted in duplicate for three years. The different plots used for the experiment were exactly the same in shape and size, each plot being 1/60 of an acre.

Distance between rows.	Distance between plants in the rows.	Kind of cultivation.	Percentage of crop marketable, average 3 years, 1896-7-8.	Yield of whole crop per acre average 3 years, 1896-7-8.
			%	bush.
$26\frac{2}{5}$ inches	12 inches	Flat	78.12	**189.42**
33 "	33 "	Flat	80.74	**170.63**
33 "	33 "	Hills	84.46	**162.07**

Exactly similar quantities of seed were used in the different plots in this experiment ; and it will be seen from the figures here presented, that by planting the potatoes in rows twenty-six inches apart, and having the potato sets twelve inches apart in the row, 189 bushels per acre were realized. In comparison with this the potatoes which were planted thirty-three inches apart, and were hilled up, gave twenty-seven bushels per acre less. There appeared to be, however, a larger percentage of marketable potatoes from the land which was hilled than from that which was left on the flat. This experiment will likely be repeated for several years.

Potatoes—Treatment for the Potato Beetle

For two years in succession an experiment has been made to ascertain the relative difference in actual experience from treating potatoes differently in order to kill the potato beetle, and also to determine the actual results in the crops produced from the potatoes thus treated. The experiment was conducted in duplicate each year. In every instance some were left untreated, and the potato beetles allowed to eat at pleasure. Another plot in each experiment was treated with a compound which is sold upon the market under the name of "potato bug finish," and the other two plots were treated with Paris green, mixed either with plaster or with water. The application was made four times in 1897 and three times in 1898. The tops of the vines where no treatment was used were, of course, nearly all destroyed, and those upon which Paris green was used with water were the freest from the ravages of the beetles.

POTATOES—TREATMENT FOR THE POTATO BEETLE.

Treatment used for the potato beetle.	Percentage of crop marketable			Weight of 30 largest potatoes.	Yield of whole crop per acre.		
	1897.	1898.	Average 2 years.	Average 2 years 1897-8.	1897.	1898.	Average 2 years.
	%	%	%	lbs.	bush.	bush.	bush.
Paris green with water.....	78.70	60.19	69.45	7.00	190.33	86.25	**138.29**
Paris green with plaster ...	79.06	52.35	65.71	6 57	158.45	77.29	**117.87**
Potato bug finish	74.57	49.86	62.22	6 76	156.86	77.08	**116.97**
Not treated	60.58	35.01	47.80	4.57	70.33	51.05	**60.69**

The early varieties of potatoes were used in 1898, and the yields were very low in every case. It will be seen that there is a marked difference in the average yield per acre of potatoes from the different plots in each of the two years, evidently resulting from the ways of treating the vines in order to destroy the potato beetles. The potatoes which were not treated at all gave a yield of less than seventy-one bushels per acre; while those from which the beetles were destroyed by means of Paris green and water, gave an average yield of about 138 bushels per acre. In average percentage of crop marketable, it will also be noticed that the untreated potatoes had only about forty-eight per cent, while those treated with Paris green and water had nearly seventy per cent of the potatoes which were over one and one-half inches in diameter.

POTATOES—PLANTING SEED ON THE SAME DAY AS CUT AND FOUR DAYS AFTER CUTTING.

For four years in succession, an experiment has been conducted by cutting potatoes and allowing them to remain four days before planting in comparison with those cut and planted immediately.

Time of cutting and planting potatoes.	Percentage of whole crop marketable, average 4 years 1895-6-7-8.	Yield of whole crop per acre, average 4 years 1895-6-7-8.
	%	bushels.
Potatoes planted four days after they were cut	75.12	**154.48**
Potatoes planted same day as they were cut..........................	76.41	**165.76**

Although it is the practice of quite a number of people to cut the potatoes and leave them several days before planting, still we have found in the results of the various experiments conducted at this place, that the potatoes which were planted the same day that they were cut gave the best results throughout. In the average of four years' experiments, it will be seen that the potatoes which were cut and planted the same day gave over eleven bushels per acre more than those which were allowed to remain four days after being cut before they were planted. It will also be seen that about one and one-third per cent more marketable potatoes were obtained from seed which was planted the same day as it was cut.

POTATOES—EXPERIMENTS FOR FIVE YEARS.

Several experiments with potatoes have been conducted for five years or over but the results are not presented here. For information regarding these experiments the reader is referred to the reports of former years.

Mangels—Comparative Test of Sixty-Seven Varieties.

In 1898, sixty-seven varieties of the long, intermediate, and globe mangels were grown in our experimental plots. The land on which the mangel seed was sown in the past year was manured in the spring of 1898 with farmyard manure, at the rate of twenty tons per acre. The soil was plowed in the autumn of 1897, and was thoroughly worked on the surface in the spring of the present year. The seeding of the mangels took place on the 11th, 12th and 13th of May, and the germination was very good throughout. The seed was sown on the level, and the land was kept comparatively level throughout the season. There were three rows of each variety, each row being four rods in length, and three and one-third links were allowed between the rows, thus making each plot 1/100 of an acre in size. When the young plants were about three inches in height they were thinned to a distance of ten inches apart in the drills. The young plants were very carefully counted, in order to have the number exact. At the time of harvesting the mangels the roots were again carefully counted, and the total number of roots divided into the total weight in order to find the exact average weight per root.

Varieties of Mangels.	Results for 1898.			Average results for number of years grown.		
	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for Eight Years:	tons.	lbs.	tons.	tons.	lbs.	tons.
1 Evans' Improved Mammoth Saw-log	2.85	1.068	15.05	4.08	2.136	**23.91**
2 Simmers' Improved Mammoth Long Red	2.95	1.220	15.13	4.03	2.108	**23.86**
3 Steele's Long Red Selected	3.50	1.624	19.65	3.84	2.118	**23.67**
4 Carter's Champion Yellow Intermediate	1.80	1.440	18.00	2.86	2.098	**23.17**
5 Norbitan Giant	3.15	1.730	19.55	3.89	2.097	**22.97**
6 Carter's Mammoth Long Red	3.55	1.971	23.85	4 03	2.006	**22.30**
7 Elvetham Long Red	3.35	1 583	19.00	4.19	1.897	**22.15**
8 Yellow Obendorf	2.98	1.787	21.98	3.00	1.926	**22.07**
9 Eiffel Tower	3.35	1.672	19.15	3.58	1.992	**21.95**
10 Yellow Oval-shaped Giant	2.50	1.867	22 40	2.24	1.915	**21.65**
11 May's Mammoth Long Red	3.55	1.816	22.70	4.01	1.899	**21.65**
12 New Monarch	3.53	2.071	24.65	3.40	1.859	**21.38**
13 Oblong Giant Yellow	3.05	1.987	23.75	2.56	1.925	**21.32**
14 Giant Holstein	5.75	2.139	26.95	4.17	1.892	**21.23**
15 Colossal Long Red	3.45	1.659	20.08	3.40	1.869	**20.63**
16 Chirk Castle	3.45	1.679	21.33	3.23	1.797	**20.54**
17 Red Globe	5.85	2.229	26.30	3.12	1.742	**19.29**
18 Mammoth Red Intermediate	1.90	2.137	14.85	2.79	1.875	**19.27**
19 Mammoth Golden Giant	2.58	1.939	23.68	2.66	1.719	**19.17**
20 Carter's Warden Orange	1.65	1.573	18.25	2.36	1.565	**17.65**
21 Yellow Globe	2.10	2.004	24.25	2.28	1.794	**17.64**
22 Golden Tankard	2.95	2,029	24.55	2.01	1.531	**17.25**
23 Clark's Devon Orange Globe	2.85	1.772	18.25	2 20	1.564	**16.64**
24 Long Yellow	3.60	2.154	25.85	2.70	1.787	**16.51**
25 Fisher Hobb's Orange Globe	3.05	1.638	19 25	2.21	1.480	**16.00**
26 Webb's Kenver Yellow Globe	2.60	1.558	18.70	2.09	1.412	**15.74**
27 Oblong Giant Red	1.70	1.818	10.00	1.64	1.877	**11.85**
Grown for Seven Years:						
28 Sutton's Mammoth Long Red	4.75	2.256	26.40	3.83	1.849	**20.51**
29 Canadian Giant	4.10	1.760	21.30	3.28	1.606	**17.82**
30 Gate Post	4.35	1.742	20.73	3.34	1.582	**17.35**
31 Berkshire Prize Yellow Globe	3.00	2.122	26.10	1.80	1.561	**17.34**
32 Beck's Champion Globe	1.70	1.889	22.10	1.84	1.506	**17.00**
33 Sutton's Yellow Intermediate	2.45	1 905	25.15	1.69	1.464	**16.74**
34 Sutton's Golden Tankard	2.53	1.670	19.38	1.98	1.415	**15.48**
Grown for Six Years:						
35 English Prize	4.85	2.306	27.90	3.87	1.938	**21.93**
36 Yellow Leviathan	3.60	2.266	26.85	2.89	1.920	**21.43**
37 Giant Yellow Intermediate	3.85	2.141	27.40	2.78	1.855	**21.03**
38 Jarman's Giant Intermediate	3.15	2.762	34.25	1.71	1.874	**20.92**

Varieties of Mangels.	Results for 1898. Yield of tops per acre.	Average weight per root.	Yieldr of oots per acre.	Average results for number of years grown. Yield of tops per acre.	Average weight per acre.	Yield of roots per acre.
	tons.	lbs.	tons	tons.	lbs.	tons.
39 Ward's Oval	2.75	1.994	24.93	2.30	1.736	**20.15**
40 Jarman's Selected Golden Tankard	3.95	2.766	34.30	2.18	1.975	**20.13**
41 New Eschendorf	3.15	1.935	24.00	2.27	1.766	**20.06**
42 Jarman's Giant Long Red	4.80	2.313	27.75	3 54	1.784	**20.06**
43 Sutton's Yellow Globe	3.00	2 118	25.00	2.00	1.908	**19.68**
44 Yellow Ovoid	.48	4.000	22.00	2.12	2 028	**18.52**
45 Jarman's Model Yellow Globe	2.05	1.825	22.63	1.69	1.602	**17.25**
Grown for Five Years:						
46 Thorp's Own Yard Long	4.50	2.419	28.55	4.10	2.063	**23.65**
47 Dignity	3.95	2.403	27.75	3.87	2.035	**23.09**
48 Thorp's Own Champion Yellow Intermediate	2.40	2.105	25.95	2.49	1 920	**22.09**
49 Jumbo	4.15	2 367	25.45	3.41	1.977	**21.67**
50 Carter's Warden Prize Yellow Globe	1.75	1.595	18.50	1.79	1.737	**19.63**
Grown for Four Years:						
51 Long White	3.60	2.220	26.20	3.52	2.076	**14.92**
52 Erfurt Model (yellow intermediate)	3.85	2.124	25.70	2.48	1 795	**21.52**
Grown for Three Years:						
53 Cornish Giant Yellow Globe	2.60	2.532	31.65	1.96	2.142	**26.90**
54 Sutton's Crimson Tankard	2.75	2.202	26.20	2.30	2.009	**23.73**
55 Surprize	2.60	3.576	15.20	3.18	2.757	**23.07**
56 Red Tankard	1.80	1.933	11 60	1.68	1.602	**15.15**
Grown for Two Years:						
57 New Model	3.63	3.781	29.30	4.19	3.311	**32.40**
58 Jersey Queen	3.95	2.264	27 85	4.70	2.583	**31.70**
59 Buckbee's New Mastodon	4 65	2.555	30.40	4.63	2.587	**31.38**
60 Riverhall Giant Yellow Globe	2 40	2.132	25 80	2.88	2 491	**30.60**
61 Golden King	2.05	2.081	25 80	2 02	2.293	**29.18**
62 Taber's Yellow Gate Post	1.90	1.925	23.10	2.69	2.272	**28.50**
Grown for One Year:						
63 Giant Yellow Half Long	3.90	2.397	28.65	3.90	2.397	**28.65**
64 Carter's Elephant Yellow Globe	2.50	2.188	26 25	2.50	2.188	**26.25**
65 Carter's Windsor Prize Taker (yellow globe)	2.15	2.142	25.70	2.15	2.142	**25.70**
66 Daniel's Improved Gate Post (intermediate)	2.75	1.975	24.10	2.75	1.975	**24.10**
67 Carter's Gold Finder	2.00	1.380	16.90	2.00	1.380	**16.90**

The average yield of mangels per acre in 1898 was 23.3 tons, and the average yield of tops per acre 3.1 tons. It will be seen that the average yield of roots for the past year is nearly equal to the highest yield in the average of eight years. An average of 23.3 tons is about equal to 773 bushels per acre. The land upon which the mangels were grown was fairly uniform throughout; but that section of it upon which the varieties of mangels first named on the list were placed seemed to be somewhat more influenced by the dry weather than the most of the other plots. Even with the greatest of care it is usually unsafe to draw many conclusions from one year's results. When the experiments, however, are conducted over a series of years, the results may be accepted as furnishing information of real value. Among twenty-seven varieties of mangels which have been grown for eight years in succession, it will be seen that the Evans' Improved Mammoth Saw-log stands at the head of the list, with an average of 23.9 tons per acre. This variety is closely followed by Simmers' Improved Mammoth Long Red with 23 86 tons per acre, which is again closely followed by Steele's Long Red Selected, with 23.67 tons per acre. The fourth place is occupied by the Carter's Champion Yellow Intermediate, producing an average of 23.17 tons of mangels per acre. This variety has certainly given excellent results, as it is intermediate in length, and has surpassed in yield per acre a large number of the long varieties. Several varieties were imported from England in the spring of 1896, and some of them were sown in our experimental grounds this season for the first time. Among the five new varieties grown this year the Giant Yellow Half Long came first, with 28.5 tons per acre; and the Carter's Gold Finder the lowest, with about 17 tons per acre.

Sugar Beets—Comparative Test of Fourteen Varieties.

The subject of sugar-beet growing in Ontario has claimed more or less attention within the last few years, partly from the standpoint of their quality for producing sugar and partly from that of their value for feeding purposes. Eight varieties of sugar beets have been grown in our experimental plots for seven years in succession, and six varieties have been grown for a less number of years. The object in this experiment is to ascertain the comparative yields and the general characteristics of the different varieties, to furnish information as to the kinds which will be most serviceable for growing on the farm for feeding the live stock. The soil on which this experiment was conducted in 1898 was quite similar to that described in the experiments with varieties of mangels. Three rows, each four rods long, were given to each variety. When the plants were from two to three inches in height they were thinned to an average of eight inches apart. The following table gives the results:

Varieties of Sugar Beets.	Color of roots.	Results for 1898.			Average results for number of years grown.		
		Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for seven years:		tons.	lbs	tons.	tons.	lbs.	tons.
1 Lane's Improved	White	4.83	1.35	19.85	3.38	1.45	**19.18**
2 Red Top	Reddish	4.25	1.17	17.05	3.93	1.48	**18.63**
3 White Silesian	White	4 00	1.07	15.30	4.91	1.48	**18.46**
4 Champion	Reddish	2.85	1.18	17.05	3.39	1.43	**18.20**
5 White French	White	4.50	.98	13.70	4.41	1.33	**16.31**
6 Klein Wanzelben	"	4.98	1.12	15.85	4.97	1.26	**15.54**
7 Red Skinned	Reddish	3.23	1.08	15.48	3.46	1.19	**14.91**
8 Improved Imperial	White	4.28	.97	14.53	4.00	1.53	**13.31**
Grown for five years:							
9 New Danish Improved	Reddish	2.75	1.18	17.35	2.82	1.48	**20.10**
10 Jersey	"	4.35	1.20	16.85	3.45	1.40	**18.86**
11 French Yellow	Yellow	2.95	.93	13.25	3.56	1.26	**17.21**
Grown for three years:							
12 Green Top White	White	2.20	1.29	18.80	5.23	1.49	**20.56**
Grown for two years:							
13 Vilmorin's Improved	White	3.80	.86	12.35	5.60	1.18	**16.98**
Grown for one year:							
14 Carter's Nursery	White	6 25	1.28	18.30	6.25	1 28	**18.30**

The White Silesian, which stood first on the list in yield of roots per acre up to two or three years ago, now occupies third place, it being surpassed by Lane's Improved and the Red Top. The Lane's Improved has given an average of about three-fourths of a ton per acre more than the White Silesian. The New Danish Improved has certainly given very good satisfaction, as the average yield of roots per acre for five years is a little over twenty tons, showing this variety to be one of the best producers among the different varieties of sugar beets. The tops of these varieties are small, but the roots are large and grow well under the ground. The Danish Improved variety was sent out over Ontario with four other varieties for co operative experiments in the spring of 1898. When the reports were received and the results summarized, it was found that the two long red varieties of mangels gave the highest yields, and the globe and intermediate varieties the lowest yields, the Danish Improved variety of sugar beets coming between these two groups in yield of roots per acre. The largest yield in the experimental plots in 1898 was produced by Lane's Improved, and the smallest by Vilmorin's Improved. It will be noticed that in yield of tops per acre there was a variation from 2.2 tons to 6.2 tons, Carter's Nursery, a new variety imported from England, producing the greatest yield of tops per acre.

Carrots—Comparative Test of Fifty-one Varieties.

Varieties of Carrots.	Results for 1898. Yield of tops per acre.	Results for 1898. Average weight per root.	Results for 1898. Yield of roots per acre.	Average results for number of years grown on plots. Yield of tops per acre.	Average results for number of years grown on plots. Average weight per root.	Average results for number of years grown on plots. Yield of roots per acre.
Grown for seven years:	tons.	ounces.	tons.	tons.	ounces.	tons.
1 Pearce's Improved Half Long (white)	4.55	15.19	28.00	6.74	15.65	**29.10**
2 Mastodon (white intermediate)	4.93	16.50	31.40	6.23	15.18	**28.44**
3 Steele's Improved Short (white)	4.18	13 30	25.60	6.87	15.26	**28.41**
4 White Green Top Orthe (intermediate)	5.25	14.92	28.20	6.25	14 55	**26.84**
5 Large White Vosges	3.85	13.18	24.35	5.53	13.93	**26.10**
6 Simmer's Short White Vosges	3 65	13.96	25.30	5.51	13 95	**25.70**
7 Large White Belgian	5.00	15.11	28 80	5.81	13.51	**23.89**
8 Sutton's Yellow Intermediate	3.70	14.12	25.15	5.56	13.18	**23.89**
9 Danver's Orange	3.38	11.55	22.20	3.96	11.00	**21.46**
10 Guerande	2.63	12 04	24.75	3.40	10.05	**21.35**
11 Mitchell's Perfection	3.95	12.53	24 55	4.07	11.19	**21.05**
12 Giant Wiltshire (long white)	4.08	23 25	15.55	6.09	13.17	**20.65**
13 Carter's Orange Giant (long)	4.85	15.79	23 10	4.50	12.44	**19.20**
14 Half Long Stump Rooted (red)	2.45	9.51	18.25	3 11	9.49	**19 01**
15 James' Scarlet Intermediate	2.75	9.03	16.65	3.44	8.54	**17.00**
16 Sutton's Improved Intermediate (red)	2.28	8.45	17.83	3.05	8.36	**16 08**
17 French Intermediate	2.20	7.34	15 95	3.61	7.89	**16.16**
18 Yellow Belgian	4.15	8.91	17.40	4.45	8.89	**15.70**
19 Long Red Surrey	1.50	6.78	14 10	3.49	7.80	**14.74**
20 Long Orange	1.45	6.07	13.75	5.03	7.65	**11.69**
21 Improved Long Red Altringham	2.10	6.11	12.50	3.66	7.29	**13.09**
Grown for six years:						
22 Rubicon Half Long (red)	3.15	12.57	24.50	3 60	10.79	**20 13**
23 Chantenay (short red)	3 65	12.03	24 30	3.38	10.99	**19.68**
24 Nichols' Improved Large Orange	3.95	10.00	20.50	4.09	9.90	**18.84**
25 Half Long Scarlet	4.65	10 09	19 50	3.65	8 70	**17.38**
26 Nantes' Half Long Stump Rooted (red)	1.85	6.45	14 83	2.66	8.65	**16.66**
27 Long Red St. Vallery	2.60	13.35	12.10	3.22	10.26	**16.08**
28 Jarman's Selected Green Top (long red)	3.25	14.74	15.25	3.17	13.15	**12 62**
29 New Long Red Coreless	1.25	4.97	9.10	1.78	5.87	**10.92**
Grown for five years:						
30 Mammoth Intermediate Smooth (white)	4.45	16 38	30.10	5.47	17.18	**31.12**
31 Iverson's Champion White (intermediate)	5.15	16.03	30.50	6.18	15 99	**27 05**
32 Improved White Belgian (long)	3.50	14.26	22.50	4.79	13.20	**22.19**
33 Yellow Intermediate	2.85	12.56	18 05	5.76	13.85	**20.57**
34 Victoria (long red)	4.60	12.30	23.45	4 33	10.78	**19.51**
35 Midsummer (short red)	2.30	10 99	21.15	2.60	10.15	**18.32**
36 Yellow Giant	4.30	10 29	17.33	4.13	10.27	**16.68**
37 Early Half Long Carentian	1.45	6.82	11.55	1.39	6.04	**11.07**
Grown for four years:						
38 Thorpe's Own Short White	4.40	15.86	27.75	4.78	13.29	**23.39**
39 Henderson's Intermediate (red)	2.90	9.11	18.50	3.83	10.01	**18.44**
Grown for three years:						
40 Carter's Gate Post Orange (long)	3.85	10.79	22.25	5.87	12.77	**23.00**
41 Cooper's Yellow Intermediate	4 35	11.64	23.10	5.47	15.65	**21.78**
42 Intermediate Red	2.75	9.41	17.35	4.37	10 83	**20.00**
43 California Mammoth Orange	2.30	9.75	14.63	3.93	10.06	**17.11**
Grown for two years:						
44 Long Yellow Stump Rooted	3.85	12.79	25.10	5.28	14.41	**26.40**
45 Buckbee's Majestic	3.90	16.42	29.50	5.35	14 13	**25.33**
46 Lobberich's Agricultural	3.60	12.82	24.35	4.10	13.43	**24.68**
47 Peer of All	2.75	15.00	13.50	4.18	14.24	**19.15**
Grown for one year:						
48 Sutton's Matchless (white)	4.10	14.35	27.45	4.10	14.35	**27.45**
49 Carter's Hundred Ton	3.80	13 69	26.35	3.80	13.69	**26.35**
50 Daniels' Giant Yellow (intermediate)	3.55	12.63	24.55	3.55	12.63	**24.55**
51 Carter's Giant Wiltshire (white)	3.60	12.52	23.20	3.60	12.52	**23.20**

On May 6th and 7th, 1898, different varieties of carrots were sown on plots 1/100 of an acre in size in the experimental grounds. Three rows of each variety were sown, the rows being four rods in length and three and one-third links apart (26 2/5 inches.)

The land used for this experiment was similar to that used in the experiment with mangels, having received a dressing of twenty tons of farmyard manure per acre in the spring of 1898. The seed was sown on the flat, and the land was kept comparatively level throughout the season. The plants were thinned to an average distance of four inches apart when from two to three inches in height. They were again counted a little later in the season, and finally at the time of harvesting, so that the varieties had a very good comparative test.

The carrots grown in 1898 gave an average yield of about 21¼ tons per acre, or a little over 700 bushels. It will be seen, however, by an examination of the foregoing table, that three varieties, namely, Mastodon, Iverson's Champion White and Mammoth Intermediate Smooth, each gave a yield of a little over 30 tons, or about 1,000 bushels per acre. In the average results of twenty-one varieties grown for seven years in succession, it will be seen that the Pearce's Improved Half Long keeps the highest place in the production of roots, the average being a little over 29 tons. This variety is closely followed by the Mastodon and Steele's Improved Short White, each giving 28 2/5 tons per acre. These three varieties are all intermediate in length, and are very excellent varieties to grow for feeding stock. It will be seen that the Large White Vosges has given three tons per acre less than Pearce's Improved Half Long White, and that the Large White Belgian has given over five tons per acre less than the variety first named on the list. The large White Belgian, being a long slender carrot, is very hard to remove from the ground, unless a common plough, a subsoil plough, or some other implement is run along the row to loosen the roots before pulling. The Guerande variety, which stands tenth on the list in yield per acre, is a very short, thick, yellow variety of carrot. We have sent this variety out in connection with the co-operative experiments along with other varieties for several years, and although the yield is considerably less than that of some of the others, still in many cases it is quite highly spoken of, as it is a compact root and is easily handled. Three new varieties of carrots were grown in 1898 for the first time. The seed of these was imported from England, and it will be seen that Sutton's Matchless gave the largest yield per acre, and Carter's Giant Wiltshire the smallest, there being a difference of a little over four tons per acre between these two varieties.

Parsnips—Comparative Test of Thirteen Varieties.

In the spring of 1898 thirteen varieties of parsnips were planted in the experimental department, on plots 1/100 of an acre in size. The seeding took place on the 13th of May. Between that date and the 23rd of May rain fell on five different dates, there being about one and a half inches of rain fall in that period. The germination of the parsnip seed was somewhat irregular, and as a consequence the results of the experiment are not given for this year. In the average of three years' experiments with four varieties previous to 1898, the Improved Half Long came first in yield per acre, with an average of about twelve and a half tons of roots. Among seven varieties grown in 1897 for the first time, the Bloomsdale took first place in yield of parsnips, the produce being 15 tons of roots per acre. This variety stands in quite a marked contrast with the Arlington Long Smooth, which gave less than ten tons per acre.

Kohl-Rabi—Comparative Test of Six Varieties.

Six varieties of Kohl-Rabi have been grown in the experimental department for two years in succession. This crop is sometimes grown for food for stock in some of the older countries. The root of the Kohl-Rabi is somewhat like that of cabbage, while the leaves resemble the tops of Swede turnips. The valuable part of the plant, however, grows about three inches above the level of the ground, in the form of a bulb. Kohl-Rabi makes a very nice vegetable for domestic use, and is prepared for culinary purposes in much the same way as Swede turnips. The seed of Kohl Rabi resembles very closely that of Swede and fall turnips, and the crop is grown in much the same manner as that of the other classes of roots. The plots used for this experiment in 1898 were exactly 1/100 of an acre in size. The seeding took place on the 13th of May.

Varieties of Kohl-Rabi.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1898.	Average 1897-98.	1898.	Average 1897-98.	1898.	Average 1897-98.
	tons.	tons.	lbs.	lbs.	tons.	tons.
1 Large White	4.10	4.25	1.97	2.21	15.00	**25.70**
2 Early White Vienna	2.55	3.98	2.04	2.04	23.95	**25.45**
3 Purple Vienna	6.80	4.70	1.91	1.90	21.60	**23.73**
4 Earliest Erfurt	1.80	2.13	1.63	1.75	19.18	**23.17**
5 Green	6.10	4.68	1.85	1.92	19.80	**22.58**
6 Earliest Green Vienna	3.50	2.78	1.85	1.83	20.55	**21.83**

From the foregoing table, it will be seen that the Large White variety of Kohl-Rabi gave the largest average yield per acre for two years, although the results from this variety in 1898 were not nearly so good as those of the previous year. It will be seen that the Early White Vienna gave the largest yield of roots per acre in the results for the past season. In the average results for the two years there is a difference of about four tons per acre ; and in the results for 1898 the difference in yield was nearly nine tons per acre.

Fall Turnips—Comparative Test of Forty-Six Varieties.

Forty-six varieties of fall turnips were sown in the experimental grounds on the 24th of June, 1898. The plots were 1/100 of an acre in size, three rows, four rods long, being sown with each variety. The seed was sown on the flat, and the land was kept comparatively level throughout the growing season. When the plants were about two inches high, they were thinned to a distance of about ten inches apart in the drills.

Fall turnips are frequently spoken of as soft turnips, or white and yellow fleshed turnips. They usually yield well per acre, but are very poor keepers, and are only suitable for fall feeding. The last two years have proven unfavorably for the production of good turnips of the fall varieties. A large quantity of the roots were badly decayed in 1897, and a smaller quantity in 1898. As the land used for these turnips in each of the pass seasons was very uniform throughout, and as all were subject to the same conditions, one of the most interesting and valuable results from the experiments for the last two years is the record of the power of the different varieties to resist the rot. The roots were accurately counted when the plants were partly developed, and before any rot had started. Those which had not rotted at the time of harvesting were again counted, and the percentage of decayed roots was calculated from these notes. This method of calculation gives the percentage of sound roots with a fair degree of accuracy, and furnishes information regarding the way in which the different varieties resisted or succombed to the injurious effects of the disease. The information thus gained is given in the left hand column of figures in the foregoing table. It will be observed that in the average of the two years results, the Cow Horn, Yellowstone, Early American, Purple Top, White Egg, Jersey Navet, and Jersey Lily varieties possessed the largest percentage of sound roots in the order named ; and that the Yellow Globe, Extra Early Milan, Rennie's Selected White Globe, and Sutton's Perfected Green Top Hybrid had the smallest percentage of sound roots ; in fact, over two-thirds of the roots of the last named varieties were rotten before the crop was harvested in October. In the average yield of roots per acre, previous to 1896, the Jersey Navet stood highest among thirteen varieties grown for six years in succession. This variety, it will be observed, is not only a good yielder, but also has produced roots within the last two years which have been very good in quality.

Varieties of fall turnips.	Percentage of roots not rotten when crop was harvested.		Average weight per root.	
	1898.	Average for two years.	1898.	For number of years grown.
Grown for eight years:	%	%	lbs.	lbs.
1 Jersey Navet	98	85.0	1.29	**2.24**
2 Greystone Improved	86	70.0	1.32	**2.23**
3 Purple Top Mammoth	74	75.5	1.11	**2.20**
4 Early American Purple Top	94	93.0	1.18	**2.09**
5 Early Purple Top Munich	58	47.5	1.38	**2.02**
6 Pomeranian White Globe	78	45.0	1.04	**1.97**
7 Red Globe Norfolk	91	55.0	1.00	**1.94**
8 Whitestone	94	66.0	1.14	**1.94**
9 Red Top Strap Leaf	93	82.0	1.40	**1.93**
10 Orange Jelly	91	55.5	1.01	**1.61**
11 Yellow Aberdeen Purple Top	81	49.0	.89	**1.43**
12 Yellow Aberdeen Green Top	79	51.0	.85	**1.36**
Grown for seven years				
13 Imperial Green Globe	73	65.0	.96	**1.52**
14 Purple Top Hybrid	88	64.5	1.03	**1.37**
Grown for six years:				
15 Cow Horn	93	95.5	1.43	**2.04**
16 Jersey Lily	96	84.5	1.21	**2.03**
17 Yellow Stone	95	93.5	1.34	**1.96**
18 Green Barrel	76	69.5	.97	**1.82**
19 Sutton's Improved Green Globe	66	63.5	.99	**1.76**
20 Early White Model	79	72.0	.90	**1.75**
21 White Flat Dutch Strap Leaf	41	43.5	1.09	**1.73**
22 White Six-Weeks	68	68.0	1.02	**1.71**
23 Jarman's Selected Green Globe	47	50.0	.95	**1.70**
24 Amber Globe	78	70.5	.62	**1.61**
25 Extra Early Milan	30	27.5	1.08	**1.61**
26 Yellow Montgomery	69	77.5	.79	**1.55**
27 Jarman's Improved Green Top Yellow Scotch	52	59.5	.63	**1.49**
28 Dale's Hybrid	42	49.0	.89	**1.39**
29 Fosterton Hybrid	45	48.5	.64	**1.18**
30 Carter's Champion Green Top Scotch	54	47.0	.60	**1.09**
Grown for five years:				
31 Milk Globe	73	73.5	1.03	**2.39**
32 White Egg	87	85.5	.91	**2.24**
33 Early La Crosse	96	56.0	1.16	**1.86**
34 White Lily	84	67.0	.83	**1.85**
35 All Gold	45	38.0	.54	**1.48**
36 Orange Sweet	64	43.5	.63	**1.38**
Grown for four years:				
37 Red Top White Globe	42	61.5	.73	**2.36**
38 Rennie's Selected White Globe	35	28.0	.76	**1.69**
39 Yellow Globe	35	26.0	.67	**1.65**
Grown for three years:				
40 Long Tankard	57	45.5	.89	**1.43**
41 Sutton's Favorite Purple Top Yellow Hybrid	39	37.0	.67	**1.22**
42 Yellow Finland	65	47.0	.66	**1.18**
43 Sutton's Perfection Green Top Hybrid	22	32.5	.40	**1.10**
Grown for two years:				
44 Large White Norfolk	65	61.5	.85	**1.12**
45 Sutton's Purple Top Scotch	58	40.0	.63	**.83**
Grown for one year:				
46 Hunter's Purple Top Globe	82	82.0	.70	**.70**

Mangles, Carrots, Sugar Beets, Swede Turnips, and Fall Turnips Sown at Different Depths.

An experiment has been made by planting seed exactly one inch, two inches, three inches, and four inches deep of Swede turnips for four years in succession; and of fall turnips, mangles, carrots, and sugar beets for two years in succession. The soil on which this experiment was conducted in 1898 might be termed an average clay loam.

The land was level at the time of seeding, and flat cultivation was practised throughout. The seed was placed in the soil with great care, and the yields per acre were determined from the actual yields of the plots.

Depth of planting.	Yield of roots per acre.					Average yield per acre.
	Mangels. Average 2 years.	Carrots. Average 2 years.	Sugar beets. Average 2 years.	Swede turnips. Average 4 years.	Fall turnips. Average 2 years.	
	tons.	tons.	tons	tons.	tons.	tons.
1 inch deep	34.91	21.57	31.41	15.68	22.68	**25.25**
2 inches deep	34.52	9.70	26.50	13.02	19.96	**20.74**
3 inches deep	22.13	4.09	16.07	30.28	9.78	**11.07**
4 inches deep	11.78	3.19	8.01	1.05	1.05	**5.02**

It will be observed by an examination of the figures here presented, that the seed which was planted 1 inch in depth gave the best results in average yield of roots per acre in every instance. The difference, however, in the results from planting mangel seed 1 inch and 2 inches deep are not very marked, there being only two-fifths of a ton per acre in favor of the one inch planting. From sowing carrot seed one and two inches deep, however, the returns are very different, as upwards of twice the yield per acre was obtained from planting the seed 1 inch deep as compared with that which was placed 2 inches below the surface of the ground. It will be seen that the mangel and the sugar beet seed will stand deeper planting than either carrots, swede turnips, or fall turnips. In the case of mangels, nearly 12 tons per acre were realized from the seed which was placed 4 inches below the surface of the soil; while, in the case of both swede and fall turnips, only about one ton per acre was grown from seed planted 4 inches deep. In 1898, the seed of the mangels, sugar beets, carrots, and turnips was also planted one half and one and one-half inches deep; and eighty per cent of the results show better returns from planting one inch deep, as against one-half and one and one-half inches deep, in the experiments of the past year. This experiment will likely be continued by planting the seed at six different depths in 1899.

Height of plants when thinned.	Yield of roots per acre.				Average yield of roots per acre.
	Mangels. Average 2 years. 1897-98.	Carrots. Average 2 years. 1897-98.	Swede turnips Average 2 years. 1896-98.	Fall turnips. Average 2 years. 1896-98.	
	tons.	tons.	tons.	tons.	tons.
Plants thinned when 1½ to 2 inches high	21.31	20.44	13.90	25.20	**20.21**
" " 8 to 10 "	17.83	20.44	11.19	16.89	**16.59**

Mangels, Carrots, Swede Turnips, and Fall Turnips, Thinned at Different Stages of Their Growth.

An experiment was conducted in 1896 for the first time in thinning Swede turnips and fall turnips when the plants were about two inches in height, as compared with thinning them when they reached an average of eight to ten inches in height. In 1897, however, this experiment was conducted with mangels and carrots; and in 1898 it was conducted with all four classes of roots. It may appear on first thought, that from eight to ten inches is an extreme height to allow the roots to grow before being thinned, but if the reader will pause for a moment and think over the matter, he may recall numerous instances, which have come under his observation, in which the young root plants wouid approximate that height before the thinning was completed. This experiment was conducted on land of an average quality. The experiment was conducted in duplicate with each class of roots each year. The plants were carefully thinned in the rows when at the stages of growth indicated in the table to follow, and an equal number were allowed to remain in each plot. The foregoing table gives the results for each class of roots, and also the average returns for the different classes of roots taken together :

The figures which represent the results of this experiment show that in the case of mangels, Swede turnips and fall turnips, there was a decided advantage from thinning the plants when quite young. In the case of carrots, however, the results from the two thinnings are exactly equal. It may, however, be mentioned that the detailed results in this case were a little irregular; as the plants, which were thinned when young, gave the best results in three out of the four tests made with carrots. From thinning the plants at different stages the results are less marked in the case of carrots than in the case of any of the other crops included in the experiment. The average results from the four classes of roots show that the plants which were thinned when two or three inches in height, produced nearly four tons of roots per acre more than those which were allowed to reach a height of from eight to ten inches before being thinned.

Mangels, Carrots, Swede Turnips and Fall Turnips Grown on the Flat and on Ridges.

For three years in succession an experiment has been conducted by growing mangels, Swede turnips and fall turnips; and for two years in succession by growing carrots, on land which was level and also on land which was ridged with a double mould board plow at the time of seeding. The experiment was conducted in duplicate during each of these years. The ridges were made to a height of about four inches. The rows were exactly the same distance apart for the flat and for the ridged cultivation. The yield per acre of the duplicate plots were averaged for each year; and the results for 1896, 1897 and 1898 were averaged in the case of each class.

Method of cultivation.	Yield of roots per acre.				Average yield per acre for all kinds of roots.
	Mangels. Average 3 years. 1896-98.	Carrots. Average 2 years. 1897-98.	Swede turnips Average 3 years. 1896 98.	Fall turnips. Average 3 years. 1896-98.	
	tons.	tons.	tons.	tons.	tons.
Flat cultivation	21.08	20.31	12 33	17.39	**17.78**
Ridged cultivation	21.91	19.35	10.73	17.10	**17.27**

In the average of three years' experiments, it will be seen that the land which was kept flat, produced a little over one-half ton of roots per acre more than that which was ridged at the time of seeding. The best results were obtained by growing carrots, Swede turnips and fall turnips on the flat, and from growing mangels on ridges; the greatest difference between the two methods appearing in the case of the Swede turnips as there was 1 3-5 tons per acre in favor of the flat cultivation.

Mangels, Carrots, Sugar Beets, Swede Turnips, and Fall Turnips Grown from Different Selections of Seed.

An experiment has been conducted by sowing different selections of seed for four years in succession with mangels and carrots, three years in succession with sugar beets and fall turnips. In each of these years, the large plump seed, medium-sized seed, and small-sized seed was taken from good average seed purchased from leading seedsmen. In selecting the seed, great care was taken to use nothing but what was apparently sound in every respect.

Selections.	Yield of roots per acre.					Average yield per acre for all classes of roots.
	Mangels. Average 4 years.	Carrots. Average 4 years.	Sugar beets. Average 2 years.	Swede turnips. Average 3 years.	Fall turnips. Average 2 years.	
	tons.	tons.	tons.	tons.	tons.	tons.
Large plump seed	36.20	28.71	20.76	14.93	23.82	**24.88**
Medium-sized seed	32.74	26.20	20.20	13.12	19.70	**21.39**
Small-sized seed	24.07	19.15	20.17	5.31	10.90	**5.91**

The results presented in the foregoing table are certainly very interesting and very suggestive. There are but few growers of roots who ever think of sifting the seed or trying in any way to improve the seed purchased for sowing upon their land. As none but apparently perfectly sound seed was used for this experiment, the results indicate that much better returns could be obtained in ordinary farm practice by carefully separating the large from the small seed and using only the former. In the average results of all the classes of roots, for the number of years during which the experiment has been conducted, it will be seen that large plump seed gave about $2\frac{1}{2}$ tons per acre more than the medium-sized seed and about nine tons per acre more than the small-sized seed. The greatest difference resulting from the selection of seed is shown by Swede turnips; and the least difference by the sugar beets. It is only fair to state, however, that the sugar beet seed was more uniform than that of the other classes of roots; and consequently the difference between the different sizes of seed selected was not very marked. We believe that a great mistake is frequently made by root growers trying to purchase seed at a low price without much regard to size or quality.

Mangels, Fall Turnips, and Swede Turnips—Application of Fertilizers.

Fertilizers.	Quantity of fertilizers per acre. 1898.	Cost of fertilizer per acre. 1898.	Yield of roots per acre.			Average yield per acre, three classes of roots for 2 years.
			Mangels. Averege 2 years. 1897-98.	Fall turnips. Average 2 years. 1896-97.	Swede turnips. Average 2 years. 1896-97.	
	lbs.	$	tons.	tons.	tons.	tons.
Nitrate of soda	160	3.84	30.40	21.55	15.76	**22.57**
Mixture	213.3	3.79	27.96	20.78	16.39	**21.71**
Muriate of potash	160	3.84	29.70	19 78	14.19	**21.22**
Superphosphate	320	3.68	26.82	19.20	15.33	**20.45**
No fertilizer	....	....	27.12	17.78	13.53	**19.48**

There are so many brands of fertilizers on the market containing varying proportions of nitrogen, phosphoric acid and potash that it would be an endless task to experiment with all the different kinds. These complete fertilizers frequently change in composition more or less from one season to another. It will, therefore, be seen that satisfactory work cannot be done by trying to test all the kinds of the so-called complete commercial fertilizers which are offered for sale at the present time. We believe, however, that some good work is being done by testing distinct fertilizers which are fairly constant from year to year, and the constituents of which form the basis of all other commercial fertilizers. Experiments have been made with a considerable number of crops by using a nitrogenous (Nitrate of Soda), a potassic fertilizer (Muriate of Potash), a phosphoric fertilizer (Superphosphate), and a fertilizer containing nitrogen, potash and phosphoric acid (mixed or complete fertilizer). For two years these fertilizers have been used with mangels, fall turnips and Swede turnips. The Muriate of Potash and Superphosphate were applied at the time of seeding, and the Nitrate of Soda when the plants were about two inches in height. One row of roots was left unfertilized between each two plots. The plants were thinned to ten inches apart in the drills, when about three inches high.

The figures here presented give the amount of each fertilizer used per acre, the market price for the quantity of fertilizer used, the yield of crop per acre from each class of roots, and the average yield per acre for all the roots for two years.

It will be seen that the nitrate of soda increased the yield of mangels 3.28 tons per acre, or 117 bushels at a cost of 3.28 cents a bushel; that the nitrate of soda increased the yield of fall turnips 3.77 tons per acre, or 134.6 bushels at a cost of 2.86 cents per bushel; and that the mixed fertilizer increased the yield of swede turnips 2.86 tons per acre, or 102 bushels at a cost of 3.72 cents per bushel. In working out these figures, it will be understood that the full cost of the fertilizers was charged to the first crop. An extra increase might also be secured the following year by the influence of the fertilizers on the second crop. If we examine the average yield per acre for all the roots for the two years, we will find that the nitrate of soda caused an increase of 3.9 tons of roots per acre, or 110.4 bushels at a cost of about 3½ cents per bushel.

It might here be mentioned that fertilizers similar to these have been sent out over Ontario for co-operative experiments in each of the past seven years. These fertilizers were used with the oat crop for five years in succession, and have now been tested with corn and mangels for two years. The results of these experiments are very interesting, as they are being conducted on the different kinds of soil and in various parts of the Province. In the average of nineteen successfully conducted experiments throughout Ontario within the last two years, it is found that the yield of mangels from the use of the different fertilizers and from the unfertilized land is as follows: Nitrate of soda 23.06 tons; mixed fertilizers 21.92 tons; superphosphate 21 tons; muriate of potash 20.9 tons; and the unfertilized land 17.3 tons. This shows that the nitrate of soda had the greatest influence, and increased the crop between five and six tons per acre.

Green Fodder Crops.

Within the past seven years a large number of experiments have been conducted with corn, millet, rape, sunflowers, grasses, clovers, etc. These experiments have included tests with varieties, methods of seeding, methods of cultivation, application of fertilizers, mixtures of grain for green fodder, etc. One hundred and seventy varieties of corn were planted in the spring of 1898; but owing to damage done by crows pulling out part of some of the varieties, the results of the experiments are not reported here.

Millet—Comparative Test of Nineteen Varieties.

Although seven of the varieties of millet have been grown for seven years in succession, it is considered advisable to give only four years' results; as a number of the leading varieties have been grown for that length of time, and this would place a greater number of varieties under similar conditions, and thus give a better basis for the comparison of results. The land used for the millet in 1898 produced a crop of beans the previous year. The plots were exactly 1-100 of an acre in size. The seed was sown brood-cast; and the germination of the different varieties was quite satisfactory.

Varieties of millet.	Earliness or lateness of crops.	Average height of crop for number of years grown.	Average yield of green crop per acre for number of years grown.	Yield of hay crop per acre. Average for number of years grown.
		inches.	tons.	tons.
Grown for four years :				
1. Japanese (Milleacum)	Late	39.50	13.07	**5.98**
2. Japanese (Italicum)	Medium	29.63	12.83	**5.84**
3. Holy Terror Gold Mine	Very late	32.75	13.34	**5.77**
4. Japanese (Crusgalli)	Medium	36.00	12.17	**5.60**
5. East India Pearl	Very late	32.00	13.66	**5.42**
6. Golden Wonder	Late	35.25	12.89	**5.40**
7. German or Golden	"	34.75	12.79	**5.10**
8. Salzer's Dakota	"	36.88	10.80	**4.38**
9. Magic	"	34.13	10.38	**4.38**
10. Hungarian Grass	Early	33.00	9.03	**4.03**
11. California	"	31.50	7.30	**3.46**
12. White French	"	33.38	7.51	**3.28**
13. Common	"	34.19	7.46	**3.22**
14. Red French	"	29.13	6.56	**1.91**
Grown for two years :				
15. Siberian	Early	34.00	11.48	**4.60**
16. Hog	"	36.00	8.25	**3.40**
17. Early Harvest	"	33.00	9.40	**3.25**
Grown for one year :				
18. California Beauty	Early	34.00	8.65	**3.95**
19. Chinese	"	35.00	6.10	**2.95**

The average yield of green crop per acre of nineteen varieties of millet in 1898 was 9.13 tons. This yield is considerably less than that of former years. The season of 1898 appeared to be quite unfavorable for the growth of millet, especially in the case of some varieties. The three varieties of millet which were brought out from Japan a few years ago and gave large yields in the past, standing highest in the list of yield of crop per acre previous to 1898, gave much lower yields in the past year. In the foregoing table, it will be seen that the average height of the crop and the average yield per acre of the green millet, and also of the millet after being made into hay, are given for the number of years that each variety has been grown. It will be seen that the two varieties of Japanese millet which stand at the head of the list in yield of hay, produced an average of nearly six tons per acre per annum; and that seven varieties produced an average of upwards of five tons per acre The East India Pearl variety, which stands fifth on the list, is very late, seldom heading out in the experiments conducted at this place. The leaves are broad and resemble those of corn, but start very near the ground. The crop is, therefore, not very tall and is mostly composed of leaves. The Salzer's Dakota variety gave most excellent results six and seven years ago, but the seed of that name which is now secured gives very much poorer results. The Hungarian Grass, which is probably the best known variety mentioned in the foregoing table, occupies tenth place in yield of hay per acre and also tenth place in yield of green crop per acre, among fourteen varieties grown for four years in succession.

In 1898, the nineteen varieties of millet were grown in duplicate; one set of the varieties was cut and weighed as a green crop and as hay, and the other set was allowed to mature. The varieties were then cut and when dry were hauled to the barn and threshed, in order to ascertain the relative amount of seed produced from the different varieties. Owing to the very wet season at the time of harvesting, however, the results of the experiment were not so satisfactory as they would have been, had the season been more favorable. The largest yields of seed per acre were produced by the Hungarian Grass, California, Siberian, and Early Harvest varieties of millet, each producing upwards of 30 bushels, while the Common, Japanese (Milleacum), Hog, and Japanese (Italicum) each produced between twenty and thirty bushels of seed per acre. The White French variety produced less than five bushels of seed per acre; and the East India Pearl was the only variety which produced no seed on account of its lateness. The average yield of seed per acre in 1898 for the eighteen varieties was 21.3 bushels.

Mixtures of Grain for Green Fodder.

For six years we have sown oats, peas, barley, and spring wheat separately and in various combinations, to find out which would be the most suitable for producing a large amount of valuable food to be used either as green fodder or as hay. The experiment has been carried on in duplicate for five years. In each of the years, the grains were sown separately and in various combinations, with two or three kinds of grain in each combination; and also in the mixture of all four kinds together. This has required fifteen plots in each set, or thirty plots in the duplicate experiments; so that one hundred and eighty plots have been devoted to this experiment in the past six years. The plots in all instances were 1/100 of an acre in size. In 1898, the seed for this experiment was sown on April 28th on land which had produced a crop of potatoes the year, having been manured at the rate of twenty tons per acre in the spring of that year. The following table gives the results of the grain grown singly and in the various combinations in 1898, and the average of the six years during which this experiment has been in progress:

Crops.	Average height of mixtures, 1898.	Percentage of crop lodged, 1898.	Yield of hay per acre, 1898.		Yield per acre of green crop grown separately.		Yield per acre of green crop grown in mixtures.	
			Grown separately.	Grown in mixtures.	1898.	Average 5 years, 1893, 4, 5, 6, 8.	1898.	Average 6 years, 1892, 3, 4, 5, 6, 8.
	ins.	%	tons.	tons.	tons.	tons.	tons.	tons.
1 Peas and oats	40.5	8.0	2.58	2.84	7.68	7.41	7.80	7.93
2 Barley and peas	40.5	52.5	2.20	2.35	6.89	6.60	7.08	7.20
3 Barley, peas and oats	39.5	6.5	2.43	2.73	7.09	6.72	7.10	7.07
4 Barley and oats	39.5	0.0	2.51	2.65	6.72	6.17	6.88	6.78
5 Peas, wheat and oats	41.5	4.0	2.32	2.64	6.54	6.24	7.23	6.53
6 Barley, peas, wheat and oats	38.5	5.0	2.27	2.74	6.39	6.02	7.05	6.56
7 Wheat and oats	40.0	0.0	2.35	2.50	5.89	5.44	6.35	6.09
8 Barley, wheat and oats	39.0	0.0	2.27	2.68	5.90	5.41	6.43	6 09
9 Peas and wheat	41.5	85.0	2.03	2.13	6.07	5.88	6.28	6.03
10 Barley, peas and wheat	39.5	37.5	2.07	2.22	6 02	5.93	6.03	5.88
11 Wheat and barley	36.5	0.0	1.97	1.83	5.10	4.63	4.53	5.04

The reader should understand that the main objects of the foregoing experiment were to ascertain (1) whether there is any advantage from growing grains in mixtures as compared with growing the same grains separately for green fodder; and, (2) which of the various combinations that can be made from the four principal classes of spring grains, will give the most satisfactory results. In order to find out the proper proportions of seed to use of any combination of two, three, or four kinds of grain for the best results, other experiments are necessary. Work has already been done along this line in the use of nine different proportions of seed of peas and oats, as will be seen from the results of the experiment next referred to. In the experiment now under consideration, the amounts of seed used were as follows: When grown singly, the same quantity of seed was used per acre as in the variety tests for No. 1 set, and one-half as much again for No. 2 set; and when the grains were grown in mixtures, two-thirds the quantity used in the variety tests was sown of each grain in No. 1 set; and, when two kinds of grain were grown together one-half as much seed was used as when grown singly; when three kinds were grown together one-third the quantity of seed, and when four kinds were grown together one-quarter the quantity of seed in No. 2 set.

In averaging the results of these two sets in each of six years, we believe some good results have been obtained in furnishing information on the lines indicated in the objects of this experiment.

The results represented by the figures in the foregoing table are worth a careful study, as they represent a large amount of carefully conducted experimental work extended over a period which embraces different conditions of weather and soil. The question of growing grain in mixtures for green fodder and for hay is an important one, especially in the dairy districts of the Province. It is very unwise for farmers to depend entirely upon their pasture land during the summer months. If the food supplied by the pasture fields, can be supplemented by green fodder, or by ensilage. the flow of milk can be maintained in such a way that the financial results are almost sure to be much more satisfactory. Grain grown in mixtures furnishes an excellent green fodder, or, if not required to be used in that way, it will furnish a large amount of hay of good quality. From an examination of the foregoing table, it will be seen that in average yield of green crop per acre, the grain grown in mixtures gave more than the same grains grown separately, in fully ninety per cent of the experiments. It will also be observed that of all the mixtures used, peas and oats gave the largest yield of green crop per acre. This mixture also produced the greatest yield of both green crop and hay per acre in 1898. Oats, peas, barley, and wheat, when grown in various mixtures, each appeared to exert an influence upon the resulting crop in the order named; oats producing the greatest influence, and wheat the least. It is very important in selecting varieties of grain to grow in mixtures for the production of either green fodder, hay, or grain, that varieties be selected which require about the same length of time to reach the proper stage for harvesting when all are sown on the same date. The varieties used in the experiment in 1898 were Kinna Kulla barley, Prussian Blue peas, Wild Goose spring wheat, and Siberian oats; and these varieties have been found to answer well for this purpose.

PEAS AND OATS SOWN IN DIFFERENT QUANTITIES FOR GREEN FODDER AND FOR HAY.

Mixtures.	Height of crop, average 3 years.	Percentage of crop lodged, average 3 years.	Yield of green crop per acre. 1898.	Yield of green crop per acre. Average 7 years.	Yield of hay per acre. 1898.	Yield of hay per acre. Average 3 years.
	inches.	%	tons.	tons.	tons.	tons.
Oats 2 bushels, peas 1 bushel	41.33	2.00	12.08	9.31	4.19	3.26
" 2 " " 2 "	41.83	9.17	12.48	9.08	4.16	3 25
" 2 " " 3 "	41.00	21.50	12.38	9 38	3.96	3.19
" 1½ " " 2 "	41.33	13.17	11.05	9.13	3.61	3.17
" 1½ " " 3 "	41.17	35.00	11.75	9.09	3.80	3.12
" 1½ " " 1 "	41.33	3.83	11.50	8.77	3.91	3 00
" 1 " " 3 "	40.33	40.00	11.30	9.03	3.61	3.00
" 1 " " 2 "	40.33	20.50	11.00	8.64	3.51	2 95
" 1 " " 1 "	40.17	6.66	10.78	8.49	3.49	2.80

For seven years in succession an experiment has been conducted in the experimental grounds by sowing nine different proportions of peas and oats, in order to determine which mixture and which quantity of seed would give the best results in the production of fodder. This experiment was conducted in duplicate during each of these years; thus requiring eighteen plots each year, or a total of one hundred and twenty-six plots in the seven years. The seed was sown broadcast on plots 1/100 of an acre in size. In 1898, the seeding of one set took place on April 16th and of the duplicate on April 29th.

The mixture of two bushels of oats and one bushel of peas, making in all three bushels per acre, has given the largest yield of hay per acre in the average of three years' experiments. This mixture, however, is followed very closely by a combination of two bushels of oats, and two bushels of peas per acre. In the average yield of green crop for seven years in succession, however, it will be seen that two bushels of oats, and three bushels of peas per acre made the highest record, although the amount of increase produced for the mixture of two bushels of oats, and one bushel of peas is very small in comparison with the extra cost of the two bushels of peas required for the seed. It is also worthy of note that the third mixture on the list had, on an average, over twenty-one per cent. of lodged crop ; while in the case of the first mixture, only two per cent. of the crop was lodged at the time of harvest. The mixture of two bushels of oats and one bushel of peas produced a crop which stood up best at the time of harvest of all the different mixtures used. The reader, when examining the results of the experiments here presented, will have but little difficulty in coming to the conclusion that two bushels of oats and one bushel of peas per acre form a mixture which has given very excellent results in the comparative test of seven years.

Peas and Oats—Different Varieties Grown in Mixture for Green Fodder.

In 1897 and in 1898 different varieties of peas and oats were sown in mixtures for the production of green fodder. A very careful selection was made with the object of securing a crop that would come early in the season ; and another that would come somewhat later, and another that would come still later. This experiment was conducted in dup icate on plots which were 1/40 of an acre in size in 1897 ; and in triplicate on plots 1/100 of an acre in size in 1898. The seeding of the different mixtures all took place at the same time in each year, and the crops were harvested when in about the right stage of maturity for using as a green fodder, the peas being nearly full size and the oats in the milk condition.

Mixtures.	Number of days from seeding time until ready for green fodder.		Yield of hay per acre.		Yield of green fodder per acre.	
	1898.	Average 2 years.	1898.	Average 2 years.	1898.	Average 2 years.
			tons.	tons.	tons.	tons.
Chancellor peas, 1 bus. per acre...... Daubeney oats, 2 bus. per acre.......	69	72.5	2.68	3.23	6.01	8.31
Prussian blue peas, 1 bus. per acre... Siberian oats, 2 bus. per acre	76	80.5	2.89	3.55	7.27	9.72
Oakshott field peas, 1 bus. per acre... Golden Giant oats, 2 bus. per acre ...	84	89	2.30	3.32	5.71	8.39

By examining the average results for two years under the heading of "Number of days from seeding time until ready for green fodder," it will be seen that there is a period of over two weeks from the time the earliest mixture is ready to feed, until the latest has reached a corresponding condition. So, by using suitable mixtures of this nature, a farmer can take his seed and implements into the field and sow at once all that he will require for the season, instead of sowing at several successive dates. In yield of green crop per acre, the Prussian Blue peas and the Siberian oats gave the highest returns in the average two years' experiments. Taking all experiments into consideration, we found that a mixture of two bushels of Siberian oats and one bushel of Prussian Blue peas per acre made an admirable seeding for the production of either green or dry fodder.

Fodder Crops.

For four years in succession six varieties of fodder crops have been carefully tested in the experimental grounds. This experiment is an interesting one, as several of the crops regarding which much has been said of late, are included in the comparative test. The plots were 1/100 of an acre in size in every instance. The crops were harvested when in about the right condition for feeding purposes, and were weighed immediately on being cut; therefore the results given below represent the yields of green crop per acre. In the results of previous years rape was also included in this experiment, and it was grown with these crops in 1898; but the rape this year is reported along with other crops with which there is a closer resemblance in character of growth.

Varieties.	Average height of crop.		Average yield per acre.	
	1898.	Average 4 years.	1898.	Average 4 years.
	inches.	inches.	tons.	tons.
Egyptian peas	24.0	18.8	11.30	9.39
Grass peas	32.0	42.7	8.95	8.88
Yellow Soya Beans	23.0	25.5	8.07	8.52
Crimson Clover	5.0	13.0	1.50	6.80
Prussian Blue Peas	43.0	51.9	6.35	6.73
Horse Beans	24.0	28.3	4.40	4.28

The Egyptian peas have given the largest average yield of green crop per acre in four years; and it will be seen that they have also given decidedly the largest yield per acre of green crop in 1898. The grass peas come second in yield per acre for 1898, and also for the average of four years. The green food produced by the grass peas is much relished by live stock. Three leguminous crops, namely, grass peas, crimson clover, and tares, or vetches, were sent out over Ontario for two years in succession in connection with our co-operative experiments. The grass peas gave the largest yield of green crop per acre during each of the two years, and was the most highly prized by the experimenters as a food for live stock. The Yellow Soya bean, which has proven to be one of the best of the soja beans which have been grown at this place, occupies third place in production of green crop per acre. It will be observed that the crimson clover gave an exceedingly low yield last season. This crop is quite irregular, some seasons doing well and others doing very poorly. Although a great deal has been said regarding the growth of the crimson clover, we find that in nearly all instances it is unprofitable to grow in Ontario, whether sown in the spring or fall.

Sunflowers—Comparative Test of Three Varieties.

Varieties of Sunflowers.	Results for 1898.			Average results for number of years grown.		
	Height of crop.	Total yield per acre.	Yield of heads per acre.	Height of crop.	Total yield per acre.	Yield of heads per acre.
Grown for four years:	inches.	tons.	tons.	inches.	tons.	tons.
Black Giant	78	12.95	4.35	73.00	12.11	4.87
Mammoth Russian	71	10.85	4.45	68·88	9.75	4.31
Grown for two years:						
White Beauty	62	7.85	3.40	64.75	9.23	3.85

Seven varieties of sunflowers were tested in the experiments conducted previous to 1897. Some of these varieties, however, did not give satisfactory results. Nearly all of them were dropped from our list, and that year the experiment was with but three varieties, namely, Black Giant, Mammoth Russian, and White Beauty—the two former having been grown in 1897 for the third time, and the latter for the first time. The experiment was repeated in 1898 with these three varieties. The experiment was conducted in duplicate, there being six plots in all and each plot being 1-100 of an acre in size.

In the average results from growing the Black Giant and the Mammoth Russian varieties of sunflowers for four years in succession, it will be seen that the Black Giant has done best in every particular. In yield of heads per acre the Black Giant has given about one-half ton more than that produced by the Mammoth Russian. The White Beauty grows a shorter crop and is a more spreading form of plant than either of the other varieties. Farmers who wish to grow sunflowers to secure the heads for cutting with corn and placing in the silo, can glean some useful information from the foregoing table.

Pumpkins and Squashes—Comparative Test of Nine Varieties.

Eight varieties of pumpkins and squashes have been grown under experiment for two years in succession. In each of these years, there have been two hills of each variety. One hill was well manured, and the other was left without any special manuring. In the well-manured hill only one plant was allowed to grow, while in the unmanured hill three plants were allowed to grow. The vines were not cut back, nor were the plants fed in any way except by the manuring they received.

Varieties of Pumpkins and Squashes.	Yield of pumpkins and squashes from one vine of each variety on land highly manured.		
	1895.	1898.	Average 2 years.
	lbs	lbs.	lbs.
Rennie's Yellow Mammoth Squash	552.0	476.5	**524.25**
King of the Mammoth Pumpkin	618.0	114.0	**366.00**
Thorp's Mammoth Pumpkin	387.5	277.0	**332.25**
Mammoth Bright Red Etampes Pumpkin	282.0	375.0	**328.50**
Mammoth Tours Pumpkin	358.0	174.0	**266.00**
Rennie's Green Mammoth Squash	253.0	148.0	**200.50**
Buckbie's New Sandwich Island Pumpkin	200.0	97.5	**148.75**
Large Cheese Pumpkin	122.5	6.5	**64.50**
Connecticut Field Pumpkin	82.5	....	....
Gray Boulogne Pumpkin	....	242.5	....
Hundredweight Pumpkin	....	188.5	....
True Potiron Pumpkin	....	186.0	....

The seed of the different varieties which were planted on the manured land gave very poor results indeed in 1898; and in 1895, the yield from the unmanured hills was less than half what it was from the well manured hills. The figures in the foregoing table simply represent the yield of pumpkins and squashes produced from one plant of each variety in each year, when grown on well manured land. Nearly all of these varieties are noted for producing very large specimens; and the object has been to grow them, to ascertain which varieties would likely be the best producers of food for live stock. It will be seen that the King of the Mammoth pumpkin gave the largest yield in 1895, but the returns from it in 1898 were very much less. When the results from the two years' tests are taken into account Rennie's Yellow Mammoth squash occupies first place in yield per acre, this variety having produced good results during each year of the experiment.

Rape—Comparison of Varieties.

For four years in succession two varieties of rape have been grown side by side in the experimental grounds under similar conditions. The crop each year was harvested when it reached the proper condition, and was weighed immediately on being cut. The following table gives the yield per acre of the two varieties in each of the four years, and also the average results for the whole period.

Rape is grown in considerable quantities in some parts of Ontario for feeding sheep and hogs. The Dwarf Essex variety is the one generally used by the farmers of this Province. A few years ago a Wisconsin seedsman introduced a variety, under the name

Varieties of Rape.	Yield of green rape per acre.				
	1895.	1896.	1897.	1898.	Average 4 years.
	tons.	tons.	tons.	tons.	tons.
Dwarf Essex	15.15	24.18	37.20	27.40	**25.98**
Dwarf Victoria	14.55	18.60	32.40	26.10	**22.91**

of Dwarf Victoria, for which he made a very extravagant claim. The following quotation is taken from the annual seed catalogue for 1898: "It, (Dwarf Essex) is eleven miles behind in yield, in bushy, leafy quality, and in vigor of growth and hardness, to our splendid, yes wonderful, Dwarf Victoria rape." In the tests made by growing these two varieties of rape under similar conditions it will be seen from the foregoing table that the Dwarf Essex has given an average of fully three tons of green crop per acre more than the Dwarf Victoria variety. The Dwarf Essex has certainly given very good satisfaction in comparison with the Dwarf Victoria, and also in the comparison of seven varieties grown in 1894 and 1895.

Varieties of Kale, Cow Cabbage, Rape, Etc.

An interesting experiment has been conducted during the past three years by growing crops which much resemble rape in character of growth and of crop. The plots were 1-100 of an acre in size in every instance. The crops were weighed immediately on being cut each year.

Varieties of Kale, Cow Cabbage, Rape, etc.	Average height.		Yield of green crop per acre.	
	1898.	Average for number of years grown.	1898.	Average for number of years grown.
	inches.	inches.	tons.	tons.
Grown for two years:				
Dwarf Essex Rape	32	38.0	27.4	**32.30**
Cow Cabbage, or Marrow Stem Kale	33	37.5	23.9	**31.59**
Tall Jersey Cabbage	30	37 5	21.2	**24.40**
Thousand Headed Kale	31	33.5	20.8	**24.34**
Large Tall French Brussels Sprouts	23	22.5	13.5	**20.75**
Tall Green Curled Scotch Kale	26	18.5	18.1	**16.32**
Grown for one year:				
Jersey Kale	30	30.0	21.6	**21.6**
Georgia Collards	20.5	20.5	10.1	**10.1**

As the experiment with Cow cabbage, or Marrow Stem kale, and the Tall Jersey Cabbage has been conducted for only two years in succession, the results from the other four varieties obtained in 1896 are left out of consideration in order to give the results of the six varieties under similar conditions. It will be seen that the Dwarf Essex rape occupies first place in yield of green crop per acre, furnishing an average of 32.3 tons. This is followed closely by the Cow cabbage or Marrow Stem kale. The seed of the latter variety was secured from Montreal. The Tall Jersey Cabbage is used extensively on the Island of Jersey; and Prof. H. H. Dean, when visiting the Island of Jersey in 1895, observed that this variety was in general use and was very highly prized. He brought with him a small quantity of seed; and we have since imported a larger quantity. The growth of this variety for two years has been very good, an average of 24.4 tons per acre being produced. Mr. W. E. Butler, one of the graduates of the College, wrote his thesis on the feeding quality of the different varieties of crops named in the above table. He fed them to dairy cows, examined closely the influence upon the milk produced, and found that, in every instance, there was more or less taint in both the milk and the butter.

Rape—Application of Fertilizers.

In 1891, 1896, 1897, and 1898, an experiment was conducted by applying different commercial fertilizers to a crop of rape, in order to compare the results from land which is fertilized with those from land which was unfertilized. The plots were 1-100 of an acre in size in the experiments of 1891, 1896, and 1897, and were 1.80 of an acre in size in 1898. The fertilizers were applied at the time the rape seed was sown. The mixed fertilizer consisted of nitrate of soda, superphosphate, and muriate of potash, one-third as much of each as was used when they were sown separately. The mixture, therefore, would be a complete fertilizer containing nitrogen, phosphoric acid, and potash. The cost of the different fertilizers used per acre was as follows: Nitrate of soda, $3.84; mixture, $3.79; Superphosphate, $3.68; and Muriate of potash, $3.84.

Fertilizers.	Amount of fertilizer used per acre 1898.	Yield of green rape per acre (tons).				
		1891.	1896.	1897.	1898.	Average 4 years.
	lbs.	tons.	tons.	tons.	tons.	tons.
Nitrate of Soda	160	15 8	14.7	14.0	16.3	**15.2**
Mixture (complete)	313	14.8	10.6	15.6	14.7	**13.9**
Superphosphate	220	12.6	10.4	13.8	13.7	**12.6**
Muriate of Potash	160	12.2	10.4	12.7	14.2	**12.4**
No fertilizer	....	13.2	10.2	11.3	11.4	**11.5**

In the average of four years' experiments, the application of nitrate of soda increased the yield of rape 3.7 tons per acre. Providing the full advantage of the fertilizer was secured in the first crop, this extra increase in yield of rape was made at a cost of practically one dollar per ton. It is very evident that the nitrate of soda exerted the greatest influence of any fertilizer used in this experiment in increasing the yield per acre.

Rape—Methods of Cultivation.

Method of soil preparation.	Yield of green rape per acre.			
	1895.	1896.	1898.	Average 3 years.
	tons.	tons.	tons.	tons.
Land subsoiled	6.7	18.25	24.99	**16.65**
Land not subsoiled	5.5	17.39	26.19	**16.36**

In 1895 an experiment was conducted by sowing rape on land which had been subsoiled, in order to compare these results with those obtained from sowing rape on land the subsoil of which had not been disturbed. This experiment was repeated in 1896, and again in 1898, and was conducted in duplicate during each of the three years. The subsoiling was done with a subsoil plow, which loosened the soil to a depth of from twelve to fourteen inches. The subsoil was simply loosened and was not brought to the upper surface of the soil. The rape, which was sown in rows, was cultivated throughout the season. The crop produced on the different plots was weighed immediately on being cut in each of the years in which this experiment was conducted.

It will be seen that the land which was subsoiled gave the largest yield per acre in 1895 and 1896; but in 1898 that which was left unsubsoiled gave the best results By taking the average of the results for three years, it will be seen that there was the largest yield by about one-third of a ton per acre on the land which was subsoiled. This, however, would not pay for the labor of subsoiling the land. In all the experiments conducted at this place in which the subsoil plow has been used, it has been found that the advantage from its use has generally been very small.

Rape—Selection of Seed.

In 1895, 1896, and 1897 an experiment was conducted in duplicate by sowing the following selections of rape seed, namely, large plump, medium-sized, and small-sized seed. In the average yield per acre for the three years it was found that large plump seed gave about $2\frac{1}{3}$ tons per acre more than the medium-sized seed, and nearly 5 tons per acre more than the small-sized seed. This experiment was repeated in 1898; but, owing to some irregularity in the experiment, the results cannot be given this year, further than to say that sixty-three per cent. of the large seed, forty-seven per cent. of the medium-sized seed, and forty per cent. of the small seed germinated.

Rape—Depths of Planting.

In 1898 an experiment was conducted by planting rape one-half inch, one inch, one and one-half inches, two inches, three inches, and four inches deep. The experiment was conducted in duplicate. Great care was taken to have the seeds exactly the right depth from the surface of the soil. Level cultivation was used throughout. The seed which was sown one-half inch and one inch in depth produced the greatest percentage of plants. There was not much difference in the germination of the seed when planted not deeper than two inches below the surface. The seed, however, which was planted three inches deep produced only one-half, and that planted four inches deep produced only one-sixth the number of plants compared with those produced from the seed which was planted two inches or less in depth.

Clovers—Comparative Test of Varieties.

A considerable amount of important experimental work is now being carried on with the different varieties of clover, and we hope in the near future to furnish some valuable information about this most important crop. We are carefully testing a number of varieties; and are also sending seed of four of the principal varieties throughout Ontario in connection with the co-operative experimental work, to get information about the comparative value of the different clovers when grown on the various soils of the Province. In the summer of 1898 some important experimental work was started with the object of finding out the amount of clover roots produced by some of the principal varieties in the first six inches of soil, the second six inches, and the third six inches. The yield of roots in each of these layers of soil was obtained with Mammoth Red Clover, Common Red Clover, Alsike Clover, and Lucerne, two months, five months, fourteen months, and seventeen months after seeding. The Chemical department kindly undertook the work of analysing the roots, and has given the results in Part IV. of this report. A sufficient area of each variety was used in the experimnnt, so that the results might be presented in yield per acre. We hope the public will not be in too great a hurry for these results, that we may have sufficient time to secure thoroughly reliable information which will be of truly practical value. It might be mentioned here, that, of the four varieties of crops under investigation, the Lucerne, or Alfalfa, has given decidedly the largest yield, and the Alsike Clover decidedly the smallest yield of roots per acre.

Special attention has been given at this place to the growing of Lucerne, or Alfalfa, and seed has been distributed in connection with the Experimental Union work during each of the past seven years. Mr. Robert Harcourt, B.S.A., has also been carrying on some important work in determining the proper stage to harvest Lucerne in order to secure the best results. The investigations in connection with the digestibility of the Lucerne is being prepared in bulletin form, and in connection with this information some results of field experiments in the growing of Lucerne will be included, and are consequently not presented in this report.

Grasses—Comparative Test of Twenty Varieties.

On the 15th of May, 1894, a large number of varieties of grasses were carefully sown on uniform plots in our experimental grounds. Several of the varieties were completely killed out during the first winter. Twenty varieties, however, have now passed through four winters. No fertilizer or manure of any kind has been applied to the plots, as the desire has been to ascertain which varieties would prove the hardiest and would give the most satisfactory results when constantly cropped without being specially manured or fertilized.

Names of varieties of grasses.		Height of crop.		Yield of hay.		Yield of freshly cut grasses.		
Common names.	Scientific names.	1898.	Average four years.	First cutting, 1898.	Second cutting, 1898.	First cutting, 1898.	Second cutting, 1898.	Average per year for four years.
		ins.	ins.	tons.	tons.	tons.	tons.	tons.
1 Lyme Grass	Elymus Virginicus	33.0	28.8	1.32	.72	4.56	1.84	7.23
2 Fringed Brome Grass	Bromus ciliatus	32.0	30.8	2.88	.70	5.16	1.96	7.14
3 Western Rye Grass	Agropyrum tenerum	36.5	27.4	3.08	.38	5.48	.96	6.80
4 Tall Oat Grass	Arrhenatherum avenaceum	49.0	43.3	2.64	.52	6.04	1.72	5.62
5 Bearded Wheat Grass	Agropyrum caninum	39.5	29.9	2.44	.34	4.20	.80	5.23
6 Orchard Grass	Dactylis glomerata	39.0	32.5	2.32	.42	5.28	1.24	5.13
7 Timothy	Phleum pratense	35.0	33.3	3.12	.16	6.96	.60	4.98
8 American Lyme Grass	Elymus Americanus	37.0	24.3	2.80	.18	4.64	.40	4.97
9 Awnless Brome Grass	Bromus inermis	14.0	19.3	2.04	.10	4.08	.28	3.68
10 Soft Brome Grass	Bromus Mollis	37.0	32.5	1.52	.22	3.36	.64	3.48
11 Meadow Foxtail	Alopecurus pratensis	33.0	30.0	1.44	.18	3.92	.52	3.48
12 Meadow Fescue	Festuca pratensis	29.5	28.1	1.16	.28	2.96	1.00	3.47
13 Canadian Blue	Poa campressa	19.0	16.5	1.92	.10	3.52	.20	2.58
14 Red Top	Agrostis vulgaris	23.0	20.5	1.24	.04	2.64	.12	2.25
15 Rhode Island Bent	Agrostis canina	22.5	21.9	.96	.12	1.84	.16	2.17
16 Yellow Oat	Avena flavescens	31.5	25.4	1.24	.00	2.56	.32	1.98
17 Perennial Rye	Lolium perenne	22.0	18.8	.56	.34	1.20	.88	1.82
18 Kentucky Blue	Poa pratensis	23.0	21.8	.88	.48	1.88	1.24	1.81
19 Creeping Bent	Agrostis stolonifera	23.0	16.0	.76	.06	1.69	.12	1.60
20 Fine Leaved Sheep's Fescue	Festuca ovina	22.0	17.8	(1.90)		(3.64)		1.55

The three varieties which stand at the head of the list in the average yield of green crop per acre for four years were grown from seed which was received from Manitoba through the kindness of Mr. S. A. Bedford, Superintendant of the Experimental Farm for that province. The seed of the Bearded Wheat grass, and American Lyme grass was obtained from the same source. It will be seen that the Tall Oat grass gave about two-thirds of a ton per acre more than Timothy; and the Timothy gave 1.3/10 tons per acre more than the Awnless Brome grass (Bromus inermis). The Canadian Blue grass gave a yield of about three-fourths of a ton per acre more than the Kentucky Blue grass. The Lyme grass, which stands the highest in yield per acre, is coarse in quality, and, it will be noticed, it gave a smaller yield in 1898 than several of the other varieties. This variety did not look nearly so well in the summer of 1898 as in the previous year.

The Tall Oat grass, Orchard grass, Timothy, and Meadow Fescue have been sent out over Ontario for two years in succession for co-operative tests, and it is hoped that valuable information regarding the relative value of these four varities on the various soils of

Ontario will be secured. These experiments, which were started in the spring of 1897, and continued in 1898, show that, in yield during the present year, the Tall Oat grass gave 3 tons of hay per acre, Timothy 2.7, Meadow Fescue 2.1, and Orchard grass 2.

PERMANENT PASTURE.

Mixture recommended in	Grasses and clover.	Varieties in mixtures.	Amount of seed per acre.	Average height of first cutting. Average four years.	Yield of freshly cut grass per acre. 1898, three cuttings.	Yield of freshly cut grass per acre. Average four years, 1895-6-7-8, ten cuttings.
			lbs.	inches.	tons.	tons.
1885	Grasses	Meadow Fescue	6	32	14.00	15.40
	"	Meadow Foxtail	3			
	"	English Rye	2			
	"	Timothy	3			
	"	Canadian Blue	4			
	"	Orchard	3			
	"	Red Top	2			
	"	Yellow Oat	2			
	Clovers	Lucerne	4			
	"	White	2			
	"	Alsike	2			
	"	Red	1			
	"	Yellow	1			
		Total amount seed used.	35			
1893	Grasses	Orchard	4	33	18.28	19.09
	"	Meadow Fescue	4			
	"	Fall Oat	3			
	"	Timothy	2			
	"	Meadow Foxtail	2			
	Clovers	Lucerne	5			
	"	Alsike	2			
	"	White or Dutch	1			
	"	Yellow or Trefoil	1			
		Total amount seed used.	24			

A large amount of experimental work has been done in testing varieties of grasses and clovers, both singly and in combination, during the past twenty years. The grasses and clovers have been carefully studied, and much information has been gleaned in regard to their value for pasture, and for hay. In 1885 Prof Wm. Brown, who was then Farm Superintendant at the Ontario Agricultural College, recommended a mixture which he thought well adapted for permanent pasture. Only the most hardy varieties which had been tested up to that time were included in the mixture. In 1893, after eight years additional experimental work, during which time the writer was closely connected with the work of the experimental department, we recommended another mixture containing a smaller number of varieties and requiring a smaller amount of seed per acre. The grasses and clovers recommended in 1893 have proved themselves to be a valuable mixture. They are all hardy varieties and, when grown together, give a large yield. An experiment was started in the spring of 1894 by sowing a plot of the mixture which was recommended in 1885, and another plot of the mixture which was recommended in 1893. The seed was sown with a light seeding of barley; and the germination of the seed of the grasses and clovers were quite satisfactory.

Two cuttings were made from each plot in 1895; three, in 1896; two, in 1897; and three, in 1898. Without a single exception, the mixture which was recommended in 1893 has produced a larger yield per acre than that which was recommended in 1885. We have named all the varieties of grasses and clovers sown in each mixture: and also the quantity of seed per acre, particularly, for two reasons: In the first place, that this experiment might thus be as clear as possible and, secondly, that any person wishing to know the quantity of seed per acre of the different varieties which were recommended as a permanent pasture mixture could find the information in good form. It will be observed that the mixture recommended in 1893 possesses none but very hardy grasses which have been tested at this place more or less for about twenty years. It could, of course, be somewhat modified to suit different localities and different soils.

Miscellaneous Crops.

As experiments have been conducted with a number of crops which do not strictly belong to any of the classifications of the previous part of the report, the results will be briefly referred to under the heading of miscellaneous crops. With some of the crops, however, more experimental work will need to be done before anything very definite can be said about them.

Flax. For two years in succession three varieties of flax have been grown in the experimental department. There was some difference in the appearance of seed of the different varieties, that which was received under the name of Russian being decidedly the largest and the common variety of Ontario being the smallest. In the results of the two years' experiments it is found that the Russian variety has given the best yield of seed per acre, the average being 15.6 bushels. The Manitoba and the common have given about equal yields of seed per acre.

Peanuts. For two years in succession experiments have been conducted with seven varieties of peanuts. None of these fully matured in either of the years. The varieties which gave the best satisfaction in 1897 were the White, Red, Spanish, Root Hog or Die, and Rennie's New Canadian; and the varieties which gave the best results in 1898 were the Root Hog or Die, Savatilla, Spanish, and Rennie's New Canadian, in the order named. Some of these varieties produced nuts of good outward appearance, but on becoming dry they shrivelled considerably on account of not being fully matured.

Soya, Soja, or Japanese Beans. Five varieties of Japanese beans have been grown for two years in our experimental grounds. Most of these varieties were brought out from Japan by Prof. Brooks of Amherst University, Massachusetts. Some of them are doing well in the State of Massachusetts. They produce grain which is the richest of any produced on the farm. Our experiments, so far, are not of sufficient extent to justify our saying much in regard to the place these beans are likely to occupy in the future agriculture of Ontario. It might be stated, however, that in yield of grain per acre, the Yellow Soya beans, the seed of which we originally obtained from the State of Kansas, stands highest, and that the Early White, Medium Black and Medium Green gave yields in the order named. The seed of the last three were secured from Prof. Brooks. In yield of green crop per acre the largest returns were secured from the Yellow and from the Medium Green varieties of Soya beans.

Horse Beans. Experiments have been conducted more or less for the last eight years with Horse beans, but in the most of the years the crop has proved unsuccessful. During the hot, dry weather of the summer, the leaves dropped from the plants, and the stems turned black and became dry. In some instances there was a second growth from the roots after the fall rains saturated the ground. Among the different varieties tested the Small Horse bean has proved to be one of the best.

Cow Peas. One or more varieties of Cow peas have been sown in our experimental grounds during each of the past seven or eight years. These crops, however, are too late for the climate of Ontario, unless it is, in some instances, for producing a green crop for ploughing under. They seldom grow to a height of more than ten to twelve inches, and sometimes do not reach even the blossoming stage. The four varieties grown in 1898 were the Warren Extra Early, Black Eye, New Era and Thorp's Cow peas. Of these varieties the Black Eye gave the largest yield of green crop per acre, and the New Era the smallest.

Tares, or Vetches. For two years in succession an experiment has been conducted in growing three varieties of Vetches for food purposes. In the average results of the two years' experiments, the Hairy Vetch gave the best results, the yield per acre being considerably more than that of the common variety. Vetches are frequently mixed with oats for producing a green fodder crop; but in the experiments on our experimental grounds, and in the co-operative tests throughout Ontario, we find that peas and oats give better all round satisfaction.

Chicory. In 1896, 1897 and 1898, Chicory was sown in the experimental plots. It is from the dry roots of the plant that the chicory of commerce it obtained, which is so commonly used as an adulteration in coffee. Nothing was done with the roots excepting that the yield of the fresh roots was determined. In 1898 there was 7.5 tons and in 1896 11.4 tons of green roots per acre. In 1897, however, the crop was a comparative failure.

Flat Pea. *(Lathyrus Sylvestris.)* Several plots of the flat pea have been sown in the experimental grounds within the past eight years, but on the whole the results have not been very satisfactory, and we believe that this will not be a very important crop in general cultivation. While visiting the Agricultural College in Michigan in 1897, the writer saw about one acre of the flat pea, which was producing a good crop. From our experiments, however, we find that it is not relished by the live stock, and we scarcely know what to do with the crop after it is grown. The seed is very expensive, and the plants require three years to obtain their full size. There is apt to be much trouble from weeds during the first year or two when getting a crop once properly established. With great care, we have succeeded in getting fairly good crops on our small plots; but, on the whole, we consider it a crop of but little value to the farmers of Ontario.

Bokhara or Sweet Clover. Seed of the Bokhara—Sweet or Wild Clover—has been sown on our plots on several occasions, and the crop therefrom has been large; in fact, on some occasions the yield from this clover has been two and three times greater than that of the Common Red Clover. It is a biennial, the plants dying after the second year's growth. The green fodder and the hay produced by this variety of clover is not very suitable for live stock, for the reason that it has a bitter taste and the stems become very large and woody while the plants are still comparatively young. This clover is sometimes recommended, however, to be grown for ploughing under as a green crop, for which purpose it might prove quite serviceable.

Lupines. Three varieties of Lupines have been grown in our experimental grounds, but they have proved a failure in every case. The climate of Ontario seems to be unsuited to their growth and development. They have been tested for several years, and have given very unsatisfactory results during each of these years.

Sachaline, Prickley Comfrey, Kidney Vetches, Etc. Besides the experiments above referred to, some work has been done in testing sachaline, prickley comfrey, kidney vetches, hemp, ground almonds, teosinte, ramie, Australian salt bush, lentils, banana field beans, etc.; but so far none of these crops have given returns which warrant us in concluding that they will be of much value in this Province.

Co-operative Experiments in Agriculture.

The co-operative experiments in agriculture are carried on conjointly by the Experimental Department of the Ontario Agricultural College and the Ontario Agricultural and Experimental Union. All necessary material and detailed instructions for conducting the various experiments are furnished to the experimenters from the Agricultural College. Each experimenter joins in the work voluntarily, and chooses from a carefully prepared list, furnished by the director, the particular experiment in which he is most interested. At the end of the season the results of the tests are reported to the director, who carefully examines them and prepares a summary of the results of the successfully conducted experiments, with conclusions therefrom, for the annual meeting of the Union and for general distribution in printed form. The number of voluntary experimenters in agriculture has increased from 12 in 1886 to 3,028 in 1898.

Concise Statement of Work Completed or Now Being Done.

1. Testing nitrate of soda, muriate of potash, and superphosphate ; wood ashes, salt, and land plaster ; complete fertilizers, farmyard manure and no-manure with different kinds of farm crops in a study of the fertility of the soil. The principal objects of this work are as follows : (1) To ascertain whether it will pay to use commercial fertilizers in Ontario ; (2) To ascertain the comparative value of commercial fertilizers and farmyard manure with different crops and on different soils ; and (3) To ascertain which kinds of soluble plant food, if any, are lacking, in order to know how best to improve the fertility of the soil. A more systematic use of clover, greater care in the use of absorbents for saving all the liquid manure, a decrease in the practice of selling valuable wood ashes from the farm at low prices, etc., all naturally result from this line of investigation.

2. Testing different methods of cultivation, as embraced in the three following experiments : (1) Growing potatoes in hills and on the level ; (2) Growing corn in drills and in squares ; and (3) Growing corn broadcast and in drills, 42 inches apart, from thick and from thin seeding in each case.

3. Testing the following methods of planting potatoes : (1) Planting large whole potatoes, small whole potatoes, cut pototoes with two eyes in each set, cut potatoes with one eye in each set, etc. ; and (2) Planting potato sets immediately after and five days after being cut.

4. Testing the following mixed grains as green fodder crops : oats and peas, oats and tares ; and oats, peas, and tares.

5. Testing the leading varieties of grain, root, tuber, grass, clover, and fodder crops. These experiments embrace the principal classes of farm crops which are grown in Ontario. Each experiment includes from three to six varieties. Sixty-six of the varieties distributed in 1898 have done exceptionally well among all the varieties grown for several years in succession in the experimental grounds at the College, and the remaining six varieties, which were tested in 1897 for the first time, headed the list in their respective classes.

For the results of the co-operative experiments for 1898 the reader is referred to the annual report of the Ontario Agricultural and Experimental Union.

Conclusions.

We have aimed to make all our work practical, accurate and reliable, and we hope that the record of the results here presented may be of some service in the advancement of agriculture in Ontario.

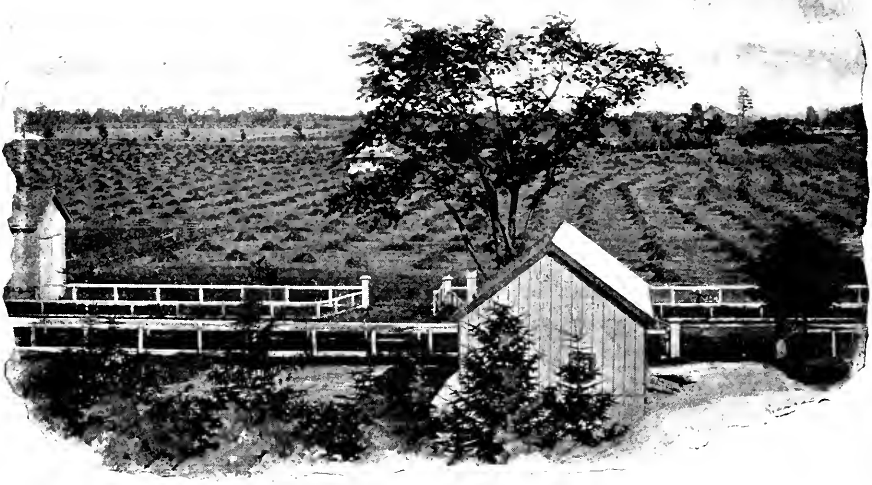
I wish to thank you, and also the Minister of Agriculture, for the able support given me in developing the work of the Experimental department.

Respectfully submitted,

C. A. ZAVITZ,

Experimentalist,

Guelph, Dec. 31st, 1898.



Field of Hay O. A. C. Farm, Guelph.

PART XI.

REPORT OF THE FARM SUPERINTENDENT.

To the President of the Ontario Agriculture College:

SIR,—I have the honor to submit herewith my annual report of the Farm department for the year 1898. It affords me pleasure to state that notwithstanding the frost on July 9th, followed by extreme heat and dry weather, which injured our grain crops very much in quality, we reaped an abundant harvest, all of which was housed in good condition.

Improvements.—Last spring we found that the wooden silo was so much decayed that it would not permit of being used another season; and, as there was no appropriation for that special purpose, we had to use what had been voted for underdraining and fencing. The new silo is a substantial structure built of cement, in two compartments, one 16½x13½ ft. inside measurement, and the other 16½x9½ ft., 36 ft. high. The capacity of the two is about 300 tons. During the winter we fed out of the larger compartment; and in the spring and summer out of the smaller one. The walls are 21 inches thick at the bottom and 14 inches at the top. The cost of the cement was $200, and the other material and the labor, including the roof, was as much more, making a total cost of $400. Small stones were put in the centre of the walls, and the cost was materially lessened thereby. Instead of doors there are openings from top to bottom, which are closed by means of inch boards, 12 inches wide, nailed together with an overlap of 2½ inches, to break the joints and exclude the air. These are tacked on as the ensilage is used and remain ready for re-filling.

Fencing.—We have the posts nearly all set for a new wire fence on the Puslinch town-line, 200 rods. It is the same style of fence as we put up three years ago. When this is complete, all the boundary fences on the farm will be in good condition. We have also done a good deal of grading on the public road adjoining the farm.

Implements.—Last year favorable arrangements were made with implement manufacturers for a number of up-to-date implements adapted to modern methods of cultivation. Our old implements were given in part-payment; and the exchange proved very satisfactory.

Rotation of Crops.—Under the present systematic rotation of crops, and by the cultivation of the soil according to scientific principles, the fertility of the farm is rapidly increasing without the application of any fertilizer but the barnyard manure made on the place.

Although the farm proper has been reduced to 340 acres, we have, nevertheless, secured a very fair profit on the year's operations, as will be seen by the financial statement at the end of this report.

Meadow.—We had 85 acres of meadow which averaged 2 tons per acre, which was cured and housed in good condition. It was composed of common red clover, alsike, and timothy, mixed as followa: red clover 7 lbs., alsike 3 lbs., and timothy 4 lbs.—total 14 lbs. Twelve pounds of this mixture was sown with the grain and the remainder immediately after harvest, wherever there were any spots too thin. There were 40 acres of pasture for the College cattle (including 15 feeding steers) and sheep; and 25 acres for the cows of the Dairy department.

Fall Wheat.—24 acres were grown—13 acres of Dawson's Golden Chaff, and 11 acres of Early Genesee Giant—all of which succeeded peas the previous year. It was an extraordinarliy heavy crop and greatly admired by visitors during the month of June; but the frost on the night of July 9th injured it somewhat. We commenced cutting on July 14th, when the grain was in the dough state, finishing on the 16th; and in this short time the grain had become quite hard and the straw brittle on account of the excessive heat which followed the frost. The yield was as follows: Dawson's Golden Chaff, straw, 69 dozen sheaves, and grain, 36 bushels per acre; Early Genesee Giant, straw, 72½ dozen sheaves, and grain 38 bushels.

Oats.—64 acres of Siberian oats were grown on the section following corn and roots. Instead of the land being plowed the previous fall it was drilled with a double mouldboard plow, 21 inches wide, and thoroughly harrowed and cultivated last spring, before the oats were sown: 1½ bushels per acre were sown with the drill, and our usual mixture of clover and grass seed. We had an excellent crop of oats. According to what we have threshed they will average between 60 and 65 bushels per acre; and had it not been for the July frost, followed by excessive heat, they would have yielded considerably more. They were sown 11th to 15th April and harvested 1st to 5th August.

Barley.—29 acres of Mandscheuri barley were grown after sod, which had been plowed shallow early in the fall and thoroughly harrowed and cultivated with a spring-toothed cultivator, with wide points, to cut off all weeds about 2 inches below the surface. This was ribbed in the early part of November. The barley was sown, 20 acres on the 15th to 16th of April, and 9 acres on the 28th and 29th, at the rate of 1½ bushels per acre; and harvested on the 20th to 23rd July. Both were magnificent crops. Although it is not threshed yet, we can safely place the yield at not less than 50 bushels per acre.

Peas.—22 acres were grown of the Prussian Blue variety, which has been the principal variety on the farm for a number of years. From it we usually get a superabundance of straw; and we never fail to get a fair yield of grain. According to what we have threshed the yield this year will be about 25 bushels per acre, notwithstanding the July frost. They were sown on the 29th and 30th of April, at the rate of 2½ bushels per acre, and harvested 1st to 5th of August.

Corn.—32 acres of the following varieties were grown: 6 acres of Early Butler, 16 acres of Wisconsin Earliest White Dent, 8 acres of Mammoth Cuban, and 2 acres of Kendall's Giant Sweet—the last for green fodder, which was of good quality but not more than 10 tons per acre. The corn was sown with the grain drill, 42 inches apart, at the rate of 14 lbs. per acre, on the 26th to 28th of May. It started nicely; but we had a very heavy shower of rain on June 8th, which formed a crust on the land that had to be broken up as quickly as possible. On the 11th we had another heavy shower, and as soon as the land was dry, the cultivators were started again. By the 1st of July the corn had quite recovered and did well until the frost on the night of the 9th, which blackened most of it, so that there was little hope of a crop; but with persistent cultivating it started anew and grew rapidly until it was again slightly frost-bitten on Sept. 10th. We commenced cutting on the 13th and finished on the 26th Sept. The yield of Early Butler was 12 tons per acre; Wisconsin Earliest White Dent and the Mammoth Cuban, 18 tons per acre. All considered, Wisconsin Earliest White Dent was the best corn.

Preparation of Land for Corn and Cultivation of Corn Crop.—The previous fall clover sod was plowed, 4 inches deep, about the 1st of Sept. Afterwards it was harrowed and cultivated. In October barnyard manure was spread on the surface, at the rate of 15 loads per acre, and the land was then drilled 22 inches wide, with a double mouldboard plow. In the spring, before seeding, the drills were levelled down with the harrows and spring-tooth cultivators. A few days after sowing the ground was thoroughly pulverized with Breed's weeder, which was followed a few days later with a two-horse corn cultivator, about 3 inches deep. This implement was kept going until the corn was about 4 ft. high, when we used two home-made harrows with ordinary harrow teeth, set on a slant and projecting 4½ inches below the frame. These were weighted with a block of wood, and were kept going until the corn was in tassel. We found this an excellent implement to pulverize the surface soil and thereby conserve moisture for the benefit of the corn; and the teeth being set on a slant are not so liable to break the rootlets (feeders) as an ordinary cultivator.

Rape.—Six acres were grown. One acre was sown on May 18th, for early feeding (Pigs and Lambs), and the remainder on June 20th and 21st, in shallow drills, 24 inches apart, and cultivated the same as other root crops. This was fed during the fall to pigs, lambs, young cattle, and feeding steers. All animals do well on this succulent food.

Field Roots—There were 8 acres of mangels grown as follows: 3 acres of Mammoth Long Red and 5 acres of Yellow Intermediate, yielding 770 bushels per acre. Two acres of Red Top sugar beets were grown, of the Nantes variety, which yielded 560 bushels per acre.

Cultivation of Land for Roots.—The previous fall, early in October, clover sod was plowed about 4 inches deep, and thoroughly harrowed: during the winter barnyard manure was spread on the surface at the rate of 15 loads per acre. In the spring it was gang plowed, harrowed, and cultivated with a spring-tooth cultivator, until the manure and rotted sod were thoroughly incorporated. The subsoil was loosened with three horses attached to a cultivator with narrow chisel-pointed teeth for the purpose. The land was then put into shallow drills, 30 inches apart, with a double mould-board plow, with a marker attached, so that the rows were uniform in width. The seed was sown with an ordinary horse turnip drill, at the rate of 4 lbs. per acre. After seeding, the drills were rolled down with an ordinary field roller, and in a few days the surface was pulverized with Breed's weeder, to conserve moisture and destroy weeds. After thinning the plants to 12 inches apart, we used the ordinary horse-hoe with rake attachment. The mangels and sugar beets were sown on the 4th and 5th of May, and pulled on the 20th to 26th October. Six acres of turnips were grown after clover sod, treated the same as for the mangels. They were sown on the 17th and 18th of June, and pulled on the 29th Oct. to 2nd Nov., yielding 3,150 bushels, or 525 bushels per acre.

Potatoes—Seven acres of the following varieties were grown: Burpee's Extra Early, Stray Beauty, Rose of Erin, Empire State, and American Wonder. The July frost injured them very much, so that they grew very little afterwards. The preparation of the land was the same as for the mangels and turnips. The potatoes were planted in drills 30 inches apart, on the 19th to 21st of May, and harvested on the 1st to 6th Oct.—total yield 790 bushels.

Fall Cultivation.—As soon as the peas and 9 acres of barley were harvested the land was gang-plowed shallow, and then harrowed and cultivated twice for fall wheat; before seeding the sub-soil was lossened with a three-horse grubber.

In the previous spring, before the peas were sowed, barnyard manure was gang-plowed in at the rate of 15 loads per acre. In the fall this was thoroughly decomposed and available for the use of the wheat plant. The fall wheat, 31 acres, was sown the last days of August, and, before sowing, we treated it with a strong solution of blue vitriol to prevent smut—20 lbs. of bluestone dissolved in 20 gallons of water for 32 bushels of wheat. We took half-a-barrel of the liquid and used it by putting a bushel of wheat in a coarse sack and immersing it in the solution for 5 minutes; after taking it out we allowed it to drip for 1 minute, then spread it on the floor and dusted it with lime. The treatment proved a preventive of smut, but I think it was rather strong as it slightly injured the germinating power of the wheat.

On the 31st of August we commenced gang-plowing 20 acres of barley stubble that had been grown on 1st year clover sod; we cultivated it thoroughly in the fall, manured it at the rate of 15 loads of farmyard manure per acre, and put it up in drills 22 inches wide, so as to be ready for corn next season. The remainder of this section of the farm, 58 acres, being clover sod, was plowed about 4 inches deep, thoroughly harrowed and cultivated (shallow) by a spring-tooth cultivator with wide points. It will be manured during the winter, and gang-plowed in the spring for corn, mangels, turnips, potatoes, rape and peas. After our corn was harvested, the roots were turned out by plow without the mould-board, after which the land was harrowed and cultivated with wide points, and then drilled across with the double mould-board plow. After the mangels, turnips and potatoes were harvested the land was drilled across, so as to incorporate the tops with the surface soil. All this section will be sown with grain and seeded in the spring.

Live Stock.

Thoroughbreds.—We have at present 21 pure-bred cows (eight breeds) which are kept for educational purposes and to supply milk to the College. We have the following dairy breeds: Ayrshire, Holstein and Jersey. The beef breeds are: Short-Horn, Hereford, Aberdeen-Angus, Devon and Galloway. These might with advantage be reduced to three breeds. We have six pure-bred bulls, as follows: Short-Horn, Hereford, Aberdeen-Angus, Ayrshire, Holstein, and Jersey.

Steers.—On the 28th of Oct., we bought twenty-four 2-year old, grade steers for feeding during the winter. The average weight was 1,147 lbs. They were all dehorned. Eleven are tied in double stalls and will not be let loose all winter; four others are tied but will be let out on mild days for exercise, and nine are loose in box-stalls—three in each—the latter will not be turned out for exercise. During the month ending Dec. 15th, those loose in the box-stalls made an average gain of 114 lbs. each, while those that are tied gained only 86 lbs. each, both lots receiving the same amount of food.

Milch Cows.—During the summer, while on pasture, the cows that are milking receive 6 lbs. of chopped grain and bran, mixed half and half. The winter feed per day for each cow is 10 lbs. chaff, 4 lbs. hay, 20 lbs. ensilage, and 10 lbs. pulped roots. It is mixed the day previous, so that the whole may be moistened, and is given in two feeds, morning and night, with the addition of 6 lbs. of chopped grain and bran (half and half), at noon; each cow receives also 20 lbs. whole mangels. The cost per day is $10\frac{3}{4}$ cents. The chaff is estimated at $1.50 per ton; hay, $6; ensilage, $1.50; roots, $2.00; and chopped grain and bran, 75c. per 100 lbs.

The following is the result of feeding 21 steers last winter—fifteen tied in stalls on Nov. 1st, and six fed loose in box-stalls, 14 x 15 ft. each (three in each stall), until April 28th, 1898, nearly six months. The steers were bought at the beginning of October and ran on grass till Nov. 1st, when the experiment began. Both lots were fed the same rations, as follows:

November—

30 lbs. cut fodder corn	Mxd.	$ .0225
4 " " chaff	Mxd.	.003
16 " pulped roots	Mxd.	.016
3½ " chopped grain and bran		.025
Rape (only) at noon		.02
Cost per steer per day		$ .0865

December—

30 lbs. ensilage and fodder corn	$ .0225
10 " pulped roots	.0100
10 " cut clover and chaff	.0187
6 " chopped grain and bran	.0388
Rape (only) at noon	.0200
Cost per steer per day	$ .1100

January—

25 lbs. ensilage	$ .0188
10 " cut clover and chaff	.0187
10 " pulped roots	.0100
7 " chopped grain and bran	.04875
30 " turnips (only) at noon	.0300
Cost per steer per day	$ .12625

February—

25 lbs. ensilage	$.0188
10 " cut clover and chaff	.0187
10 " pulped roots	.0100
7½ " chopped grain and bran	.0500
30 " turnips alone at noon	.0300
Cost per steer per day	$ .1275

March—

22 lbs. ensilage	$ .0165
12 " cut clover and chaff	.0225
10 " pulped roots	.0100
8 " chopped grain and bran	.0530
Cost per steer per day	$ .1020

April—

Same rations as March	$ .1020
Average cost per steer, 6 mos.	$ 19.40½
Total cost food for 21 steers	407.50

The steers were weighed the 1st of each month, before receiving their noon meal or being watered that day. The following is a table of the cost of the rations :

Fodder corn and ensilage, per ton	$1 50
Roots, per ton	2 00
Clover hay, per ton	6 00
Chaff, per ton	1 50
Chopped grain (barley, oats, and peas, a good part screenings, per 100)	75
Bran, per ton	8 50

The chopped grain and bran were mixed, $\frac{2}{3}$ grain and $\frac{1}{3}$ bran.

One of the steers in the box stall was off his feed for a few days at the end of March, which accounts for the small gain for that month, and the very small gain in April was owing to the allowance for shrinkage when sold.

Comparative Increase in Weight During Experiment.

Weight of 15 steers in stalls on November 1st, 1897 : Total weight, 13,333 lbs.; average weight, 1,122 3-15 lbs.

Average gain for November	57 7-15 lbs.
" " " December	72 9 15 "
" " " January	62 10-15 "
" " " February	37 9-15 "
" " " March	50 1-15 "
" " " April	11 1-15 "
Total average gain	297 7-15 "

Weight of 15 steers on April 28th, 1898 : Total 22,705 lbs.; average, 1,513 10-15 lbs. Total gain, 4,372 lbs. ; average gain, 291 7-15 lbs.

Weight of 6 steers, loose in box stalls, on November 1st, 1898 : Total weight, 7,315 lbs. average weight, 1,219$\frac{1}{6}$ lbs.

Average gain for November	75 5 6 lbs.
" " " December	81 2 6 "
" " " January	91 1-6 "
" " " February	54 5 6 "
" " " March	35 4-6 "
" " " April	22 "
Total average gain	360 5 6 "

Weight of 6 steers on April 28th, 1898 : Total, 9,480 lbs. ; average, 1.580 lbs. Total gain, 2,165 lbs. ; average gain, 360 5-6 lbs.

Profit and Loss Account.

21 steers, weighing, when bought, 25,080 lbs., at $4.10 per 100	$1,028 28
21 steers weighing, when sold, 32,185 lbs., at $4.65 per 100	1,496 60
	$ 468 32
Less cost of food	407 50
Net profit	$ 60 82

Those that were tied had water before them all the time, and were not let out for exercise ; those that were loose were watered twice a day.

The steers were all sold to Mr. A. P. Scott, of Brampton, and shipped April 28th, 1898.

While we made this test as accurate as possible, still we intend to repeat the experiment.

PASTURING STEERS.

Fifteen steers were bought May 2nd, total weight 16,790 lbs., at $4 per 100 lbs.—$671.60. Sold Oct. 27th, to A. P. Scott, Brampton, weighing 20,800 lbs., at $4.90 per 100 lbs.—$1,019.20 ; leaving a balance of $347.60.

In addition to the pasture, they received at the commencement four pounds each per day of chopped grain and bran, mixed two-thirds grain to one third bran, which was increased to eight pounds per day. During October the steers were kept in loose boxes and fed cut corn and clover hay. Total cost of grain and bran, $132. They were dehorned in the spring and pastured during the summer with the cows.

By feeding off two lots in the year, instead of one, a double profit is gained, and young growing animals increase in weight more rapidly and at less cost than older animals.

Sheep.—We have fifty-eight sheep—fifty-one ewes and seven rams—of nine breeds as follows: Lincoln, Cotswold, Leicester, Shropshire, Oxford-down, South-down, Hampshire-down; Suffolk amd Dorset-horn. They might be reduced to six or seven breeds. This winter the ration is a mixture of clover, silage, pulped turnips and bran for morning and night, and pea straw at noon. The lambs are dropped in March ; shearing is done in April. Before the sheep are turned out to pasture, and after shearing, the ewes and lambs are dipped, to clean them of ticks, etc. The dipping is repeated in October. The following are the average weights per fleece of unwashed wool :

Lincoln	12.43 lbs.	Suffolk	7.29 lbs.
Cotswold	11,17 lbs.	Shropshire	7.00 lbs.
Leicester	9.60 lbs.	South-down	6.86 lbs.
Dorset-horn	7.83 lbs.	Hampshire-down	6 71 lbs.
Oxford-down	7.50 lbs.		

The wool was sold to the Guelph Woolen Mills. The long wool from Lincoln, Cotswolds, and Leicester, sold at 12 cents per lb., and the fine wool from the other breeds at 13 cents per lb.

Swine.—The following five pure breeds are kept for educational purposes: Yorkshire, Berkshire, Tamworth, Chester White, and Poland China. Since the demand is for lean hogs, the last two breeds might be disposed of. Of all the live stock the hog is the most profitable, being more prolific and giving quicker returns than any other. Our breeding pigs are fed pulped roots mixed with chopped grain and bran, morning and evening, and at noon mangels or sugar beets only. A number of grade pigs are kept to consume the College refuse, which is cooked.

Horses.—Four teams and two cart horses are kept for work on the farm. A man is engaged for each team during the summer season. In the winter, when the farm work is not so pressing, the students get an opportunity of driving the teams. During the summer months, when the horses are hard at work the daily ration for each animal is a mixture of cut clover and silage—all they will eat up clean—and 16 lbs. of chopped grain and bran mixed. The grain is composed of oats, barley and peas. During the winter, when they have little work. the ration is pulped carrots, clover and silage mixed, and 6 lbs. of chopped grain and bran. At noon 10 lbs. of carrots with a little of the clover mixture. Our horses keep healthy and ready for their work with this method of feeding.

Practical Instruction.—The first and second year students are required to work on the farm or in the other departments every alternate afternoon, for which they are allowed in proportion to the work performed and credited on their board accounts.

Plowing.—Before the June examination the second year students plowed a ridge each for the purpose of testing their skill; and marks were given according to the work performed. In the beginning of November an opportunity was given to the first and second year students who wished to test their skill in plowing sod. About forty entered into the competition, and each plowed ten furrows.

The successful competitors were as follows:

1. N. G. Cowle, Ontario County.
2. A. Stewart, Middlesex County.
3. R. Wilson, Huron County.
4. M. Switzer, Wentworth County.
5. G. Humphrey, Wentworth County.
6. J. R. Hutchison, Leeds County.
7. S. M. Ling, Wellington County.
8. H. Williams, Dufferin County.
9. J. A. Sangster, Glengarry County.
10. C. Kidd, Simcoe County.

Annual Sale.—The annual sale of surplus young stock was held on the farm, Wednesday, Oct. 19th. A large number of farmers from different parts of the Province were present: and the prices realized were moderate, considering the quality and breeding of the animals.

13 calves, various breeds realized	$724.00
12 lambs, " " "	97.50
65 pigs, " " "	716.50
	$1,538.00

FINANCIAL STATEMENT.

I submit herein a statement of the accounts for 1898:

CASH RECEIPTS.

Sales of cattle	$3,435 25	
" pigs	1,315 74	
" sheep	308 30	
" wheat	452 24	
" oats	122 68	
" barley	159 16	
" peas	165 30	
" potatoes	5 40	
" milk	49 46	
" wool	58 17	
" hides and skins	3 70	
" screenings	8 15	
" old fence	43 80	
Service of animals	207 50	
Incidentals, (labor of man and team at Mr. Harrison's house)	75	
		$6,335 60

Food, feed, fodder, and services of men and horses supplied to other departments.

To College.

Milk, 5,815 gals @ 8c	$465 20	
Potatoes, 460 bus. @ 50c	230 00	
Keep of 3 horses, 1 year @ $75.00	225 00	
Teams for hauling ice, 3 teams, 3 days @ $2.50	22 50	
Use of horse for hauling sewage	50 00	
Team hauling trunks to and from station	5 00	
		$997 70

To Experiment Department.

Keep of 4 horses, 1 year @ $75	$300 00	
Hay for experimental feeding dept. 5¼ tons @ $6.00	31 50	
Turnips for experimental feeding dept., 440 bush. @ 7c	30 80	
Team hauling 4 loads of pigs to station	3 00	
		$365 30

DISBURSEMENTS.

Salary of superintendent	$1,200 00	
Wages	2,930 25	
Live stock	2,196 67	
Maintenance of stock	585 82	
Seeds	130 06	
Binding twine	14 00	
Avertising, printing, postage and stationery	147 43	
Fuel and light	4 32	
Contingencies	106 27	
		$7,314 82
Repairs and alterations	373 28	
Furnishings	274 54	
Implements—$250.46—⅕ charged charged to 1898	50 10	
Implements in 1897, $190.67, ⅕ charged to 1898	38 14	
Two cement silos – $609.29—$\frac{1}{10}$ charged to 1898	60 92	
	$796 98	
Total expenditures		$8,111 80

To Horticultural Department.		
Keep of 2 horses, 1 year @75	$150 00	$150 00
To Dairy Department.		
Milk, 10,185 lbs. @ 65c per 100..	$ 66 20	
Wood, 63 cords @ $1.25	78 75	
Hay, 36 tons @ $6.00....	216 00	
Turnips, 420 bush. @ 7c.........	29 40	
Mangels, 1,275 bush. @ 7c.......	89 25	
Ensilage, 225 tons @$1.50	337 50	
Pasture, 25 acres @ $4.00	100 00	
Soiling crop, 1½ acre @ $8.00.....	12 00	
Team hauling 2 loads drain tile from Breslau................	6 00	
Team hauling 1 load of gypsum from Guelph	1 00	
Team hauling 3 loads of shavings from Guelph	2 25	
Teams hauling ice, 3 teams, 2 days @ $2.25...............	15 00	
Service of cows, 18 grade and 8 pure bred.........	34 00	
	$987 35	
Cr. By 25,000 lbs skim milk @ 10c 100	25 00	
		$962 35
Other Items.		
Less— Allowance for time spent by Farm Superintendent at outside duties—lecturing to students on soil cultivation and management, attending Farmers' Institute meetings, and waiting on excursionists during the month of June	$400 00	
Keeping various breeds of live stock, male and female, for educational work—8 breeds of cattle, 9 breeds of sheep, and 5 breeds of swine........	400 00	
		$800 00
Total Receipts..................		$9,610 95

Cash receipts	$6,335 60	
Other "	3,275 35	
		$9,610 95
Expenditure		$8,811 80
Net profit.............................		$1,499 18

NOTE.—It is gratifying to know from the above statement that the farm is yielding a good profit; that the systematic rotation of crops, with the cultivation of the soil according to scientific principles, is giving large returns; and that our system of feeding, though very economical, keeps the animals healthy and produces satisfactory results.

Respectfully submitted,

WM. RENNIE,
Farm Superintendent.

GUELPH, December 31, 1898.

PART XII.

REPORT OF

MANAGER OF POULTRY DEPARTMENT.

To the President of the Ontario Agricultural College:

SIR,—I beg herewith to submit my annual report for 1898. The work of the past season may be considered successful for the reason that a larger number of birds have been raised than formerly, and the quality has been much superior to that of the stock of previous years; also several successful experiments have been conducted which will be of interest to farmers and poultry breeders.

The regular course of lectures this year has included the following topics: Poultry plants, location, planning, drainage of the soil, buildings, construction, ventilation and furnishing; fowls, their origin, kinds and breeds; principles of breeding, mating, special breeding, including water fowl and turkeys; natural and artificial incubation; care and management; foods and feeding; egg and meat production; fattening, killing, dressing and marketing; diseases, symptoms and treatment; scoring, and comparison judging.

During the session of the Dairy School, lectures were given to the students in the Home Dairy Course on the most important points in the care and management of poultry.

EGG PRESERVATION.

We tried the keeping of eggs with sodium silicate (water glass) with good results. Sodium silicate is a compound containing silicon, sodium and oxygen in the proportion of one, two and three respectively. It can be purchased from druggists in the form of a semi-fluid resembling thick sugar syrup, for which it might easily be mistaken.

An experiment was conducted in our department for the purpose of determining the most effective degree of concentration. The result of the experiment is of considerable importance, inasmuch as the cost of the mixture may be greatly reduced without destroying its value.

On the 27th May, we took twelve dozen eggs, all known to be perfectly fresh, and prepared the following solutions:

No. 1. One part water glass in the semi-fluid form to ten parts water.

No. 2. One part water glass " " to fifteen parts water.

No. 3. One part water glass " " to twenty parts water.

The first solution was found to be too strong, as it caused the eggs to float. The second was all right in this respect. The third, though much weaker, gave perfect satisfaction. We divided the eggs into three lots of four dozen each, and put one lot into each solution. We tested them from time to time, and in every case found them perfectly fresh; and, on breaking we notice that the yolk stood up exactly as in new laid eggs, and did not show the slightest tendency towards decay.

We tested one half dozen from each solution on the first of December, and could not detect any difference in the appearance or quality in the eggs out of the different solutions, all being perfectly fresh after being in the solution six months. We still have three dozen in the pickle to ascertain how long they may be kept without losing their flavor.

In order to use water-glass successfully, the following plan should be adopted. Take one part by measure of water-glass, say one gallon, and twenty parts by measure of water that has been boiled (twenty gallons), and allow the water to cool; then place the water-glass and water in a vessel; stir the ingredients well together; put the eggs into the tub or vat in which they are to be kept, and pour the solution over them until the topmost layer is completely covered. The reason for boiling the water is to kill any putrefactive germs which may be in the water at the time.

If water-glass is purchased by the cwt., it should be procured for $2.50 to $3.00 per cwt. (112 lbs.).

So far as we know this is the best solution yet tried for the preservation of eggs. When taken out of it the eggs have the appearance of fresh laid eggs, and when they are broken the yolk standing up exactly as in new laid eggs, without showing the slightest tendency towards decay. It is first necessary, before boiling eggs that have been kept in this solution, as in lime pickle, to puncture the shell with a needle, otherwise the shell will crack as soon as placed in hot water, owing to the pores of the shell being closed.

Lime Pickle. We made another test this year with twenty-six dozen of eggs put down in a solution composed of lime and salt.

Three years ago we put down for College use one hundred dozen of eggs in a lime and salt pickle, using two pounds and one-half of lime and one pint of salt to four gallons of water. After the eggs had been used during the winter, the matron said they were all good—but some appeared as if they had been partially cooked, so I came to the conclusion that more lime had been used than was necessary, and we tried a solution made of two pounds of lime and one pint of salt to four gallons of water, and another composed of one and three-quarters pounds of lime and the same amount of salt and water. We tested the eggs from time to time out of both solutions, and found them as fresh apparently as fresh-laid eggs. They were put into the pickle in the first week of May, and we tested the last time the first of December, after the eggs had been in the pickle seven months. We broke and tested one dozen out of each solution, and every one was perfectly fresh and did not show the slightest appearance of being injured by the lime. We still have several dozen in pickle, and will keep them there until spring, and will report on the same next year.

How to Proceed Take three and one-half pounds of stone lime, place the same in a pail and pour sufficient water over it to slacken, then add two pints of salt; have eight gallons of water in tub or barrel; to that add the lime and salt, stir well, and let stand to settle. Then stir thoroughly the second time; and when settled, the clear liquid can be poured over the eggs that have been placed in a tub or firkin, until the topmost layer is covered. Only the clear liquid is used.

Barrels with wooden hoops are generally used. Eggs can be put into the liquid from time to time, until the barrel is filled. Cracked or bad eggs will float and should be removed. When eggs are purchased on the market or from stores, or when there is an uncertainty about their being perfectly fresh, they should be candled.

How to Candle. Take an ordinary biscuit box and make an aperture on the side, a little less than the size of the egg. Then place a lamp on the inside of the box, and place the same in a dark room, or candle at night. Hold the egg in front of the aperture, and if it is fresh it will appear perfectly clear.

Feeding Ducks for Market.

We purchased a few sittings of duck eggs in the spring for the purpose of having ducks for experimental feeding The Pekin and Rouen varieties were selected. We hatched seventeen—eight Pekins and nine Rouens. One of the Pekins got killed when young. For the first two weeks we fed equal parts by measure, corn meal, wheat bran and middlings, having added enough scalded water to make it crumbly, but not porridgy, and fed five times a day, but no more at a time than they would eat up clean. For the next four weeks, two parts wheat bran and five parts middlings constituted their ration, and after that the same mixture was used without scalding.

Grit and sharp sand was placed in a vessel containing water, so that they could have access to it at any time. No water, except for drinking purposes, was supplied to them.

We weighed the entire flock when six weeks old, with the following result: The seven Pekins weighed thirty-nine pounds, being an average of five pounds and nine and one-seventh ounces each; and the nine Rouens weighed thirty-six pounds, or an average of four pounds each. When they were ten weeks old, we again weighed the entire flock and found that seven Perkins weighed fifty-nine and one-half pounds, or an average of eight and one-half pounds each, and the nine Rouens sixty-three pounds, or an average of seven pounds each.

Fertility and Production of Eggs.

Ten laying hens were selected and separated from the male. The eggs laid from day to day were placed in an incubator the date of laying having been marked on the shell. The eggs were tested, and the result was as follows:

Of eggs obtained during the first four days after the male was removed, 70 per cent. were fertile; on the fifth day, 61 per cent.; on the sixth day, 60 per cent.; on the seventh day, 49 per cent.; on the eighth day, 12 per cent.; on the ninth day, 2 per cent.; and on the tenth day all were unfertile.

A similar experiment was conducted to determine the time eggs become fertile after introducing the male. In this case, six laying hens that had not been with a male were selected, and a male was placed in the pen with them. The eggs were tested as before with the following result: The eggs layed on the first and second day after introducing the male were all infertile. The percentage of fertile eggs on the different days were as follows:

On the third day	30 per cent.	On the seventh day	70 per cent.
do fourth day	42 do	do eighth day	68 do
do fifth day	50 do	do ninth day	70 do
do sixth day	60 do	do tenth day	74 do

On the first of January we made up two pens, as follows: Pen No. 1, consisted of one male and ten females, five being pullets and five hens; pen No. 2, contained five pullets and five hens, of the same varities as pen No. 1, but without a male. On the first of September, after an experiment of eight months, we found that pen No. 1, which contained the male, had laid 959 eggs; and pen No. 2, 972, both pens having been fed the same quantity of the same kind of food. Their yards and pens were the same in every particular.

The wide flunctuation in the number of eggs produced, according to the season of the year, and the consequent tendency to a wide range in prices, from the time when eggs are plentiful in the spring and early summer to the period of light production in the winter, have led dealers to hold eggs from one season to another, and this business can be made profitable, if the quality of the eggs could be certainly preserved, But the egg is so delicate that even with the latest improved methods of refrigeration, the flavor becomes old from long holding. The risk incurred in storing for long holding is therefore very great, and with the possible exception of preserving in pickle, the losses are likely to be as frequent as the profits.

We think that eggs preserved in water-glass will command a better price than those preserved in other mixtures, from the fact that the quality of the egg is certainly better. Eggs put in lime solution, have more or less the flavor of the lime. They can be detected easily by the smell, and the composition of the shell is somewhat weakened by the lime; while the shell of eggs preserved in water-glass appears be somewhat strengthened.

The experiment in feeding ducks teaches us that by selecting the right varieties of ducks, and feeding them on the right kinds of food, you can get them on the market when six weeks old. We also find that water is not needed, except for drinking purposes, but is a hindrance to the growth and fattening of ducks.

We selected two of the best varieties of ducks for market purposes; and while they have the same standard weight, when fully matured, the experiment plainly shows that the Pekins can be made to take on flesh faster than the Rouens. We find on our markets ducks that are fully matured and six months old not weighing over four or five pounds; and we venture to say that such birds do not pay for the food they consume, let alone the trouble of caring for them. No ducks should be kept longer than ten weeks, as they can be placed on the market at that age and sold at a good profit.

Ducks that are intended for breeding purposes should not be fed on a fattening ration, so as to weaken them by to much forcing. They should be selected when about six or seven weeks old, when their sex can readily be seen and the most perfect specimen selected.

It has been generally conceded that eggs for hatching purposes can not be relied upon for at least ten or twelve days after the hens have been mated for breeding. In our test, we found some eggs fertilized on the the third day after mating, and they proved to be strong germs; but while we found this to be the case we would prefer to wait six or seven days, or more, as a great deal depends on the condition of both male and female at the time of mating; for instance, over-fat hens, or hens that have been laying a length of time, or a male bird out of condition. We also find that the male will not mate with certain individual hens for some time after being placed in the pen. So we say that it is advisable to wait a week or so before collecting eggs to be used or sold for hatching.

Our experiment to test whether the male increases or diminishes the egg production speaks for itself. It can be seen that there was but very little difference in the number of eggs laid by the two pens, both pens containing the same number of hens and the same varieties. I have always been and am still of the opinion that hens will lay as well but no better when separated from the male. Some claim that they will lay much better. I intend selecting two pens next year, say for three months in the spring and early summer, composed of pullets of the same breed and strain.

Cross Breeds.

We kept over from last season three pullets, Langshan and Indian Game crosses, to see if there was any benefit to be derived from this cross so far as egg production is concerned, but they did not prove to be so good layers aa the purebred Langshans; they are no better than the Indian Game. They have a beautiful plumage of a rich lustrous black, and in shape are like the Indian Game. If flesh producers are wanted, I consider this cross a good one, but not profitable if egg production is the chief aim in view.

We also selected four pullets from the Brown Leghorn and Barred Rock cross, and found them great egg producers, laying a fair-sized egg. We found, in comparing this cross with others tried last season, that they made a fine table fowl, maturing early and flesh of the finest quality; so by this cross we have both egg and flesh producers.

We tried also the Buff Cochin and Barred Rock this season with good results, so far as size and shape are concerned. The plumage resemble the Rock, while in shape they resemble both. I have reserved five pullets to test their egg producing qualities.

Respectfully submitted,

L. G. JARVIS,

Manager of Poultry.

Guelph, Dec. 31st, 1898

PART XIII.

REPORT OF THE APIARIST.

To the President of The Ontario Agricultural College :

SIR.—I have the honor of submitting herewith the report of the Apiarian depart ment for 1898. Our reports for 1897 and former years have frequently been referred to in the agricultural press of the United States, Europe and Canada.

Some of the experiments, particularly in wintering, have been carried on from year to year with the object of adding to their value and weight.

PURE AIR, VENTILATION AND ARTIFICIAL HEAT IN THE WINTERING OF BEES.

It is generally recognized that the length of life of a worker bee corresponds to the activity it displays. For instance, during the spring and summer, when daily engaged either in doing the work inside the hive, or gathering honey outside, the life time of the worker bee is only some six or eight weeks. In winter, under the best, that is, a semi-dormant and inactive condition, its life time is from six to eight months. When active, there is of course waste of muscular tissue which must be replaced by the consumption, digestion, and assimilation of the elements which go to constitute muscle ; to produce this, nitrogenous food is required, which is found in the pollen or bee bread, and of course vitality in the bee is required to change it into muscle. The less activity required in the honey bee, the less there is of waste of muscular tissue, and the less has to be replaced. Heat and energy in the bee are produced by the consumption, digestion and assimilation of honey. It is a carbohydrate ; but it has a large percentage of water, and this surplus moisture is thrown off by the bee. We may also take it for granted that the bee, like other animals, when breathing throws off or expels carbonic acid gas ; and hence it is important that the atmosphere so vitiated should pass away and be replaced by fresh air. If the temperature is as low as forty-five degrees, an individual bee cannot generate sufficient heat to keep from perishing.

In an ordinary cluster, however, where the heat of one bee is conserved by the heat of its neighbors, the condition is very different. There a cluster can withstand a freezing temperature, and the cluster expands and contracts according to the temperature—the higher the temperature, the more the cluster expands ; the lower the temperature, the more it contracts, or in other words, the lower the temperature, the less space between the bees which go to form the cluster.

From the difference in the life time of the worker-bee during the active summer and quiet winter, we could judge that the less activity, the longer the bee will live, and as the bees move every time the temperature falls and rises, it is desirable to keep the bees at an even temperature. Careful observation covering the last three years shows that when the bees are put into winter quarters, and the temperature is kept even, forty-two degrees preferred, and there is a constant change of air, the bees settle down and cluster quietly on the combs, thus assuming naturally the condition most favorable for securing the greatest economy in the vitality of the bee, and in heat, and incidentally in stores consisting of pollen and honey. This being the case, it is desirable as far as possible to surround the bees with the conditions best fitted to secure the above results

In my report of 1897, there was given the result of two years' experiments in cellar wintering. In that report was shown the great importance of furnishing the bees in the cellar with a constant supply of pure fresh air from some outside source, and also the importance of having the air at a certain temperature. It was found that very little attention had been paid to this matter by bee-keepers generally. The tests would indicate that bee-keepers have been too easily satisfied with results in wintering. To bring a colony through alive is one thing; to bring them through not only alive but with the least percentage of deaths, and the least loss of vitality, is quite another matter. A colony may be alive and yet with so much vitality lost that it will yield no profit, when another wintered under proper conditions will yield a handsome return.

With cattle and other stock, some men give every care necessary to bring their cattle through the winter in the best condition for yielding a good return at the pail or the shambles; there is another class which we believe to be diminishing in numbers, who bring their cattle through alive even if towards spring they occasionally require to help them on their legs. Bees and cattle alike may be alive; but in one case, they are in spring in proper condition to yield a profit; in the other, they take a large part of the summer to return to the condition of the previous autumn. With the bees, the colony is building up during the time they should be strong enough to take advantage of the honey flow.

A careful test was made covering three years, and four distinct experiments, taking in all, observations with 782 colonies. From early winter until they were placed on their summer stands, the bees showed by signs unmistakeable to a careful and experienced bee-keeper, that their action varied very much under different conditions. They suffered from lack of ventilation and from variations of temperature. When the fire was started and the temperature raised suddenly from thirty-eight and thirty-nine degrees to forty-three degrees, and in one case forty-five degrees, the bees made quite a roaring or loud humming sound which ceased shortly after the cellar had regained the regular heat. At the home apiary, a compartment was constructed, (See fig. I.), and in it a stove was

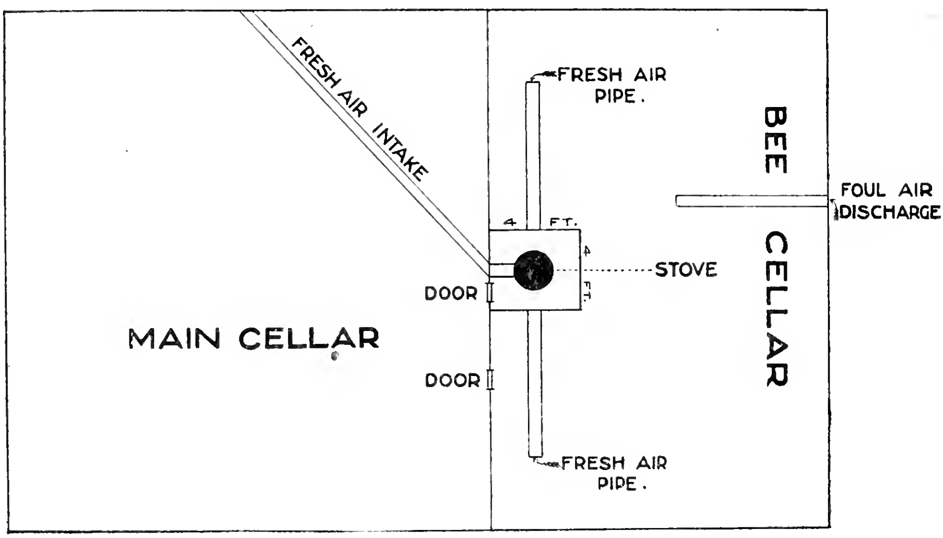


Fig. 1.

placed. In the stove we kept up a continual fire, the object being to heat fresh air brought from outside, through the pipe discharging under the stove. In the fall of 1897 the fresh air intake pipe was enlarged to fourteen inches in diameter to secure the above results; and to prevent the cellar from getting too warm the stovepipe which before had passed through the cellar was passed directly upward through the ceiling of the stove compartment. The plan of the cellar was as seen in Fig. 1.

The stove is in the centre of the compartment; the warm air shafts are 2 ft. 6 in. from the ground. The foul air pipe runs within three inches of the cellar floor, taking the foul air from the cellar bottom, or a damper may be opened to take the air fifteen inches from the ceiling. The air pipe runs to the roof of the house and about the same height as the chimney. The temperature was regulated by means of the stove; fresh air could be supplied more abundantly, and yet at not too low a temperature, by means of the same, and lastly, the heat from the stove supplied a cheap means of moving or changing the atmosphere in the cellar. Comparing non-artificial heat and steady ventilation with the old, and at present ordinary method, we find the following:

WITH THE OLD. During cold weather the ventilation is likely to be ample, as the cold air outside presses into the warmer, and the force, leaving out of the question for the moment the effect of the wind, increases in proportion to the difference of temperature between the outside and inside. A common and conspicuous illustration of this is given when we open a door between the kitchen and the outside on a cold winter's day. Then the wind plays an important part in the question; the stronger the wind striking exposed portions of the cellar, the greater the ventilation. But when the outside temperature rises and approaches that of the cellar, the ventilation is imperfect, there being the absence of special outside pressure. And the nearer to spring, when the bees are more easily aroused by unfavorable conditions, the more likely it is that these unfavorable conditions will prevail. Of course, if strong winds prevail they will tend to force fresh air into the cellar, but that cannot be depended upon.

Another very great disadvantage in depending for ventilation upon defective plastering, crevices about the windows, etc., is that such ventilation cannot be controlled and the temperature of the air cannot be regulated. It is likely to be too great when it is cold, and insufficient when warm. A few have ventilation by means of windows and pipes, but here there is the objection that it is irregular, and there is no way of regulating temperature.

The variations of temperature disturb the bees. As before stated, when the temperature rises the cluster expands, when it falls, the cluster contracts. This compels the bees to activity, waste of muscular tissue, and loss of vitality. Again, when the air is not changed, the bees charge the atmosphere with moisture and carbonic acid gas. This causes the bees to become restless and active, and again there is loss of vitality. By their activity the bees change the air, still more intensifying the trouble. Not alone do the bees suffer directly from the foul air, but the moisture in the atmosphere is in part absorbed by the honey in the comb: it becomes thin in the hives and the bees consume it to their injury.

Discomfort to the bee from improper food lessens its vitality in a twofold way; this discomfort arouses activity, and inferior food curtails the digestibility and assimilation of food by the bee. We have made frequent tests of honey in the comb which has been exposed to the temperature of the bee cellar, about forty-three degress, and in a cellar poorly ventilated containing bees, and the honey becomes thin. Uncapped stores still more rapidly deteriorate. We have also found that with colonies not sufficiently strong to cover their combs, the stores in the uncovered combs turn sour and ferment more rapidly. We are also justified in coming to the conclusion that the bees clustering in the stores raise the temperature of the stores: and we know that moisture has a tendency to condense on the cold surfaces. This is also obviated. Prolonged activity without flight appears to be an unnatural condition in the bees; just what effect unfavorable conditions have upon the relative consumption of pollen and honey we have been unable to find out: but tests made in the apiary show that strong colonies, well wintered, where they have plenty of stores in the hives, have lost from time of selling in November 21st, to the time of taking out, March 23rd, as little as four and a quarter pounds. I have frequently noticed what appeared to be dry excrement on the bottom board of the hive; and examination under the microscope showed it to consist of pollen grains. How this dry excrement, or perhaps a more proper term, refuse, is obtained I have not been able as yet to determine; different theories may be advanced. It may be separated by the bee, as she with her proboscis takes up the honey; this, however, is not likely if she does not make the separation when the liquid is in the form of nectar taken from the flowers. I cannot readily understand how she could do so, when the liquid has been evaporated to the consistency of honey. The other and more probable source of the granules is that they have been voided as dry excrement from the bowels. If so, we have yet to understand how the bee can at one time consume pollen, digest and assimilate it, and at another time pass it undigested through its ailmentary canal, or digestive system. This, however, we do know, viz., that activity under continuous confinement is very disastrous to the hives ; frequent inspection of colonies in the experimental apiary proves that. There appears to be a provision in nature by means of which activity on the part of the bees, and in consequence wearing out on their part, causes consumption of stores ; this, at the same time, results in the more liberal feeding of the Queen, egg production, and brood rearing. As activity begins, it sets in motion certain laws which result in an effort to replace the exhausting vitality by young bees. It has also been noticed that young bees after they emerge from the cells in which they are cradled, require a cleansing flight, discharging considerable excrement. I have examined for several years in connection with the experimental work, colonies when taken out of winter quarters ; and I have yet to see a colony not showing symtoms of activity, with dysentery, and having brood. I am perfectly well aware that the great majority of bee-keepers state that the bees will, under healthful conditions, brood while in winter quarters, and that it is natural for them, particularly so towards spring. I was inclined to that theory myself ; but the investigations carried on for the last three years show that the bees brood in repositories only after, by thoroughly unfavorable conditions, they have become active. During these three years, without exception, every colony showing signs of good wintering had no brood in the combs ; and those in the opposite condition for the same time had brood. The longer the bees are active and rear brood when unable to fly, the more rapidly they lose vitality. Brood-rearing in repositories is opposed to good beekeeping.

WITH THE NEW. In our experiments we have found that with the artificial heat and specific and definite means of ventilation, we have the following advantages :

Pure air at an even temperature, the moisture in the atmosphere constantly carried off, and the air kept drier. As the temperature of air rises, its power to hold moisture in suspension increases, or, in common language, its drying powers increase ; and we have by this method yet to find any moisture condense about the hive, bees, or walls of the cellars. Again, no sign of mold has ever been found about the combs ; and everything about the hives has had a healthy appearance. The cellaring conditions by these means are, as far as I can see, with one exception perfect. When the outside temperature rises to the 40 or 43 degrees, and is then much the same as the cellar, it cannot be heated when passing through the stove compartment ; there is then the tendency to stagnation of air. This should be overcome by means of an air pump drawing out the foul air, and by the same action filling the vacuum formed with fresh air. A good deal of expensive experimenting would require to be done to design and construct, and apply the pump and power for such. It appears to me clock work would be the most easily applied. The trouble with a wind mill would be that, with the least wind there would be the greatest necessity for the working of the pump. The more quiet the bees, the more stores they consume ; and the direct gain in this way with fifty colonies of bees will in five years, more than pay for any expense in connection with the necessary changes in the cellar, the cost of the stove, and the coal. We use a self-feeder coal stove ; it takes the cold air from the floor, and can be kept low without the danger of going out. During the winter we used 3,340 pounds of chestnut coal ; and the stove was used eleven days previous to putting the bees into the cellar, the object being to dry out the cellar thoroughly before placing the bees into winter quarters.

To return to the old system of cellar wintering of bees, without artificial heat, and abandon the system as above described, would mean a heavy loss.

Without a special stove and compartment with ventilating pipes, we have found that the best way to secure regular ventilation is to have a pipe three inches or more in diameter, one end of the pipe connecting with a chimney in which is entered at some point a stovepipe communicating with a fire ; the other end of the ventilating pipe reached within three or four inches of the cellar floor. Such a ventilator would draw off much of the foul air as it collects in the cellar.

The following is a table of the weights of 53 colonies of bees wintered in the cellar. The weights were taken November 18th, and again April 3rd following. It, therefore, embraces more than the actual consumption of stores while in winter quarters. The average consumption of stores was twelve pounds per colony during that time.

Fall Weight. lbs.	Spring Weight. lbs.	Loss. lbs.	Fall Weight. lbs.	Spring Weight. lbs.	Loss. lbs.
45	30½	14½	43	29½	13½
47	37½	9½	45	36	9
46	28	18	43	33	10
44	35	9	44	30½	13½
40	26	14	42	32	10
46	33	13	56	31	25
49	36	13	47	30½	12½
48	31	17	46	34	12
44	31	13	40	29	11
40	25	15	42	34	8
40	30	10	4[illegible]	31	11
41	31	10	45	35	10
53	42	11	45	33	12
47	36	11	46	30	16
42	34	8½	41	30	11
40	26	14	41	25	16
43	31	12	51	36	15
48	36	12	40	31	9
43	30	13	41	30	11
50	44	6	44	36½	7½
42	25	14	43	30	13
47	30	17	46	31	15
46	33	13	43	29	14
42	32½	9½	43	33	10
43	32	11	54	40	14
43	33	10	54	42	12
45	36	9	43	31	11
42	30	12	50	36	14
54	42	12	40	30	10

Outside Wintering.

A four year's test in the outside wintering of a hive of bees having the brood chamber in two parts, the first set of frames, ten in number, measuring $14\frac{3}{4}$ x $8\frac{1}{2}$ inches, and the upper ten $14\frac{3}{4}$ x $4\frac{1}{2}$ inches, has been followed by another year's test. As before, the only protection offered was plenty of old woollen clothing in a super above the frames. The

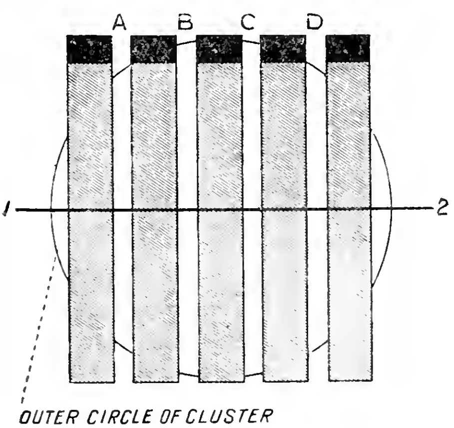


Fig. 2. Non-Divisible Brood Chamber.

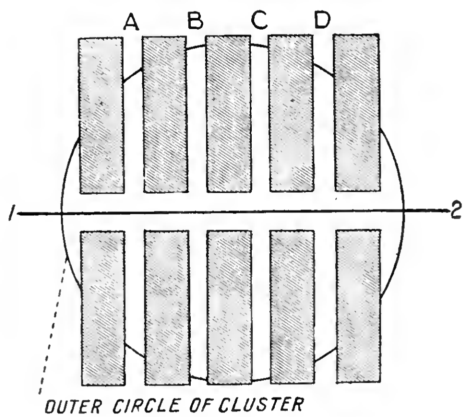


Fig. 3. Divisible Brood Chamber.

bees, as before, came through in splendid condition. This has now been carried on for five years in succession, and without any exception they have come through in first-class shape. Thinking that the success was in part due to the ready means of communication which the odd-sized hive had through the lines 1-2 (see figure 3), we selected six Hedden hives, which have a divisible brood chamber, and in which the depth of each frame is $5\frac{1}{4}$ inches. Here, again the bees had a ready means of communication by the opening through which the lines 1-2 run. The colonies were wintered on their summer stands, without any bottom or side packing, and only a little at the top. The result was decidedly unsatisfactory; no colony was in first-class condition in the spring. There were live bees in each hive; but when compared with other colonies, they were very weak. They took all the summer to build up; and if all the colonies in the apiary had been of the same strength, there would have been no honey crop this season. They consumed $10\frac{3}{4}$ pounds more than those wintered inside. After carefully weighing the results of our experiments in the above direction during the last five years, we came to the following conclusions:

Foreseeing the danger of encouraging outside wintering without plenty of protection, I dislike to make the statement that they can be so wintered at all; yet when the cluster can expand and contract through central passages, as per figure 2; when they have plenty of protection in the form of woollen or some other absorbent; and have plenty of stores, they can, at Brantford, or in as mild a climate as it is at Brantford, be wintered successfully outdoors without side and bottom protection. The passage alone, without ample top protection of woollen or some equally good absorbent, was a failure; the bees consumed more stores, and in the spring they were not worth the room they occupied in the hive.

Outside Wintering with Protection.

With the object of benefiting those who have not good cellars for wintering bees, and who cannot take advantage of the experiments conducted in cellar wintering, we decided to test what appeared to us to be the best method of outside wintering. The method adopted was as follows:

Outer cases were constructed of $\frac{3}{8}$ inch stuff and painted a dark color, to contain four colonies, two to stand side by side and the pairs back to back as in Fig. 4, with room for two inches of packing between the hives and the outer case sides, and one inch between the hive sides and backs. At the bottom, provision was made for half an inch of packing at the front, and a little over an inch at the back, thus giving the hive, when packed, a slightly forward pitch.

The entrances run the full width of the hive, $12\frac{1}{2}$ inches. To prevent the front from completely closing the entrance, the plan indicated in Fig. 5 was adopted.

On the alighting board was placed a bridge six inches long, (Fig. 5,) the width of the alighting board; under the board and at the end underneath was nailed a piece $\frac{7}{8}$ inch square, and the length of the board width. When this bridge is placed on the alighting board and the hive packed, it offers underneath a passage for the bees to go in and out on the alighting board, and underneath the packing alone. Another important point, is a piece of pasteboard (A, Fig. 5) six inches wide, an inch and a little more in depth in the centre of the lower edge; a passage one-half inch square is cut in the pasteboard. The pasteboard is put between the front of the hive and the bridge. When packing, the pasteboard is kept just above the entrance to the hive; this leaves the board projecting $\frac{3}{8}$ inch below the bridge. I am explaining this minutely because the $\frac{3}{8}$ inch projection is a matter of great importance. The bees should be packed by October 1st., and yet it is not advisable at that time to contract the entrance to $\frac{1}{2}$ inch wide; for this reason the cardboard is kept above the entrance. It is allowed to project $\frac{3}{8}$ inch below the bottom of the bridge board to allow the bee-keeper, when settled cold weather comes, to pass a long bladed knife or sharp tool, in at the entrance of the outer case, and with this draw the cardboard down to the bottom board, thus leaving the entrance to the hive only $\frac{1}{2}$ inch wide and deep. This was done Saturday, November 27th. The covers were removed from the hives; where quilts were used, they were loosened, and a block put under the rear corner (See Fig. 5, C), leaving an opening for the air to pass upward from the hive. In about half the number of colonies, honey boards $\frac{3}{8}$ inch thick were used instead of quilts; they were loosened and a $\frac{3}{8}$ inch block put under one corner. This too allows the air to pass upward through the hive. Dry leaves are now packed loosely about the hives, and ten to twelve inches on top, the last five or six inches of top packing being put in on Nov. 27th. In four cases planed shavings were used. While these answered well, I would give the preference to the leaves. At the same time, a board ten inches wide was placed in a slanting position against the outer case, protecting the entrance in the wintering case.

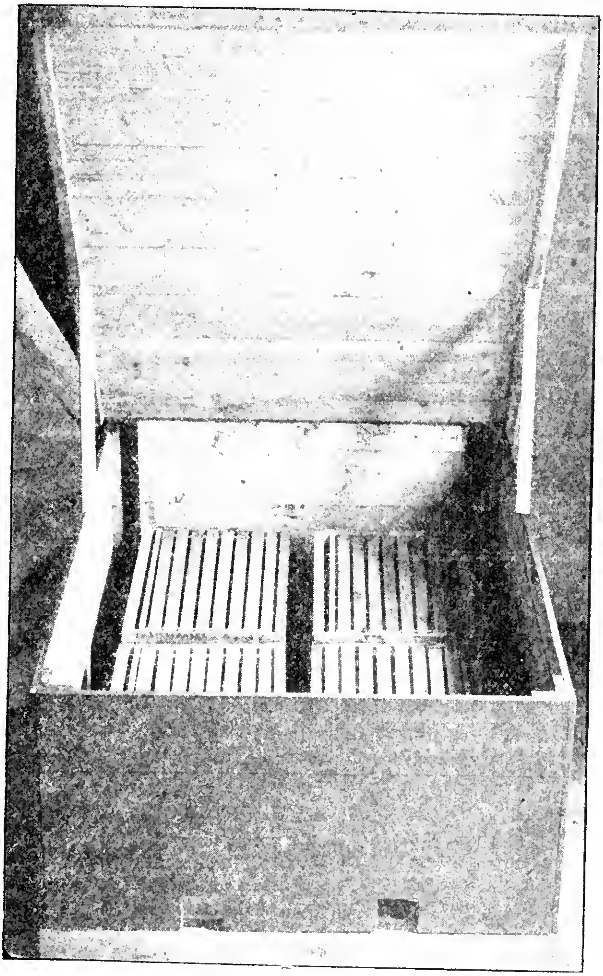


Fig. 4. Outer case containing four hives.

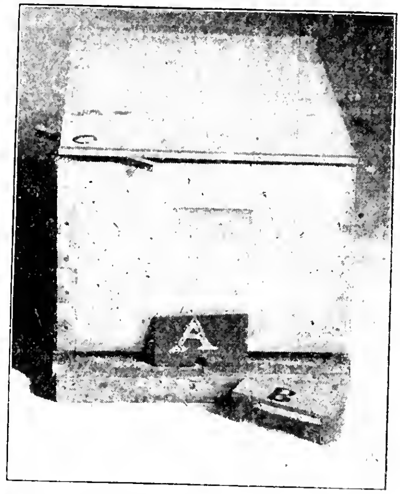


Fig. 5. Hive, showing—A, card with entrance—B, bridge which goes in front of card and on alighting board—C, block under honey board leaving space for upward ventilation.

The object in having the small entrance is to prevent rapid changes of air in the hive, and in the same way prevent loss of heat generated by the bees. It also keeps the air at the bottom of the hive warm enough to enable the bees to go down and keep the entrance clean. The board leaning against the outer case was placed there to prevent snow from falling against the entrance—also to keep the bees quiet by excluding light, and, to a certain extent, wind.

The opening between the honey board or quilt and the hive allows the air to pass gradually up and through the loose leaves taking all moisture with it. With the small entrance I consider this exceedingly important. The forest leaves are packed somewhat loosely, but not so tightly as they could be packed, to give the sun a better chance to penetrate in the spring. The light material for outer cases was used for economy, and also to allow the sun to penetrate more readily. The dark color with which the cases were painted was used with the same object in view.

RESULTS. During the entire winter not an entrance was clogged by dead bees. The bees appeared to be able to leave the cluster and come down to clear away dead bees, as they could not with the larger entrances, which would make the air at the bottom of the hive too cold. Again, no moisture was found about the interior of any of the hives.

With the exception of five colonies out of sixty-five, wintered nine miles from here in which four were disturbed by thieves, combs of honey being removed, and another being queenless, every colonly came through in first-class shape. What astonished me greatly was, that when the bees wintered in the cellar were put upon their summer stands, March 21st, forty of the colonies wintered outside were examined and no brood found in the combs. They had evidently wintered so perfectly in their summer stands that there had been but very little activity and loss of vitality. I must confess that this was a revelation to me. The outer cases were removed just before the supers had to be placed on the hives. The bees were then in splendid condition for the honey flow, and I consider, as far as I am justified in speaking from the result of one year's experiece, that this method of wintering was eminently satisfactory.

The question may be asked : Could not the entrance be enlarged or the top ventilation be done away with ? In reply to this I would say, the details as above described, require to be connected to secure a definite result. To leave out any portion is to abandon the system. Many have already asked if sawdust or chaff will not answer equally well. Sawdust packs too closely ; chaff attracts mice, and is more likely to mould.

A SWARM CATCHER.

There has been a long-felt demand for some device by means of which the bee-keeper could secure swarms without climbing trees, or following them into all kinds of awkward places, to say nothing about an occasional chase over neighbors' farms, and sometimes their total loss. The device shown in Fig. 6 is a swarm catcher. It is made of light material, a hopper-shaped frame, the width of the entrance of the hive, with $\frac{1}{4}$ inch

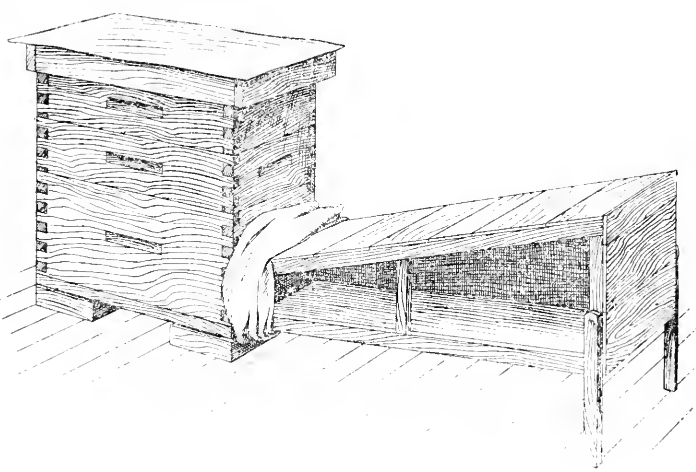


Fig. 6. A Swarm Catcher.

boards at the bottom, top, and end. The sides are enclosed with ordinary wire cloth, the same as used in window screens The mouth of the swarm catcher next the hive has a strip of cotton taked to the lower edge of the hopper, twelve inches wide, and projecting two feet at either end of the swarm catcher. This cotton serves the purpose of closing any further opening between the entrance of the mouth of the hive and the swarm catcher. At the wide end of the hopper and at the lower end of it are legs, attached by a screw, so that by swinging them backward or forward they can be shortened or lengthened and adjusted to uneven ground. In an apiary of a little over 100 colonies, we had eight of these swarm catchers standing at convenient distances.

How Applied. As soon as the swarm begins issuing, the swarm catcher is adjusted to the entrance and the bees pour into it, attempting to get out through the wire screens. In about five minutes, or ten at the outside, the swarm is in the swarm catcher, when the entrance of the catcher can be cleared up with the attached piece of cotton. We have found that the most convenient way to do this is to fold the cotton over it, and then tie a string about the mouth. I mention this because it is absolutely necessary to leave no opening through which the bees can pass from the catcher. In one catcher we made an opening $\frac{3}{8}$ inch round and through this one bee at a time passed until the entire swarm was in the air.

Method of Handling the Self Hiver. At first we dumped the new swarm at the entrance of the new hive at once, but this did not answer. The bees had the impulse to fly and, instead of entering the new hive, they took wing just as they would do if they were leaving the hive in the first place. If our experiment had stopped with this, we would have pronounced the self-hiver a failure. Another plan, however, suggested itself, and this was a complete success. The self hiver, mouth down, was set on end, the bees were kept in it until they clustered as they do in nature, and after this, when dumped at the entrance of the hive, they readily entered it.

Carniolan Bees.

In last year's experiment with Carniolan Bees, we found, briefly, that bee hives on starters swarmed excessively, and built their comb very irregularly; but those hived on full sheets of foundation did not show any greater tendency to swarm than other varieties. The bees were gentle, and built up well in the spring.

During the season of 1898, the Carniolan Bees were the first to swarm, and with one exception the last. Even on full sheets of foundation, they showed a greater disposition to swarm. With that exception, they showed all the characteristics given above.

In addition, they took longer to cluster when swarming, and showed a marked tendency to swarm out. I remember particularly that one Sunday we had twice hived the same Carniolan swarm. The last time about 4 o'clock p. m., I said we would let it go. It was bad enough to be troubled on a week day, but Sunday it was beyond endurance. However, at 6.30 p. m., the swarm was still clustered in the tree it selected the first time, and we hived it.

A good trait we found was, that the Carniolans gave us the whitest and prettiest capped comb honey.

Conclusions. With the exception of a tardiness in clustering, which is of no great importance, and a tendency to much swarming, which is a serious defect, and particularly so for those of limited experience, they are the best bees we ever had. We would still advise caution in their introduction.

Comb Foundation.

Last year some tests were made in connection with the production of comb honey. The sections were filled to a greater or less extent with foundation running from a starter to a full sheet. Last season the advantage was greatly in favor of a full sheet. This year the experiment was repeated, and a few sections were added without any foundation at all. The flow this year, although prolonged, was slower. We actually succeeded in filling in the super sections which contained full sheets of foundation, when the sections without foundation had not a particle of comb or honey in them; and the partially filled sections did not have so good an appearance, nor were they so well filled as the first mentioned. Had separators, which are indispensable in securing the best results, not been used, it is likely that the bees would have filled the sections more evenly.

Different weights of foundation, running from six square feet to fifteen square feet per pound, sections with natural comb from last season, and the deep cell foundation were also tested in the same super.

The deep cell is a new foundation. We purchased ten pounds of this at $1 25 per lb., duty twenty per cent. to be added, bringing it to $1.50 per lb. The deep cell foundation has a very thin base and side wall; the latter, unlike ordinary comb foundation, has a side wall one-quarter inch deep.

Results.—The bees worked on the natural drawn comb first, and the deep cell foundation next; there were the least number of pop holes in it. Probably owing to the deep side wall the bees capped the sections with the natural comb first, and the deep side wall next. The honey had no marked fishbone or heavy base. The heaviest brood came first in order of acceptability to the bees, and so on in weight, the lightest being the last accepted by the bees. The same as in pop holes—the lightest had the greatest number. When it came to figuring cost, the lightest section was the least costly.

The heaviest foundation had the most fishbone. In fact, that built on the six and eight feet foundation sold to the public would be likely to injure the comb honey market. The section foundation, twelve square feet to the pound, aside from the cell, was, all round, the most satisfactory.

Regardless of price the deep cell foundation was the most satisfactory. At the same time, although the order was placed the previous fall, it did not arrive until near the close of the honey season, and we could not give it the thorough test we should have liked. I am inclined to think that aside from the way in which the bees filled the deep cell foundation, it tends to draw the bees into the supers. When given the bees, they entered first the sections with the deep cell foundation; and this foundation may prove valuable as well in drawing bees into the supers. If this should be the case, it would prove, at a reasonable price, very advantageous.

Foul Brood (Bacillus Alvei.)

During the season of 1898 no foul brood has appeared in the combs built on foundation made from beeswax injected with the germs of foul brood. Mr. F. C. Harrison, B.S.A., College Bactereologist, has made a very extensive study of the question, and his investigations have shown conclusively that some of the theories of bee-keepers are not correct.

Moving Bees for Fall Pasture.

During the years 1895, 1896, and 1987, we moved bees after the clover and linden flow to fall pasture, buckwheat being the particular blossom in view. Last year we had 155 colonies within range of buckwheat. For the past three years it has paid us to move the bees. This year we had 173 colonies within range of buckwheat. They were at three different apiaries, and in two of the apiaries the results were satisfactory. The bees built up well, and had plenty of young bees for winter; they also put in ample winter stores for themselves, and gave a surplus in comb and extracted honey which more than paid for the labor expended. The third apiary did nothing at all; the bees when placed there did nothing at all, and although buckwheat was in full bloom, they were continuously on the verge of starvation. Four years of experience and observation, combined with previous experience, have put us in a much better position to judge as to the expediency of moving bees to any location for a honey flow, and while that experience applies to a greater or less extent to the flow from all blossoms, it is particularly applicable to buckwheat which is very susceptible to drouth. Buckwheat is mostly grown on sandy soil; the lighter the soil, the more readily it dries out, and then the honey flow fails. When the weather is dry, and this condition has been prolonged, pasture and crops generally feel the effects, and under such circumstances it is not advisable to move bees to the vicinity with the expectations of a return in honey.

The bees had better be held in readiness to move, and should copious showers come, with buckwheat still in blossom, and the time when frost may be expected still remote, they can be moved. The two apiaries referred to above gave good results, simply because there had been plenty of rain in the vicinity ; the third apiary, only nine miles distant, gave no return, because little or no rain had recently fallen in that locality.

Experience in Moving Bees.

Bees in July and early August that are able to use two and three comb honey supers with twenty four and twenty-eight sections each, must be strong. With one apiary of 100 colonies we took a very radical departure in preparation. Eighty colonies were prepared with a wire screen on top, and at the entrance a portico (See Fig. 7.) of the same width and height as the brood chambers in front of the eight frame dove-tailed hive, and two and a half inches deep. A frame was constructed of the above proportions, and the front covere-ed with wire cloth. This really forms a pocket into which the bees can crowd, when, through the excitement of moving on the wagon, they feel too crowded to remain in the hive. Twenty strong colonies were prepared the same as the eighty, with porticos at the entrance, but no ventilation at the top. Instead of a screen on top, a board giving no ventilation was nailed on the hive. We thought this number would be ample for the test, and we were a little afraid that the experiment might result in the destruction of the colonies so tested.

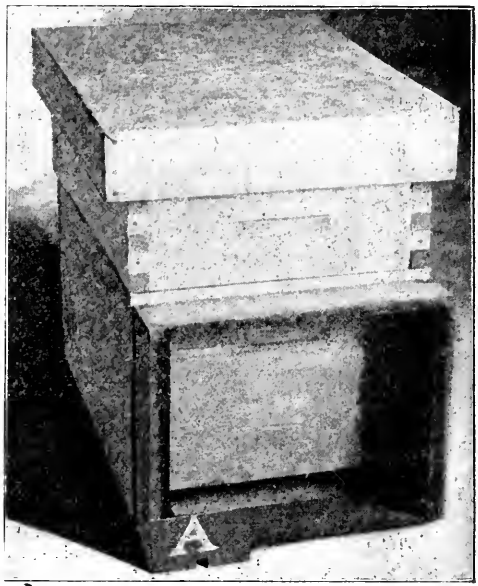
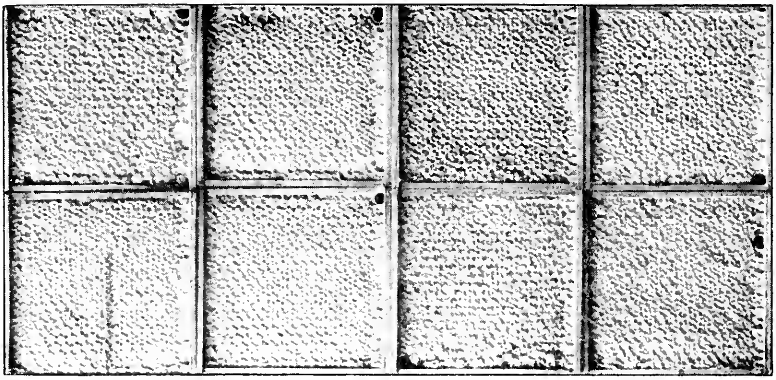


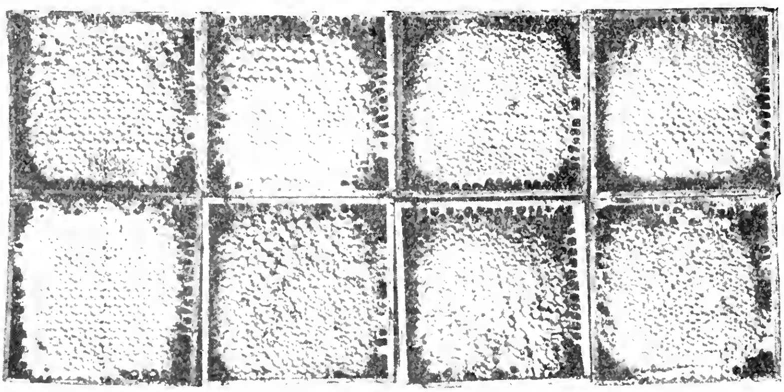
Fig. 7. Portico for moving bees.

The porticos were attached as soon as the bees ceased flying in the evening. They were loaded on three wagons engaged for the purpose. Owing to a baulky horse, a tire coming off the wagon, and other unforeseen difficulties, the bees did not reach their destination until 6 p.m. the following day. They were exposed to a bright and hot July sun during the day, yet, in spite of this, the bees came through in perfect condition. Those with the porticos only were in as good condition as those with the wire screen on top. The test was certainly severe, and we feel safe in saying that no one need hesitate in future to prepare bees for moving in this way.

Precautions.—We were careful to hammer very lightly in driving nails just before moving the bees. Two pieces of wood, of a wedge shape, formed a projection on each side of the portico, and when they were inserted into the hive entrance, the portico was kept in place by only two small wire nails. These we intend to do away with in future, and use a clamp on each side. When the hive is tapped the bees fill themselves with honey, and with the honey sack full they are more likely to be injured in moving. We find that bees suffer considerably unless the porticos are removed immediately after the hives have been moved and placed in their new stand.



Specimen of eight sections of comb honey taken at the Experimental Apiary and desirable for market.



Specimen of eight sections of comb honey which cannot be shipped to distant markets owing to their liability to break out.

Closing Remarks.

In closing, permit me to say that too many bee-keepers are at present adopting methods in wintering which will never allow them to produce a pound of honey for the least outlay. Strong colonies early in the spring, other things being equal, will give the bee-keeper a much larger honey crop, and the larger honey crop will, of course, decrease the cost of production, and enable the bee-keeper to secure a better net profit on his operations.

Respectfully submitted,

R. F. HOLTERMANN,
Apiarist.

Guelph, December 31st, 1898.

PART XIV.

REPORT OF THE PHYSICIAN.

To the President of the Ontario Agricultural College:

SIR:—Complying with your request in a recent communication received from you I now submit to you my report for the current year.

I have first to state that I have, as heretofore, carefully observed the by-laws of the College respecting the physician's duties.

The health of the College has been better this year than in any previous year during which I have been connected with the Institution. But although such has been the case there have been quite a large number of minor respiratory and digestive disorders, and a few minor accidents.

I deeply regret, however, to have to report a death in the College in the month of February last: A very estimable young man was taken ill with appendicitis. He was removed to the General Hospital in this city, where he underwent an operation for the disease, but failed to recover.

The present term opened with a large attendance, and so far there has been very little sickness. One case occurred, however, in which I was obliged to advise the patient to return home, where I hope he may improve in health.

The sanitary condition of the College is excellent.

Respectfully yours,

WM. O. STEWART,
College Physician.

Guelph, Ont., Dec. 31, 1898.

INDEX.

APPENDIX I.

GRADUATES, ASSOCIATES, AND COLLEGE ROLL.

1 GRADUATES.

Bachelors of the Science of Agriculture (Degree of B.S.A.), 89.

1896—Atkinson, J.
1898—Beam, E.
1893—Beckett, H. L.
1896—Bishop, W. R.
1893—Bell, L. G.
1890—Brodie, G. A.
1894—Brown, W. J.
1891—Buchanan, D.
1898—Butler, W. E.
1892—Carlyle, W. L.
1895—Christian, A. H.
1898—Clark, G. H.
1896—Clark, J. F.
1891—Cowan, J. H.
1888—Craig, J. A.
1898—Craig, R. D.
1893—Crealey, J. E.
1888—Creelman, G. C.
1898—Davies, A. N.
1893—Day, G. E.
1890—Dean, H. H.
1895—Doherty, M. W.
1893—Dyer, W. D.
1893—Eaton, L. W.
1898—Elliott, W. J.
1888—Fee, J. J.
1894—Ferguson, J. J.
1891—Field, H.
1897—Gamble, W. P.
1892—Gibson, D. Z.
1894—Graham, W. R.
1893—Harcourt, Robt.
1889—Harcourt, G.
1892—Harrison, F. C.
1891—Hewgill, E. A. (*ob.*)
1897—Hodgetts, P. W.
1891—Hutt, H. L.
1889—Hutton, J. R.
1892—Hutchinson, J. W.
1894—Kennedy, P. B.
1895—Kennedy, W. A.
1896—Kidd, D. F.
1895—King, A. A.
1896—Knight, J. W.
1889—Lehmann, A.
1891—Linfeld, F. B.
1898—Lucas, W. T.
1897—Macdonald, J. C.
1896—Maconachie, G. B.
1892—Marsh, G. F.
1898—McCalla, G. B.
1890—McCallum, W.
1894—McCallum, Wm.
1890—Monteith, S. N.
1889—Morgan, J. H. A.
1892—Morgan, R. N.
1892—Newcomen, W. F.
1897—Oastler, J. R.
1891—Palmer, W. J.
1897—Parker, F. A.
1888—Paterson, B. E.
1896—Paterson, T. F.
1889—Raynor, T.
1895—Robertson, G. A.
1897—Rogers, C. H.
1898—Ross, H. R.
1898—Ross, M. N.
1898—Ross, N. M.
1895—Rowe, G. F.
1890—Shantz, A.
1891—Sharman, H. B.
1893—Shaw, R. S.
1891—Sleightholm, J. A. B.
1894—Sleightholm, F. J.
1896—Smith, G. A.
1896—Smith, P. B.
1894—Spencer, J. B.
1893—Story, H.
1889—Soule, R. M. (*ob.*)
1893—Soule, A. M.
1898—Summerby, W. L.
1896—Thompson, W. J.
1895—White, E. F.
1891—Whitley, C. F.
1895—Wiancko, A. T.
1895—Widdifield, J. W.
1896—Wilson, N. F.
1897—Wilson, A. C.
1888—Zavitz, C. A.

2 ASSOCIATES

The total number of Associates up to the present time is 384, as follows:

1888—Austin, A. M.
1880—Anderson, J.
1880—Ash, W. E.
1893—*Atkinson, Jas.
1892—Aylesworth, D.
1881—Ballantyne, W. W.
1879—Bannard, E. L.
1888—Bayne, S. R. S.
1897—‡Beam, E.
1892—†Beckett, H. L.
1892—Bell, L. G.
1896—Bell, T. C.
1888—Birdsall, W. G.
1888—Bishop, W. R.
1896—Black, G. W.
1889—*Brodie, G. A.
1890—Brown, H. H.
1892—Brown, B. C.
1890—Buchanan, D.
1894—Buchanan, John.
1888—Budd, W.
1885—‡Butler, G. C.
1896—Bulter, W. E.
1884—Black, P. C.
1882—Blanchard, E. L.
1886—Broome, A. H.
1886—‡Brown, C. R.
1888—Brown, S. P.
1893—Brown, W. J.
1892—Burns, J. A. S.
1893—Burns, J. H.
1886—Calvert, S.
1890—Campbell, C. S.
1877—Campbell, J. A.
1880—Campbell, D. P. L.
1896—Campbell, W. G.
1892—Carlaw, W.
1891—Carlyle, W. L.
1884—*Carpenter, P. A. (*ob.*)
1888—Carpenter, W. S.
1892—Carpenter, F. C. S.
1894—Carrick, C. S.

* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.

ASSOCIATES.—*Continued.*

1895—Cass, L. H.
1895—Chadsey, G. E.
1896—Charlton, E. S.
1880—Chapman, R. K.
1882—Charlton, G. H.
1882—Chase, O.
1894—Christian, A. H.
1897—Clark, G. H.
1879—Clark, J.
1895—*Clark, J. F.
1879—Clinton, N. J.
1880—Clutton, A. H.
1886—Cobb, G.
1894—Cook, J. H.
1893—Cooper, W. W.
1893—Conn, Joseph.
1896—Cousins, R. J.
1890—Cowan, J. H.
1890—‡Cowan, R. E.
1887—Craig, J. A.
1897—*a*Craig, R. D.
1892—Crealey, J. E.
1887—Creelman, G. C.
1878—Crompton, E.
1896—Cunningham, J.
1897—Davis, A. N.
1878—Davis, C. J.
1880—Dawes, M. A.
1882—Dawson, J. J.
1892—*Day, G. E.
1888—†Dean, H. H.
1893—Dean, Fred.
1898—Deike, H. V.
1882—Dennis, J.
1889—Derbyshire, J. A.
1896—Devitt, I. I.
1881—Dickenson, C. S.
1894—Doherty, M. W.
1890—Dolsen, W. J.
1887—Donald, G. C.
1887—Donaldson, F. N.
1877—Douglas, J. D.
1894—Duffett, G. P.
1877—Dunlop, S.
1895—Dunn, E.
1892—Dyer, W. D.
1892—Eaton, L. W.
1895—Edelsten, E. J. M.
1896—Elliott, R.
1894—Elliott, Wm.
1897—Elliott, W. J.
1893—Elmes, W. A.
1888—Elton, C. W.
1888—Elton, R. F.
1882—Elworthy, R. H.
1887—Ewing, W.
1890—Fairbairn, O. G.
1897—Fairweather, F. H.
1878—Farlinger, W. K.
1886—Fee, J. J.
1893—†Ferguson, J. J.
1890—Field, H.
188[illegible]—File, J.
1882—Fotheringham, J.
1883—‡Fotheringham, W.
1879—Fyfe, A.
1896—Gadd, T. T.
1896—Gamble, W.
1883—Garland, C. S.
1889—Gelling, J. A
1892—Gies, N.
1891—*Gibson, D. Z.
1887—Gilbert, W. J. (*ob.*)
1879—Gillespie, G. H.
1892—Graham, W. R.
1878—Graham, D.
1879—Greig, G. H.
1881—Grindlay, A. W.
1898—Grisdale, J. H.
1896—Guy, J. T.
1890—Hadwen, G. H.
1891—Haight, W. L.
18[illegible]2—Hallesy, F.
1893—Hamilton, C. A. W.
1898—Hammell, W. H.
1892—Harcourt, R.
1888—*Harcourt, G.
1890—†Harcourt, J.
1887—Harkness, A. D.
1898—Harris, C. H.
1891—Harrison, F. C.
1888—Harrison, R. E.
1887—Hart, J. A.
1887—Hart, J. W.
1892—Harvey, W. H.
1898—Hawke, A. H.
1888—Heacock, F. W.
1897—Heartz, W. B. G.
1894—Henderson, R. H.
1890—Hewgill, E. A. (*ob.*)
1896—*Higginson, G. O.
1894—High, A. M.
1895—†Hodgetts, P. W.
1890—Holliday, W. B.
1893—Hollis, J.
1886—Holtby, R. M.
1880—Holtermann, R. F.
1892—Honsberger, J. D.
1898—Hopkins, A. G.
1882—Horne, W. H.
1888—Horrocks, T. J.
1887—Howes, J. S.
1882—Howitt, W.
1898—†Hume, H. H.
1892—Hurley, T. J.
1893—Husband, E. M.
1890—*Hutt, H. L.
1898—Hutt, W. N.
1896—Hutton, H.
1888—Hutton, J. R.
1886—Idington, P. S.
1898—Jarvis, C.
1898—Jarvis, T.
1886—Jeffrey, J. S.
1883—Jeffs, H. B.
1879—Jopling, W.
1896—Kennedy, A.
1894—‡Kennedy, W. A.
1893—Kennedy, P. B.
1898—‡Kennedy, W. J.
1894—Kidd, D. F.
1894—King, A. A.
1895—Kipp, A.
1895—Knight, J. W.
1888—Knowlton, S. M.
1894—Laily, F. T.
1894—Laird, J. G.
1882—Lansborough, J.
1895—†Lang, L. W.
1887—Leavens, D. H.
1896—Leavitt, A. S.
1893—Lehmann, R. A.
1884—‡Lehman, A.
1887—§Lick, E.
1877—Lindsay, A. J.
1889—†Linfield, F. B.
1887—Livesey, E. M.
1898—Livingstone, J. M.
1897—Lloyd-Jones, T.
1880—Lomas, J. W.
1878—Logan, T.
1896—Loghrin, S. M.
1897—Lucas, W. T.
1880—Macaulay, H.
1896—McDonald, J. C.
1890—Mcfarland, T. W. R.
1886—Macpherson, A.
1886—*Madge, R. W.
1882—Mahoney, E. C.
1882—Major, C. H.
1898—Mallory, F. R.
1889—Marsack, F.
1889—Marsack, H. A.
1891—Marsh, G. F.
1898—Marshall, F. R.
1877—Mason, T. H.
1890—McKergow, J. G.
1877—Myer, G. W.
1897—Mooney, J. A.
1897—Morgan, G. W.
1887—Morgan, J. H. A.
1881—Motherwell, W. R.
1885—†Muir, J. B.
1893—Murdoch, G. H.
1897—*McCalla, G. B.
1895—McCallan, E. A.
1887—McCallum, E. G.
1893—‡McCallum, W.
1895—McCallum, W.
1895—McConachie, G. R. B.

a First in competitions for medals, but ruled out by special regulations.
* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.
§ Winner of the Governor-General's Medal—the only medal given that year.

ASSOCIATES—*Continued.*

1893—McCrimmon, W. D.
1895—McCullough, H. A.
1889—McEvoy, T. A.
1895—McGillivray, J. W.
1885—McIntyre, D. N.
1885—McKay, J. B.
1886—McKay, J. G.
1893—McKenzie, W. G.
1891—McKenzie, A. G.
1897—McKinley, W. W.
1889—McLaren, P. S.
1893—McMordie, R.
1897—McMillan, M. J.
1893—McNaughton, K.
1895—McPhail, J. D.
1883—McPherson, D.
1890—Monk, W. O.
1889—Monteith, S. N.
1891—‡Morgan, R. N.
1890—Mulholland, F.
1878—Nasmith, D. M.
1891—Newcomen, W. F.
1879—Nichol, A. (*ob.*)
1882—Nicol, G.
1882—Notman, C. R.
1896—‡Oastler, J. R.
1877—O'Beirne, A. C.
1887—Orsman, C. P.
1886—Owen, W. H.
1888—Palmer, W. J.
1896—Parker, F. A.
1887—Paterson, B. E.
1895—‡Paterson, T. F.
1895—Payne, G. Y.
1883—Perry, D. E.
1891—Perry, E. C.
1893—Phin, A. E.
1881—§Phin, R. J.
1881—Phin, W. E.
1881—Pope, H.
1886—Power, R. M.
1884—Powys, P. C.
1898—Price, W. J.
1882—‡Ramsay, R. A.
1879—Randall, J. R.
1885—Raynor, T.
1898—Raynor, M.
1897—‡Reade, J. M.
1885—Reid, P.
1894—Reinke, C. E.
1889—Randall, W.
1889—Rennie, E. A.
1897—Richardson, E. L.
1883—*Robertson, W.
1879—Robertson, J.
1894—†Robertson, G. A.
1898—Robertson, M.
1897—Robertson, T. H.
1881—Robins, W. P.
1879—Robinson, C. B.
1896—Rogers, C. H.
1893—Roper-Curzon, A. C. H.
1892—Roper-Curzon, S.
1898—Ross, D. A.
1881—Ross, J. G.
1897—†Ross, H. R.
1897—Ross, M. N.
1897—Ross, N. M.
1894—Rowe, G. F.
1892—Ruthven, W. A.
1884—Saxton, E. A.
1898—Scott, N. C.
1888—Serson, W. E.
1892—*Shaw, R. S.
1888—Sinclair, J. J.
1882—Silverthorne, N.
1894—Simpson, A. E.
1892—‡Soule, A. M.
1882—‡Soule, R. M. (*ob.*)
1896—Stoddart, R. L.
1877—Sykes, W. J.
1883—Schwartz, J. A.
1887—†Scrugham, J. G.
1888—Swantz, A.
1887—Sharman, H. B.
1887—Shaw, G. H.
1882—†Shuttleworth, A. E.
1892—Silverthorn, C.
1884—†Slater, H. (*ob.*)
1887—*Sleightholm, F. J.
1890—Sleightholm, J. A. B.
1885—Smith, E. P.
1895—Smith, G. A.
1895—Smith, P. B.
1894—Smyth, F. L.
1898—Snider, C. H.
1892—‡Soule, A. M.
1891—Sparrow, J. C. H.
1893—Spencer, J. B.
1891—Spencer, W. A.
1897—Squirrell, W. J.
1884—Steers, O.
1888—Stephenson, C. R.
1893—Stewart, J.
1878—Stewart, W.
1892—Story, H.
1882—Stover, W. J.
1886—†Sturge, E.
1897—*b*Summerby, W. L.
1888—Sweet, R. H.
1898—Taylor, G. R.
1895—Taylor, W. H.
1891—Thompson, R. A.
1885—Thompson, W. D.
1895—Thompson, W. J.
1898—Thomson, G. T.
1889—‡Timey, T. H.
1892—Tolton, J. E.
1879—Toole, L.
1883—Torrance, W. J.
1884—Tucker, H. V.
1895—Tye, C. W.
1888—Valance, R. (*ob.*)
1894—Vipond, J. M.
1898—Wagg, A. J.
1879—Warnica, A. W.
1884—Wark, A. E.
1878—Warren, J. B.
1890—Webster, F. E.
1880—§Webster, J. L.
1879—Wells, C.
1890—Wells, E.
1897—West, A. W.
1898—Westgate, H. P.
1882—*Wettlaufer, F.
1894—*Wheatley, Jno.
1895—Whetter, J. R.
1891—White, E. F.
1882—White, C. D.
1879—White, G. P.
1890—Whitley, C. F.
1892—Wiancko, A. T.
1894—Widdifield, J. W.
1891—†Wilkin, F. A.
1879—Wilkinson, J. P.
1888—Willans, T. B.
1888—Willans, N.
1879—Willis, J.
1883—†Willis, W. B. (*ob.*)
1888—Willmott, A. B.
1895—Wilson, A. C.
1896—Wilson, A. F.
1890—Wilson, F. G.
1894—Wilson, E. E.
1898—Wilson, E. S.
1895—Wilson, N. F.
1897—Winchester, G.
1890—Wood, W. D.
1884—Wroughton, T. A.
1892—Yuill, A. R.
1886—Zavitz, C. A.
1898—Zavitz, H. V.

* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.
§ Winner of the Governor-General's Medal—the only medal given that year.
b Third in competition for medals, but ruled out by special regulation.

3. College Roll for 1898.

First Year Students.

Name.	P. O. Address.	County etc.
Allison, J. Bothwell	Pakenham	Lanark, Ont.
Balfe, J. J	Lombardy	Leeds, Ont.
Bain, C. E.	Taunton	Ontario, Ont.
Beaumont, S. W	Bracebridge	Muskoka, Ont
Beckstedt, I. N	Chesterville	Dundas, Ont.
Black, W. J	Stanton	Dufferin, Ont.
Bowers, J. C	Berlin	Waterloo, Ont.
Bowman, E	Bloomingdale	Waterloo, Ont
Brooks, C. R	Brantford	Brant, Ont.
Broomfield, R. J	Brechin	Ontario, Ont.
Brouse, A M	Iroquois	Dundas, Ont.
Campbell, J. F	Ivan	Midd esex, Ont.
Campbell, J. D	Victoria Cross	Kings, N.S.
Cameron, D. A. R	Niagara Falls, South	Welland, Ont.
Carleton, J. A	Avening	Simcoe, Ont
Carlyle, M. D	Chesterville	Dundas, Ont.
Carson, W. J	Metcalfe	Carleton, Ont.
Christie, A	Winchester	Dundas, Ont.
Christie, G. I	Winchester	Dundas, Ont.
Clarke, R	Elora	We lington, Ont.
Clarke, A. B	Montreal	Que.
Cleal, J. P	Dayton	Ohio, U.S.A.
Cote, J. C	Ottawa	Carleton, Ont.
Cowan, T. D	Galt	Dundas, Ont.
Cowle, W. G	Toronto	York, Ont.
Davis, A. J	Woodstock	Oxford, Ont.
Dennis, E	Aurora	York, Ont.
Dickenson, J. H	N. Glanford	Wentworth, Ont.
Donald, G	St. Marys	Perth, O t.
Douglas, A	Montreal	Que.
Drummond, J. A	Keene	Peterboro, Ont.
Eagle, F. J	Hamilton	Wentworth, Ont.
Eddy, A. F.	Marshville	Algoma, Ont.
Eftyhithes, B. M	Erekle at Iconium	Asia Minor.
Farley, W. J	Smithfield	Northumberland, Ont.
Forbes, W. A	Galetta	Carleton, Ont.
Forbes, C. W	Jeannette's Creek	Ke t, Ont.
Forrester, W. E	Morewood	Dundas, Ont.
Fox, A. J	Cobourg	Northumberland, Ont.
Gardiner, H. C	St. Catharines	Lincoln, Ont.
Glasgow, R. J	Fingal	Elgin, Ont.
Gorrell, G. H	Gore Bay	Manitoulin Island, Ont.
Goodchild, A	Craigleith	Grey, Ont.
Greenfield, J. K	Thorold	Welland, Ont.
Griffith, L	Byron	Middlesex, Ont.
Gunn, W. S	Lyn	Leeds, Ont.
Hains J. McD	Montreal	Que.
Hair, S	Watford	Lambton, Ont.
Hall, J. A	Rosseau	Parry Sound, Ont.
Hallman, F. E	Washington	Waterloo, Ont.
Hamilton, A	Ravenshoe	York, Ont.
Hamilton, J. D	Ravenshoe	York, Ont.
Harris, G. S	Toronto	York, Ont.
Harris, W	Rockwood	Wellington, Ont.
Hewie, J. M	Keene	Peterboro, Ont.

First Year Students—Continued

Name.	P. O. Address.	County etc.
Hilborn, J	Drayton	Wellington, Ont.
Hernnon, F. B	Rednersville	Prince Edward, Ont.
Hodgins, J. W	Waterloo	Waterloo, Ont.
Howson, W. F	Cavan	Durham, Ont.
Humphrey, G	Troy	Wentworth, Ont.
Isaacs, W. A	The Rectory, Half Way Tree.	Jamaica.
Jacobs, S	Minesing	Simcoe, Ont.
Kenyon, E. L	Liverpool	England.
Keppy, R. A	Spence	Parry Sound, Ont.
Keys, H. J. E	Toronto	York. Ont.
Kipling, J. W	Canfield	Haldimand, Ont.
King, T. L	South Zorra	Oxford, Ont.
Knox, W. J	Belgrave	Huron, Ont.
Ling, S. M	Rockwood	Wellington, Ont.
McCowie, J. R	Oakwood	Victoria, Ont.
McCrimmon, J. R	Vankleek Hill	Prescott, Ont.
McDermid, H. R	Martintown	Stormont, Ont.
McDonald, H	Glen Williams	Halton, Ont.
McEwen, D	Lakeport	Northumberland, Ont.
McFiggins, A. J	Colborne	Northumberland, Ont.
McElroy, W. A	Chesterville	Dundas, Ont.
McKellar, W. H	Colinsville	Lambton, Ont.
Magee, W. H	Port Williams	Kings, N.S.
Marks, W. J	Schomberg	York, Ont.
Martin, D. H	Whitechurch	Huron, Ont.
Mason, W. J. E	Fenella	Northumberland, Ont.
Mills, P. G	Sussex	N. B
Misener, O	Dunnville	Haldimand, Ont.
Moffet, J. F	Jordan	Lincoln, Ont.
Moorehouse, L. A	Cairo	Lambton, Ont.
Mortimer, E	Leeds	England.
Munro, A. J	Clifford	Huron, Ont.
Murray, J	Avening	Simcoe, Ont.
Murray, J. K	Avening	Simcoe, Ont.
Myer, C. E	Guelph	Wellington, Ont.
Myer, L. C	Guelph	Wellington, Ont.
Nicholson, H. W	Riverbank	Wellington, Ont.
Norcross, W. W	Trenton	Hastings, Ont.
Page, C	Toronto	York, Ont.
Picken, J. B	Montreal	Que.
Pickett, B. S	Vittoria	Norfolk, Ont.
Pipes, A. S	Amherst	N. S.
Race, F. W	Port Hope	Durham, Ont.
Rive, H	Eramosa	Wellington, Ont.
Robertson, A. J	Toronto	York, Ont.
Robinson, F. H	Brampton	Peel, Ont.
Rose, H. H	Waupoos	Prince Edward, Ont.
Ross, N	Toronto	York, Ont.
Russell, J. M	Freeman	Halton, Ont.
Rutherford, E. A	Colborne	Northumberland, Ont.
Sangster, J. A	Lancaster	Glengarry, Ont.
Shepherd, C. B	Toronto	York, Ont.
Shields, J. R	Smith's Falls	Lanark, Ont.
Silcox, J. H	Iona	Elgin, Ont.
Smith, F. G	Whitby	Ontario, Ont.
Smuck, I	Renforth	Wentworth, Ont.
Sugley, J. G	Allandale	Simcoe, Ont.

First Year Students.—Continued

Name.	P. O. Address.	County, etc.
Standly, R W	Grafton	Northumberland, Ont.
Stott, L	Wyevale	Simcoe, Ont.
Stoven, H. E.	Norwich	Oxford, Ont.
Strachan, J. J	Brussels	Huron, Ont.
Suckling, A. P.	Toronto	York, Ont.
Sullivan, H	Toronto	York, Ont.
Switzer, J. N	Binbrook	Wentworth, Ont.
Taylor, J	Todmorden	York, Ont.
Thomson, H	Magnetawan	Parry Sound, Ont.
Turner, E. P	Bealton	Norfolk, Ont.
Varcoe, J. R.	Carlow	Huron, Ont.
Walton, F. M	Cornwall	England.
Waters, B	Ivan	Middlesex, Ont.
Wicks, G. B.	Guelph	Wellington, Ont.
Williams, H	Corbetton	Dufferin, Ont.
Wilson, W. H.	Toronto	York, Ont.
Wilson, J	Whitechurch	Bruce, Ont.
Woodruff, W. E.	St. David's	Lincoln, Ont.
Wordsworth, E. I	Carlisle, Cumberland	England.

Second Year Students.

Allison, J. B.	Adolphustown	Lennox, Ont.
Anderson, J. B	St. Marys	Perth, Ont.
Bancroft, G. R	Newington	Stormont, Ont.
Brokovski, A. J	Battleford	N. W. T.
Crerar, A. H.	Molesworth	Perth, Ont.
Crow, J. W	Ridgeville	Welland, Ont.
Cutler, E. B	Arkona	Lambton, Ont.
Deike, H. V	Guelph	Wellington, Ont.
Fawell, L. A	De Cewsville	Haldimand, Ont.
Fowler, R. C.	Emerald	Lennox, Ont.
Gethen, G	Grimsby	Lincoln, Ont.
Goble, F. W	Woodstock	Oxford, Ont.
Grisdale, J. H	Russell	Russell, Ont.
Hammell, W. H.	Beeton	Simcoe, Ont.
Harris, C. H	Rockwood	Wellington, Ont.
Hawke, A. H	Winnipeg	Manitoba.
Hopkins. A. G	Highfield	York, Ont.
Hume, H. H	Marvelville	Russell, Ont.
Hutchinson. L. W	Aurora	York, Ont.
Hutchison J. R.	Escott	Leeds, Ont
Hutton, G	Easton's Corners	Grenville, Ont.
Kennedy, W. J	Vernon	Carleton, Ont.
Ketchen, J. B.	Brooklin	Ontario, Ont.
Kidd, C	Cookstown	Simcoe. Ont.
Lewis, E. R.	Burford	Brant, Ont.
Linklater, W	Stratford	Perth, Ont.
Livingstone, J. M	Sarnia	Lambton, Ont.
McCarthy, J. D	Norwood	Peterborough, Ont.
McIntyre, G. A	Renfrew	Renfrew, Ont.
McLaurin, J. D.	Vankleek Hill	Prescott, Ont.
McMillan, E, J	New Haven	P. E. I.
Mortureux, C. E. M	Quebec	Que.

Second Year Students.—Continued.

Name.	P. O. Address.	County, etc.
Patterson, H. H	Jermyn	Peterborough, Ont.
Peters, C. R	Elmhurst	N. B.
Putnam, G. A	Guelph	Wellington, Ont.
Reid, R. H	Reaboro	Victoria, Ont.
Robertson, M	Meaford	Grey, Ont.
Robertson, J. A	Blantyre	Grey, Ont.
Ross, D. A	Martintown	Glengarry, Ont.
Scott, N. C	Kingston	Frontenac, Ont.
Semple, W. C	Tottenham	Simcoe, Ont.
Snider, C. H	Attercliffe	Lincoln, Ont.
Stewart, A	Ivan	Middlesex, Ont.
Taylor, G. R	Harley	Brant, Ont.
Thomson, G. T	Blenheim	Kent, Ont.
Tozeland, J. H	Killarney	Manitoba.
Vannater, P. O	Ballinafad	Wellington, Ont.
Wagg A. J	Mindemoya	Manitoulin Island, Ont.
Westgate, H. P	Watford	Lambton, Ont.
Willmott, H. B.	Wallbridge	Hastings, Ont.
Wilson, R	Fordwich	Huron, Ont.
Wilson, E. S	Dundas	Wentworth, Ont.
Williams W. E	Clandeboye	Middlesex, Ont
Zavitz, H. V	Coldstream	Middlesex, Ont.

Third Year Students

Beam, E	Black Creek	Welland, Ont.
Buchanan, J	Hensall	Huron, Ont.
Butler, W. E	Dereham Centre	Oxford, Ont.
Clark, G. H	Cainsville	Brant, Ont.
Craig R. D	Guelph	Wellington, Ont.
Davis, A. N	Cayuga	Haldimand, Ont.
Elliott, W. J	Seaforth	Huron, Ont.
Heartz, W. B. G	Halifax	Nova Scotia.
High, A. M	Jordan Station	Lincoln, Ont.
Hollis, J. H	Shelly Bay	Bermuda.
Hutt, W. N	Southend	Welland, Ont.
Jarvis, C. D	Guelph	Wellington, Ont.
Jarvis, T. D	Guelph	Wellington, Ont,
Mallory, F. R	Frankford	Hastings, Ont.
Marshall, F. R	Westbrook	Frontenac, Ont.
Mooney, J. A	Inverness	Que.
Morgan, G. W	Kerwood	Middlesex, Ont.
Murdoch, G. H	Bobcaygeon	Victoria, Ont.
Mc alla, G. B	St. Catharines	Lincoln, Ont.
Price, W. J	Marsville	Dufferin, Ont.
Raynor, M	Rose Hall	Prince Edward, Ont.
Robertson, F. H	Kingston	Frontenac, Ont.
Ross, H. R	Gilead	Hastings, Ont.
Ross, M. N	Warrington	England.
Ross, N. M	Warrington	England.
Squirrell, W. J	Guelph	Wellington, Ont.
Summerby, W. L	Russell	Russell, Ont.

Students taking Special Classes or Courses.

Name.	P. O. Address.	County, etc.
Burnett, E.	Kenmay	Aberdeenshire, Scotland.
Cartwright, E. A	Toronto	York, Ont.
Cartwright, S. H	Toronto	York, Ont.
Cleaver, H. S	Kingsclere	England.
Fisher, Jno	Stratford	Perth, Ont.
Golding, H. E	Thamesford	Oxford, Ont.
Hood, W. H	Ashgrove	Halton, Ont.
Layborn, A.	Northfleet	England.
McDougall, C. W	Guelph	Wellington, Ont.
McKinnon, R. S	Grimsby	Lincoln, Ont.
Wilkinson, H. S.	Toronto	York, Ont.

Students in Dairy Course.

Adair, Alex	Alsfeldt	Grey, Ont.
Atkinson, W. J	Kintore	Oxford, Ont.
Babb, Joseph	Carlingford	Perth, Ont.
Barberree, Freeman	Corwhin	Wellington, Ont.
Bell, Harry J	Oxley	Grey, Ont.
Beninger, Michael	Riversdale	Bruce, Ont.
Blythe, Chas	Feelstead	England.
Boyes, Frank	Putnam	Middlesex, Ont.
Brophy, John	Jockvale	Carleton, Ont.
Burnett, Arthur	Belleville	Hastings, Ont.
Burnskill, Thos	Gladstone	Middlesex, Ont.
Callan, Peter	Innerkip	Oxford, Ont.
Campbell, Alex	Aberdour	Bruce, Ont.
Carroll, Lorne	Kilmarnock	Lanark, Ont.
Clarke, John J	Tamagouche	N. S.
Cook, Alva	Cotswold	Wellington, Ont.
Cook, A. H	Toronto	York, Ont.
Crickton, W. S	Glasgow	Scotland.
Cruickshank, A. N	Toronto	York, Ont.
Dent, John A	St. Sixte	Que.
Dewey, W. E	Wyevale	Simcoe, Ont,
Doyle, Burleigh	Delaware	Middlesex, Ont.
Elliott, Jas	Ratho	Oxford, Ont.
Elliott, Arch. T	Bluevale	Huron, Ont.
Empey, Geo. W	Culloden	Oxford, Ont.
Evans, J. H	Tiverton	Bruce, Ont.
Ferguson, Fred	Moorefield	Wellington, Ont.
Forbes, Miss Mary	Brampton	Peel, Ont.
Fotheringham, John W	Courtice	Durham, Ont.
Francis, William	Hyndman	Grenville, Ont.
Galbrieth, Harcourt	Ellsemere	York, Ont.
Gibson, Oswald	Guelph	Wellington, Ont.
Gibson, Theodore	Toronto	York, Ont.
Gillies, Miss Annie	Moffat	Halton, Ont.
Gray, Wm. E	St. Thomas	Elgin, Ont.
Hamilton, Walter	Stratford	Perth, Ont.
Hare, Miss M. A	Airlie	Dufferin, Ont.
Harris, James	Carmarthen	South Wales.
Hess, Alex	South Mountain	Dundas, Ont.
Hinman, Edward	Grafton	Northumberland, Ont.

Students in Dairy Course—Continued.

Name.	P. O. Address.	County, etc.
Hodgins, Ralph W	Shawville	Que.
Hodgson, Geo	Toronto	York, Ont.
Hope, William	Palermo	Halton, Ont.
Howell, Miss Edith	Brantford	Brant, Ont.
Hunter, Hermon	Spencerville	Grenville, Ont.
Hyland, A. G	Sinchamton	Grey, Ont.
Jamieson, Norman	Hil sdale	Simcoe, Ont.
Kennedy, Edwin C	Welland	Welland, Ont.
Kent, Wesley	Woodstock	Oxford, Ont.
Kinnell, L. R	Owen Sound	Grey, Ont.
Law, John G. H	Bramtree	England.
Lea, E. P	Consecon	Prince Edward, Ont.
Leak, F. A	Woodslee	Essex, Ont.
Lough, John	Toronto	York, Ont.
Maines, D. W	Millarton	Bruce, Ont.
Malcolm, J. D	Sheffield	Wentworth, Ont.
Marshall, E. G	Guysboro	Norfolk, Ont.
Martin, Donald	Crieff	Wellington, Ont.
Mason, Wesley	Springbrook	Hastings, Ont.
Mather, O	Weston	York, Ont
Matheson, Edward	Kincardine	Bruce, Ont.
Maddock, Miss Blanche	Guelph	Wellington, Ont.
Millar, Miss Bella	Guelph	Wellington, Ont.
Milbane, Miss Ethel	Guelph	Wellington, Ont.
Mills, Miss G	Guelph	Wellington, Ont.
Morrison, W. J	Singhampton	Grey, Ont.
Moody, Jesse	Guelph	Wellington, Ont.
Moore, Miss Jennie	Spryside	Halton, Ont.
Moody, Geo	Guelph	Wellington, Ont.
Moody, Miss Ethel	Guelph	Wellington, Ont.
Murray, R. A	Brooksdale	Oxford, Ont.
McBeth, Solomon	Stayner	Simcoe, Ont.
McCready, John	Harriston	Wellington, Ont.
McCrae, Miss Geills	Guelph	Wellington, Ont.
McDougall, C. W	Guelph	Wellington, Ont.
McDonald, Geo	Bluevale	Huron, Ont.
McKay, Fred	Cannington	Ontario, Ont.
McKay, Wm. A	Underwood	Bruce, Ont.
McKim, Miss Edith	Guelph	Wellington, Ont.
McMillan, Samuel	Unionville	York, Ont.
McPhee, J. A	Kilworthy	Muskoka.
North, Mrs. Rebecca	Marden	Wellington, Ont.
Passmore, Alex	Teeswater	Bruce, Ont.
Patterson, Miss Jennie	Aberfoyle	Wellington, Ont.
Pelton, James	Innerkip	Oxford, Ont.
Purdon, John	Rockfield	Leeds, Ont.
Reddon, Philip	Mildmay	Bruce, Ont.
Riddle, Andrew D	Shakespeare	Perth, Ont.
Ridgeway, Miss Francis	Guelph	Wellington, Ont.
Robinson, Robt	South Mountain	Grenville, Ont.
Sales, Jos. G	Chatterton	Hastings, Ont.
Schweitzer, Oscar	Chesterfield	Oxford, Ont.
Scott, Robert	Anson	Hastings, Ont.
Shuttleworth, Miss Lottie	Guelph	Wellington, Ont.
Smith, Miss Louis	Guelph	Wellington, Ont.
Smith, R. M	Beachville	Oxford, Ont.

Students in Dairy Course.—Concluded.

Name.	P. O. Address.	County, etc.
Standish, C. E	East Hartley	Que.
Stewart, Gilchrist	Brooklin, N.Y	U.S.A.
Struthers, Robt	Owen Sound	Grey, Ont.
Sutherland, Alex. F	Holyrood	Bruce. Ont.
Taylor, Sam. J	Singhamton	Grey, Ont.
Torrance, Thos	Fenelon Falls	Victoria, Ont.
Vanderlip, Miss Emily	Langford	Brant Ont.
Vandewater, Edgar S	Belleville	Hastings, Ont.
Wallace, Harold	Hamilton	Wenthworth, Ont.
Wallace, Miss Bessie	Woodbridge	York, Ont.
Wheaton, A. Macey	Upper Sackville	N.B.
Whetley, Francis	Guelph	Wellington, Ont.
Wiancko, Theo. A	Sparrow Lake	Muskoka.
Warwick, Andrew	Wingham	Huron, Ont.

APPENDIX II.

SYLLABUS OF LECTURES.

Lectures began as usual on the 1st October, 1897, and continued, with the omission of the Christmas vacation, until the 30th June, 1898, which latter date was the end of the scholastic year 1897-98.

The following syllabus of lectures will convey some idea of the class-room work done by the several professors in the nine months just mentioned :

FIRST YEAR.

Fall Term—1st October to 21st December.

AGRICULTURE.

Live Stock. Judging beef and dairy cattle with and without score-card. General stable management and care of live stock.

Buildings. Construction of barns, stables, and other outbuildings with reference to economy, convenience, ventilation, etc., the college outbuildings being used to illustrate desirable and undesirable features.

NATURAL SCIENCE.

Chemical Physics. Matter : accessory and essential properties of matter ; attraction ; various kinds of attraction—cohesion, adhesion, capillary, electrical, and chemical ; specific gravity ; weights and measures ; heat, measurement of heat, thermometers, specific and latent heat; sources, nature, and laws of light.

Inorganic Chemistry. Scope of subject : elementary and compound substances ; chemical affinity ; symbols ; nomenclature ; combining proportions by weight and by volume ; atomic theory ; atomicity and basicity ; oxygen and hydrogen ; water—its nature, functions, decomposition, and impurities ; nitrogen ; the atmosphere—its composition, uses, and impurities ; ammonia—its sources and uses ; nitric acid and its connection with plants.

Human Physiology and Hygiene. Description of the defferent tissues of the body ; alimentary system ; circulatory system ; nervous system ; importance of ventilation, and the influence of food on the body ; remarks on the proper care of the body and attention to its surroundings in order to keep it in a continual state of health.

Zoology. Distinction between animate and inanimate objects ; distinction between plants and animals ; basis of classification of animals ; leading character of each sub-kingdom, with special reference to classes of amimals connected with agriculture.

VETERINARY SCIENCE.

Anatomy and Physiology of the horse, ox, sheep, and pig ; osseous system, muscular system, syndesmology, plantar system, and adontology.

ENGLISH.

Composition. Review of grammar, with exercises on capital letters and punctuation.

Literature. Scott's Ivanhoe, and selections from Longfellow.

MATHEMATICS.

Arithmetic. Review of subject, with special reference to methods, decimals, interest, discount, general problems.

Bookkeeping. Subject commenced.

Winter Term—14th January to 14th April.

Agriculture.

Live Stock. Judging sheep.

Manures. Composition, management, and application of farmyard manure; crops for green manuring; utility of ashes, lime, salt, gypsum, etc

Soils. Formation, composition, classification, etc. Principles underlying the various operations of tillage. Movements of water in the soil, importance of soil moisture, conservation of soil in moisture, etc.

Land Drainage. Methods of draining. Laying out and construction of drains, etc.

Farm Crops. Characteristics of the principal farm crops, suitable soils, cultivation, etc.

Natural Science.

Inorganic Chemistry (Continued). Carbon; combustion; carbonic acid and its relation to the animal and vegetable kingdom; sulphur and its compounds; manufacture; land uses of sulphuric acid: phosphorus; phosphoric acid and its importance in agriculture; chlorine—its bleaching properties; bromine, iodine; silicon; potassium; calcium; magnesium; iron, etc.

Organic Chemistry. Constitution of organic compounds; alcohols; aldehydes, acids and their derivatives; formic, acetic, oxalic, tartaric, citric, lactic, malic, uric, and tannic acids. Constitutions of oils and fats—saponification; sugars, starch, cellulose, albuminoids, or flesh formers, and their allies; essential oils; alkaloids—morphine and quinine; classification of organic compounds.

Zoology (Continued). Sub-kingdoms further described; detailed account of some injurious parasites, such as "liver-fluke," "tape-worm," "trichina," etc.; insects—their influence on plant life; corals and mollusks as agents in the formation of soil; vertebrates, with special reference to those of importance in the economy of the farm.

Lectures illustrated by specimens and diagrams.

Veterinary Science.

Veterinary Anatomy. Anatomy and physiology of the horse, ox, sheep, and pig—digestive system, circulatory system, respiratory system, urinary system, nervous system, sensitive system, generative system, tegumental system.

English.

Composition. Exercises continued; letter writing, etc.

English Classics. Ivanhoe, and critical study of selections from Longfellow.

Mathematics and Bookkeeping.

Arithmetic. Equation of payments; percentage; profit and loss; mensuration.

Bookkeeping. Business forms and correspondence; general farm accounts; dairy, field, and garden accounts.

Spring Term—6th April to 20th June.

Agriculture.

Live Stock. Judging Swine.

Rotation of Crops. Necessity of rotation, principles underlying rotation, rotation of crops in relation to maintaining soil fertility, discussion of rotations for different soils and different systems of farming, etc.

Weeds. The most troublesome weeds, theirs habits of growth, modes of destroying them, etc.

N. B.—*In all judging of live stock during the first year, breed characters are noticed only incidentally, the students being required to judge animals merely as representatives of meat milk, or wool-producing types.*

Natural Science.

Geology. Connection between geology and agriculture ; classification of rocks—their origin and mode of formation, changes which they have undergone after decomposition ; fossils—their origin and importance ; geological periods and characteristics of each.

Geology of Canada with special reference to the nature and economic value of the rock deposits ; glacial period and its influence on the formation of soil.

Lectures illustrated by numerous specimens and designs.

Botany, Full description of seed, roots, stem, leaves and flower. Plants brought into the lecture room and analyzed before the class, so as to render students familiar with the different organs and their use in the plant economy.

Lectures illustrated by excellent diagrams.

Veterinary Science.

Materia Medica. The preparation, doses, action, and use of about one hundred of the principal medicines used in veterinary practice.

English.

English Grammar and Composition. Tarbell's Lessons in Language, Bk. II.

English Classics. Same as winter term.

Mathematics.

Mensuration. Mensuration and services—the square, rectangle, triangle, trapezoid, regular polygon, circle, Special application to the measurement of lumber. Mensuration of solids, special application to the measurement of timber, earth, etc,

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SECOND YEAR.

Fall Term.—1st October to 22nd December.

Agriculture.

Live Stock. History and characteristics of the leading breeds of sheep ; critical judging of animals as representatives of their respective breeds.

Natural Science.

Agricultural Chemistry. Connection between chemistry and agriculture ; the various compounds which enter into the compositions of the bodies of animals ; the chemical changes which food undergoes during digestion ; chemical changes which occur in the decomposition of the bodies of animals at death ; the functions of animals and plants contrasted ; food of plant sand whence derived ; origin and nature of soils ; classification of soils ; causes of unproductiveness in soil and how detected , preservation, improvement and renovation of soils ; manures classified : the chemical action of manures on different soils ; commercial valuation of fertilizers.

Horticulture.

Introduction. Brief history of horticulture ; extent and importance of the industry Ontario as a fruit-growing country : the outlook for the fruit industry ; requisities for the business.

Leading Principles in the Growth of Trees. Description and function of roots, stems, branches buds, leaves, flowers, fruit and seeds. Illustrated by specimens in the class room.

Production of New Varieties. Species and varieties ; natural and artificial pollination ; crossing and hybridizing practised by students in the greenhouses and orchards.

Propagation of Varieties. By cutting, layers, grafting and budding. Illustrated by specimens and practised by students in the greenhouses.

Setting out Orchards and Fruit Plantations. Suitable soils and situations ; distances for planting ; marking out the ground ; obtaining nursery stock ; transplanting ; watering ; mulching.

General Management of Orchards and Fruit Plantations. Cultivation ; manuring ; spraying ; thinning fruit ; implements suitable for the different operations.

Different Kinds of Fruits. Apples, pears, quinces, plums, apricots, cherries, grapes, raspberries, blackberries, currants, gooseberries. strawberries, etc., treated of in detail according to the following syllabus ; (1) History and botanical matter ; (2) extent of cultivation ; (3) methods of propagation ; (4) soils suitable ; (5) culture required ; (6) methods of pruning and training ; (7) time and manner of harvesting ; (8) packing and marketing ; (9) method of keeping and storing ; (10) varieties grown.

Veterinary Science.

Pathology. Osseous System. Nature, causes, symptoms and treatment of diseases of bone, as splint, spavin, ringbone, etc.

Muscular System. Nature, causes and treatment.

Syndesmology, Nature, causes, symptoms, and treatment of curb, bog spavin, and other diseases of the joints.

Plantar System. Nature, causes, symptoms, and treatment of corns, sand-crack, founder, and other diseases of the feet.

Odontology. Diseases of teeth, and treatment of the same

English.

English Classics. Critical study of Shakespeare's "Julius Cæsar," and George Eliot's "Mill on the Floss."

Physics.

Dynamics. Force (different kinds of) ; motion ; laws of falling bodies ; work ; the simple machines.

Statics. Composition and resolution of forces ; parallelogram of forces ; conservation of energy.

Winter Term.—14th January to 4th April.

Agriculture.

Live Stock. History and characteristics of the leading breeds of beef and dairy cattle. Special attention paid to practical work in judging with and without score-card.

Natural Science.

Agricultural Chemistry. Continuation of the subject from preceding term, as follows Composition of plants in relation to the soils upon which they grow ; rotation of crops ; the classification of fodders according to their chemical composition, and a general treatment of the science of cattle feeding ; relation of feeding to manure ; chemistry of the dairy.

Economic Entomology. Anatomy ; classification and metamorphosis of insects ; principal insects injurious to vegetation ; their habits, and the best methods of checking and preventing their ravages ; insecticides, and the best methods of applying them ; beneficial insects referred to. Course illustrated by a good collection of beneficial and injurious and of insectivorous birds.

Meteorology. Relation of Meteorology to agriculture ; composition and movements of the atmosphere ; description of the barometer ; different kinds of thermometers ; pluviameter and anemometer, and how to read them ; temperature ; its influence on agriculture ; the elements which are to be considered in the discussion of climate ; the principles considered in forecasting the weather.

Lectures illustrated by instruments referred to.

Horticulture.

1. *Vegetable Gardening.*

Gardening as an Occupation. Extent and importance of this industry; market gardening near large towns and cities.

The Farmer's Garden. Location, size and soil suitable.

Fertilizers for the Garden. Barnyard Manure; composts; artificial fertilizers; time and manner of applying them.

General Management of Garden. Preparation for and cultivation of crops; rotation of crops; plan of garden.

Garden Seeds. Method of obtaining; vitality; time and manner of sowing; conditions favorable to germination.

Raising Plants. Construction and management of hotbeds and cold-frames; transplanting

Forcing Garden Crops. Illustrated by growth in the greenhouses of radishes, lettuce, onions, potatoes, tomatoes, cauliflowers, cucumbers, melons, rhubarb, mushrooms, etc.

Garden Crops. Beets, carrots, parsnips, salsify, radishes, turnips, potatoes, onions, asparagus, spinach, lettuce, cabbage, celery, rhubarb, cauliflower, peas, beans, corn, melons, squashes, cucumbers, tomatoes, herbs, etc., treated of in detail according to the following syllabus: (1) History and botanical matter; (2) Importance and extent of cultivation; (3) Soils and fertilizers suitable; (4) Propagation; (5) Culture and general management; (6) Harvesting; (7) Packing and marketing; (8) Storing; (9) Varieties grown.

2. *Floriculture.*

Soil for house plants; methods of potting; propagation of plants; effect of atmosphere, temperature, and light upon plants; watering; trimming, and training; treatment of frozen plants; resting plants; kind of plants suitable for window or conservatory; hanging baskets, rockeries; flower beds, etc.; arrangement of plants for effect.

3. *Landscape Gardening.*

Location of buildings; making and care of lawns; kinds, arrangement, and care of trees, shrubs, vines, hedges, and flower-beds; course and construction of walks and drives; general surroundings.

4. *Arboriculture.*

Importance of forests; their effect on climate; different kinds of trees—their occurrence, habits, and uses; where trees should be planted; raising trees from seed; planting operations; transplanting large trees; care and management of trees, with a view to ornament, shelter and economy.

Veterinary Science.

Digestive System. Nature, causes, symptoms, and treatment of spasmodic and flatulent colic, inflammation of the bowels, acute indigestion, tympanitis in cattle, impaction of the rumen, and many other common diseases.

Circulating System. Description of the diseases of the heart and blood.

Respiratory System. Nature, causes, symptoms, and treatment of catarrh, nasal gleet, roaring, bronchitis, pleurisy, and inflammation of the lungs, etc.

Urinary System. Nature, causes, symptoms, and treatment of inflammation of the kidneys, etc.

Nervous System. Nature, causes, symptoms, and treatment of lock jaw, stringhalt etc.

Sensitive System. Nature, causes, symptoms, and treatment of the eye and ear.

Generative System. Nature, causes, symptoms, and treatment of abortion, milk fever, etc.

Tegumental System. Nature, causes, symptoms, and treatment of scratches, sallenders, mallenders, parasites, and other diseases of the skin.

ENGLISH LITERATURE AND POLITICAL ECONOMY.

English Classics. The critical study of Shakespeare's "Henry IV.," and George Eliot's "Mill on the Floss."

Political Economy. Utility: production of wealth—land, labor, capital; division of labor; distribution of wealth; wages; trades unions; co-operation; money; credit; credit cycles; functions of government; taxation, etc.

PHYSICS.

Hydrostatics. Transmission of pressure; the hydraulic press; specific gravity; density pumps, siphons, etc.

Agricultural Physics. The physical peculiarities of different soils; the physical effect of lime, humus, etc., on soils; the action, movements and functions of water in the soil; water capacity of soils; conservation of soil moisture; soil cultivation and drainage.

Spring Term.—6th April to 30th June.

AGRICULTURE.

Live Stock. History and characteristics of the leading breeds of swine. Practical work in judging swine. Lectures on herd-books, pedigrees, principles of breeding, management, and feeding of beef cattle, dairy cattle, sheep and swine.

NATURAL SCIENCE.

Determination of soils and fertilizers by physical properties.

Analytical Chemistry. Chemical manipulation; preparation of common gases and reagents; operations and analysis—solution, filtration, precipitation, evaporation, distillation, sublimation, ignition, and the use of the blow-pipe; testing of substances by reagents; impurities in water: adulteration in foods and artificial manures; injurious substances in soils.

Systematic and Economic Botany. Classification of plants and characters of the most important orders.

This course is illustrated by a large collection of plants in the College herbarium, and also by analysis of several plants collected in the fields and woods of the farm.

Greenhouse Plants. Special study of all plants grown in our greenhouses, and the shrubs etc., on the lawn.

VETERINARY SCIENCE.

Materia Medica. The preparation, actions, uses, and doses of medicine—continued from the spring term of the first year. Lectures on special subjects, such as pleuro-pneumonia, the rinderpest, tuberculosis, etc.

Veterinary Obstetrics. Description of fœtal coverings. Pneumonia in connection with puberity, œstrum gestation, sterility, abortion, normal and abnormal parturition. Diseases incidental to pregnant and parturient animals.

ENGLISH.

English Classics. The critical study of sections from Tennyson.

PHYSICS.

Electricity and electrical machinery.

ROAD-MAKING.

Determination of proper slopes; shape of road bed; drainage of roads; various road coverings, etc.

THIRD YEAR.

General Course.—Taken by all Third Year Students.

AGRICULTURE.

(1) Review of first and second year work ; (2) Lectures and practical work (Fall Term.)

CHEMISTRY.

(1) Review of second year work in agricultural and animal chemistry.

(2) *General Chemistry.* Lectures, with experiments, two hours per week, till Christmas.

(3) Reading: (Storer), Vol I., Chapters 1, 2, 3, 4, 7, 8, 10, 11, and 12 ; Vol. II., Chapters 5, 6, 7, 8, 9, 10, 15, 17, 18, and 19 ; "Manual of Cattle Feeding" (Armsby).

GEOLOGY.

(1) Lectures : A general review of the subject, referring particularly to the ages, systems, and formations in Canada ; special attention to the geology of Ontario, New Brunswick, Nova Scotia, Manitoba, and the Northwest, with regard to their most valuable economic products ; the disintegration and decomposition of rocks in the formation of soil, etc.

(2) Reading : "Elements of Geology" (Le Comte), Part I., Chapters 2 and 3 ; Part II., Chapters 5 and 6 ; Part III., Chapters 3 and 5.

Reference : "Handbook of Canadian Geology" (Dawson).

BOTANY.

(1) Structural and physiological botany ; cells and tissues of plants ; organs of vegetation and reproduction ; plants in relation to soil ; processes of absorption, circulation, assimilation, metabolism, and transpiration.

(2) Vegetable histology : technique of microscope ; mounting, examination, and drawing of vegetable cells and tissues, etc.

(3) Reading : Botany (Bastin).

Reference : "Physiological Botany" (Goodale).

ENGLISH.

Composition. The writing of impromptu compositions and four original essays in connection with the study of models of prose as found in "Representative Essays."

Shakespeare—"King Lear" and "Winter's Tale"

Milton—"Paradise Lost," Book I.; "L'Allegro," and "Il Penseroso."

Wordsworth—"Michael," and "The Leech Gatherers."

Scott—"Kenilworth."

Tennyson—"In Memoriam," and "Guinevere."

Pancoast—"Introduction to English Literature."

Special Courses.—One taken by each Third Year Student.

I.—AGRICULTURE AND DAIRYING.

AGRICULTURE.

General Field Agriculture. Soils, soil physics, methods of cultivation, draining, manures rotation of crops, adaptation of soils to different plants, seeds and seeding, growing and harvesting of crops, including a scientific and practical knowledge of the grasses and clovers found in Ontario, and all else pertaining to the soils and crops of this Province.

Miscroscopic study of rust, smut, and other injurious fungi affecting farm crops, with notes on methods of treatment and prevention.

Reading: all works and selections prescribed for first and second year; "Storer's Agriculture," Vols I. and III.; "The Soil" (King), Reports and Bulletins as directed.

Live Stock.

(1) *Cattle.* The principal breeds of beef and dairy cattle, including Shorthorns, Herefords, Aberdeen-Angus, Galloways, Sussex, Devons, Ayrshires, Jerseys, Guernseys, Holsteins, Crosses, and Grades; general characteristics, with emphasis on the strong and weak points of each; principles and practice of breeding; foods, fodder, feeding, and management.

(2) *Sheep.* The principal breeds of sheep, including Shropshires, Oxford Downs, Southdowns, Hampshire Downs, Suffolks, Cotswolds, Lincolns, Leicesters, Dorset Horns, and Merinos; the general characteristics, with the strong and weak points of each as regards carcass, wool, and mutton; breeding; food, feeding, and management of flocks, ewes, and lambs; also an exact and thoroughly practical knowledge of the different kinds of wool.

(3) *Swine.* Principal breeds of swine, including Berkshires, Yorkshires, Tamworths, Poland Chinas, Chester Whites, Duroc Jerseys, Suffolks, and Victorias; general characteristics, with emphasis on strong and weak points of each; breeding, foods, feeding, and management.

(4) *Horses.* Heavy-draught—Clydesdale, Shire, Suffolk Punch, and Percheron; Coach horses—Hackney, Cleveland Bay, etc.; roadsters; thoroughbreds; saddle horses; horse breeding; education of horses; soundness; foods, feeding, and management.

(5) *Poultry.* Principal breeds of poultry; including Wyandottes, Plymouth Rocks, Javas, American Dominiques, Andalusians, Leghorns, Minorcas, Spanish, Brahmas, Cochins, Langshans, Hamburgs, Polish, French, Dorkings, Indian Game, and Black-Red Game; poultry houses; food, feeding, and management of poultry.

(6) Reading: "Stock Breeding" (Miles); Live Stock Hand Books; "Farm Live Stock of Great Britain" (Wallace), Chaps. 3, 4, 5, 6, 7, and 17; "The Business Hen" (Rural Publishing Co., N.Y.); Reports and Bulletins as directed.

Dairying.

(1) Theory and practice in everything pertaining to the setting of milk, handling of milk and cream, milk-testing, butter-making, cheese-making, and the running of cream separators, etc., as required of students in the special Dairy Course; pasteurization of milk; dairy bacteriology; experimental work, and original investigation.

(2) Reading: "American Dairying" (Gurler); "Chedder Cheese-Making" (Decker); "Milk-Testing" (Shoenman); "Milk, Butter and Cheese" (Oliver); "The Farm and the Dairy" (Sheldon); "Dairy Bacteriology" (Russell).

Entomology.

(1) Review of second year work.

(2) Further study of those species which attack farm and garden crops.

(3) Reading: "Insects and Insecticides" (Weed); portions of "Comstock's Entomology."

Reference: "Insects Injurious to Fruits" (Saunders).

II.—HORTICULTURE, BOTANY, AND ENTOMOLOGY.

Horticulture.

Fruit Growing—

(1) General review of second year lectures.

(2) Laboratory work in pollination; propagation of plants; preparation of insecticides and fungicides; management of pumps, nozzles, and other appliances for spraying; laying out of orchards and fruit gardens; classification and description of fruits; making drawings of fruits.

(3) Reading: "American Fruit Culturist" (Thomas); "Amateur Fruit Grower" (Green) "Small Fruit Culturist" (Fuller); "Nursery Book" (Bailey), and "The Apple in North America" (Bailey).

Vegetable Gardening—

(1) General review of second year lectures.

(2) Laboratory work in testing seeds and conditions favorable to germination; transplanting seedlings; forcing vegetable crops; handling and storing vegetables: planning, arrangement and rotation of crops in garden; making hotbeds and cold frames, etc.

(3) Reading : "How to make the Garden Pay" (Greiner) ; "Vegetable Garden" (Vilmorin), and "Origin of Cultivated Plants" (De Candolle).

FLORICULTURE—

(1) Lectures based on work in laboratory and greenhouses.

(2) Laboratory work in the preparation of soil for plants ; propagating plants ; study of the effects of atmosphere, temperature, and light on plants ; watering ; trimming ; training ; treatment of frozen plants ; resting plants ; making collections suitable for window, conservatory, hanging baskets, rockeries, and flower beds ; arrangement of plants for effect.

(3) Reading : "Home Floriculture" (Vick), and "Practical Floriculture" (Henderson).

ARBORICULTURE—

(1) Lectures on the importance of forests, their effect on climate, etc.; kinds of trees, their occurrence, habits, and uses ; raising trees from seed ; planting and management of trees with a view to shelter, ornament and economy.

(2) Reading : Practical Forestry (Fuller).

BOTANY—

(1] General review of first and second year work, with "Spaulding's Introduction to Botany" as a text-book.

(2) Systematic botany and experimental plant physiology : mounting of 100 plants ; collection and identification of seeds of 25 species of weeds.

(3) Microscopic study of injurious fungi which affect orchard, garden, and greenhouse crops and plants.

(4) Reading : "Experimental Plant Physiology," (Oels and Macdougall) ; "Physiological Botany for Gardeners," (Sorauer) ; "Fungi and Fungicides," (Weed) ; bulletins, reports and special literature as directed.

ENTOMOLOGY—

(1) Review of second year work.

(2) Further study of species, especially those which attack orchard, garden and greenhouse crops and plants.

(3) Reading : "Insects and Insecticides," (Weed) ; "Insects Injurious to Fruit," (Saunders) ; portions of Comstock's "Entomology."

III.—BIOLOGY.

BOTANY—

(1) Review of first and second year work, with Spaulding's "Introduction to Botany" as a text-book.

(2) Systematic Botany ; mounting of 100 plants ; collection and identification of 25 species of weeds.

(3) Experimental Plant Physiology ; Laboratory work with "Experimental Plant Physiology," by Oels and Macdougall, as a text-book.

(4) Vegetable Histology ; methods ; imbedding, section cutting, mounting on tissues, etc., with Thomas's "Vegetable Histology" as a text book, and references to Lee's "Microtomist's Vade Mecum," Zimmerman's "Micro-Technique," Bower's "Practical Botany," and special literature as directed.

(5) Cyptogamic Botany and plant Pathology ; a laboratory course, supplemented by lectures—microscopic study of the diseases of plants ; remedies, etc.; collection and identification of 25 species of injurious fungi.

Reading and reference : "Fungi and Fungicides," (Weed) ; "British Uredineae and Ustilagineae," (Plowright) ; "British Fungous Flora," (Massee) ; "Myxogastres" (Massee) ; "Biology of Ferns" (Atkinson) ; special and current literature as directed.

(6) Reading : As prescribed by professor, including portions of "Text-Book of Botany," by Vines ; and "Outlines of the Classification of Plants," by Goebel ; also current literature.

Books of reference : Spotton, Part II. ; "Manual of Botany," (Gray) ; "Practical Botany," (Bowers) ; "Comparative Anatomy of the Phanerogams and Ferns," (De Barry) ; "Physiological Botany," (Sachs).

Zoology—

(1) Lectures and laboratory work, including dissection and critical examination of typical specimens of the main divisions of the animal kingdom.

(2) Histology (elementary work): Methods; imbedding, cutting, and mounting of specimens, with Huber's "Normal Histology" as a text-book.

(3) Reading: As prescribed by professor, including portions of "Invetebrate Zoology," (McMurrich); "Zoology," (Wright), and "Biology," (Parker).

Reference: "Biology," (Huxley); "Practical Zoology," (Cotton); "Zootomy," (Parker).

Dissecting Instruments, etc., to be provided by students, say, 1 scalpel, 1 pair scissors (fine) 1 pair forceps, and a lens.

IV.—BACTERIOLOGY.

Bacteriology—

(1) The Microscope and its technique.

(2) Life history and structure of bacterial cell; form and classification of bacteria; requirements and chemistry of bacteria; staining; preparation of culture media.

(3) Laboratory work with non-pathogenic and pathogenic germs; methods of infection; post morten and microscopical examination.

(4) Reading: "Principles of Bacteriology," (Abbott); "Manual of Bacteriology," (Sternberg); "Dairy Bacteriology," (Russell); "Bacteriology," (Novy).

Histology—

Methods: imbedding, cutting, mounting, and drawing of specimens; Klein's Histology.

After completing the above course the student will be required to specialize in some line of bacteriological work, to be chosen in consultation with the Bacteriologist; and to prepare a thesis on original work done in the line of his specialty.

Special reading and books of reference will be prescribed for each student according to the line of investigation chosen by him.

V.—CHEMISTRY AND PHYSICS.

Chemistry—

(1) Organic Chemistry—elementary course of 48 lectures.

(2) Inorganic Chemistry—a course of 28 lectures.

(3) *Laboratory Work.*

(1) Preparation of 82 organic compounds (Orendorf).

(2) Full course in qualitative analysis.

(3) Gravimetric and volumetric analysis.

(4) Quantitative analysis of water, soils, manures, fodders, and dairy products, etc.

(4) Reading: As prescribed by the Professor of Chemistry, including introduction to the study of the Carbon Compounds (Remsen); Elliot & Storer's Qualitative Chemical Analysis; Principles of Theoretical Chemistry, (Remsen); portions of Manual of Qualitative Chemical Analysis, (Fresenius): Inorganic Chemistry, Advanced Course, (Remsen); Principles and Practice of Agricultural Analysis (Wiley).

Text Books: "Agricultural Chemistry," (Warrington); "Agriculture," Vols. I. and II. (Storer); "Manual of Cattle Feeding," (Armsby); "Compounds of Carbon," (Remsen) "Inorganic Chemistry," Advanced Course, Remsen); "Laboratory Manual" (Orendorf).

Physics—

(1) Review of second year work.

(2) Soil physics; "The Soil," King.

(3) Laboratory Work in General and Agricultural Physics.

APPENDIX III.

EXAMINATION PAPERS.

I. Papers set at Easter Examinations, 1898.

FIRST YEAR.

Agriculture.

I. Describe the conditions necessary in order that a soil may be productive.

II. Describe the advantages and disadvantages of manure sheds and open yards for keeping manure.

III. What are the main sources of loss in farm-yard manure, and how may these losses be lessened?

IV. Discuss the relation of humus to soil fertility.

V. What means may be employed in order to render the mineral matter of the soil available to plants?

VI. Describe the characteristic effects of lime and gypsum on the soil.

VII. State what is required in the beef animal in connection with the following points, and give reasons: loin, rib, shoulder, fore flank and skin.

Agriculture: Cultivation and Seeding.

I. Give three methods of summer-fallowing, and explain advantages and disadvantages of each system.

II. How would you prepare pea land for fall wheat? At what time should the wheat be sown, and what quantity per acre?

III. In seeding fall wheat with clover and grass seed, what quantities should be sown and at what time.

IV. What rotation of crops would be advisable to adopt to maintain soil fertility?

V. Give fall cultivation of sod land intended for corn, roots and peas.

VI. How would you cultivate land in the fall, after corn and roots?

VII. State spring cultivation of land intended for spring wheat, oats and barley.

VIII. What quantity of spring grain is it advisable to sow per acre, including peas? How would you determine the depth grain and seeds should be put in the soil?

IX. How should clover and grass seed be sown with spring grain to insure a catch?

Poultry.

I. What varieties of fowl would you select for winter layers, and state whether they are sitters or non-sitters. To what age would you consider them profitable for egg production?

II. What location would you select on which to erect poultry buildings? Give reasons. What kind of floor would you prefer in poultry houses, and what system of ventilation would you consider the best and cheapest?

III. What varieties of fowl would you select if meat production were the chief object in view, and state reasons for your selection?

IV. Name the different varieties of fowl in the American Class, stating color of plumage, color of skin, and shape of comb.

V. How would you construct roosts, troughs for soft food, nests, and dust boxes?

VI. What would you feed, and how would you prepare it, for egg production when fowls are confined to winter quarters?

VII. Give symptoms of "roup," "chicken-pox," and "vertigo," and treatment in each case.

VIII. Describe a "rose," "single," "pea," and "leaf" comb.

IX. (For B class only) Describe a fertile and an unfertile egg on the sixth and eighteenth days during the period of incubation.

X. (For A class only) Name the varieties of fowl in the Asiatic class that have white skin, and those that have yellow skin. What kind of a comb has the Brahma?

Inorganic Chemistry.

I. Define and give examples of each of the following: chemical change, incombustible substance, acid salt, neutral salt, metal, base, and acid.

II. "The weight of the substance burned plus the weight of the oxygen used up is exactly equal to the weight of the product formed." Explain. Outline an experiment proving the statement.

III. Twenty grams of zinc are treated with sulphuric acid. How much hydrogen will be liberated (*a*) by weigh? (*b*) by volume?

$Zn=65$, $H=1$, $S=32$, $O=16$.

Sketch the apparatus showing the preparation and collection of the gas.

How may it be proven that the gas collected is hydrogen?

IV. What is formed (*a*) when hydrogen burns, (*b*) when charcoai burns, (*c*) when hydrogen sulphide burns, (*d*) when nitric oxide is exposed to the air, (*e*) when carbon dioxide is passed into lime water, (*f*) when hydrogen is passed over heated copper oxide, (*g*) when ammonium nitrate is heated?

V. What substances have been studied that are used for bleaching purposes? How are they formed and what is their composition?

VI. Complete the following equations:—

$HglC_2+H_2S=$ | $CaCO_2+HCl=$

$Na+H_2O=$ | $NaCl+H_2SO_4=$

$CuO+CO=$ | $Ca(OH)_2+Co_2$ in excess$=$

$NH_4Cl+Ca(OH)_4=$

VII. What laws are explained by the atomic theory?
Show clearly how this theory does explain them?

VIII. How are salts of the different acids named?

IX. When oxalic acid is treated with sulphuric acid two gases are given off. What are they, and how may they be separated?

X. Name the members of the chlorine family, and compare their physical properties.

Zoology.

I. Illustrate by diagram or otherwise the structure of a sponge.

II. Give instances of asexual reproduction among invertebrates.

III. What peculiarities of structure does the spider possess in common with other Arthropoda? What characters separate it from the insecta?

IV. What modification of the parts of the mouth are seen in insects?

V. Describe the exoskeleton of the perch.

VI. Give a classification of the reptiles. Note some of the common Canadian species.

VII. Describe the heart and circulatory system of a fish. In what respect does the blood differ from the blood of birds?

VIII. Write notes upon either the Raptores or Passeres—their distinguishing characteristics, habits of life, familiar representatives, &c.

IX. Note differences between the skeleton of a horse and of a pigeon.

X. What are the reasons for and against placing man in the order Primates?

Horticulture.

I. Define the following terms: Epidermis, cambium, collar, alburnum, stomata, shoot.

II. What do you understand by the following terms: "Compound fruit-bud," "tripple fruit-buds," "self-sterile," "cross-fertilization?"

III. Write brief notes on the nature and functions of roots.

IV. Explain how the trunk of a tree increases in size.

V. Describe the appearance and manner of growth of the principal forms of fruiting branches in an apple tree.

VI. What are the conditions most favourable to the "setting of fruit" in an orchard?

VII. Explain how new varieties of fruit are obtained.

Veterinary Anatomy.

I. Describe the periosteum.

II. Describe the os naviculare.

III. Name and define the different motions in joints.

IV. State the number, kinds, and arrangement of teeth you would expect to find in the mouth of a three-year-old.

V. State the manner in which the bile and pancreatic juice enter the digestive organs, and state in detail the functions of each.

VI. State the differences between the liver and its duct of the horse, and of the ox.

VII. Describe the inguinal canals.

VIII. Follow the blood from the left ventricle to the brain.

IX. Describe the membrana nicticans.

X. Describe the internal surface of the wall of the hoof.

English Literature.

I. State in what poem, and in what connection, each of the following passages occur:

(*a*) A traveller, *by* the faithful hound,
Half-buried in the snow was found.

(*b*) As showers from the clouds of summer,
Or tears from the eyelids start.

(*c*) For the gods see everywhere.

(*d*) In spite of false lights on the shore,
Sail on, nor fear to breast the sea.

(*e*) *It is the heart and not the brain,*
That to the highest doth attain.

(*f*) *But we have feet to scale and climb,*
By slow degrees, by more and more,
The cloudy summits of our time.

(*g*) Making the humble house and the modest apparel of homespun
Beautiful with her beauty, and *rich with the wealth of her being.*

II. Explain clearly the meaning of the underlined parts in I.

III. Scan passages (*b*), (*c*), (*d*), (*g*), and name the different kinds of measure used.

IV. Write in your own words the story, "The Legend Beautiful."

V. Explain clearly the underlying meaning of each incident of the "Legend Beautiful," and deduce the moral lesson implied in the poem.

VI. "There are few more beautiful or striking scenes in England than are presented by the *vicinity* of this ancient Saxon fortress. The *soft* and *gentle* river Don *sweeps* through an *amphitheatre*, in whith cultivation is richly blended with woodland, and on a mount, ascending from the river, well defended by walls and ditches, rises this ancient edifice, which, as its Saxon name implies, was, previous to the Conquest, a royal residence of the kings of England. The outer walls have probably been added by the Normans, but the inner keep bears token of very great antiquity. It is situated on a mound at one angle of the inner court, and forms a complete circle of perhaps twenty-five feet in diameter. The wall is of immense thickness, and is propped or defended by six huge external *buttresses* which project from the circle, and rise up against the sides of the tower as if to strengthen or to support it. These massive buttresses are solid when they arise from the foundation, and a good way higher up; but are hollowed out towards the top, and terminate in a sort of turrets communicating with the interior of the keep itself. The distant appearance of this huge building, with these singular *accompaniments*, is as interesting to the lovers of the *picturesque* as the interior castle is to the eager *antiquary*, whose imagination it carries back to the days of the heptarchy. A barrow, in the vicinity of the castle, is pointed out as the tomb of the memorable Hengist; and various monuments, of great antiquity and curiosity, are shown in the neighbouring churchyard."

State the exact meaning, as used here, of each underlined wor

VII. Draw a diagram of a horizontal section, through the foundation, of the keep and buttress, and make a sketch of one of the buttresses.

VIII. "In which cultivation is richly blended with woodland."

Re-state this in other words.

"This ancient edifice, *as its Saxon name implies*, was a royal residence." Explain giving the name referred to.

"The date of the heptarchy;" "the memorable Hengist." Write explanatory notes on these phrases.

IX. Write the substance of the concluding chapters of "Ivanhoe," as affecting

1. Athelstane.
2. Ivanhoe.
3. Rebecca.

NOTE.—Class B. may omit V.

Grammar and Composition.

DIVISION A.

I. (1) Distinguish between *object* and *predicate noun*, and between *predicate adjectives* and *modifier of the predicate*.

(2) In the following sentences, point out the *objects*, the *predicate nouns*, the *predicate adjectives*, and the *modifiers of the predicate*:—

(*a*) His so-called friend became his bitterest enemy.

(*b*) On this low ground, they have grown hay a hundred years.

(*c*) Already he has grown dissatisfied with his work.

II. In the following sentences, fill the blank with *is* or *are*, giving, in each case, your reason for selecting the word you do select:—

(1) There ...... not two persons here.

(2) The news ...... not pleasant.

(3) All of his friends ...... gone.

(4) All of his money ...... spent.

(5) The captain, as well as the sailors ...... lost.

III. (1) What are the principal parts of a verb, and why are they so called?

(2) Give the principal parts of *bring*, *freeze*, *lie*, *lay* and *hurt*.

IV. (1) State the different ways in which compound nouns form their plurals, and write the plurals of *half-penny*, *president-elect*, *handful* and *knight-templar*.

(2) Write the possessive singular and plural of *brother-in-law*, *prince* and *princess*.

V. Punctuate the following:—

(1) Self-conceit presumption and obstinacy hurt the career of many a boy.

(2) Some affirm that we say let us do evil that good may come.

(3) And what does this concern me said the Scot much answered the physician even the sage flies the tempest which he cannot control.

VI. Correct the following, giving a reason for each change that you make.

(1) If he was here, he would tell you at once.

(2) What sort of a man is he?

(3) Going from A—— to B—— the scenery is beautiful.

(4) His father was one of the best men that has ever lived.

(5) Do you wish me to bring this book, or will I leave it at home?

VII. Write a short essay (about 250 words) on *one* of the following subjects:—

(1) The Klondike. (2) The Bicycle.

(3) The Value of Education to the Farmer.

N. B.—Write the essay on a separate sheet of paper. The value of the essay will be estimated from an *arrangement of the thoughts*, the *clearness of expression*, the *grammatical correctness of the sentences*, the *spelling*, and *punctuation*.

Grammar and Composition.

DIVISION B.

I. Many adjectives are said to be capable of *comparison*. Explain this. Compare the following :—Good, tall, worse, round, fore, far.

II. Give the *general rule* for the formation of the plural of nouns in English. Mention five other modes of forming the plural, illustrating each by an example.

III. Define the following terms, and give one example of each used correctly in a sentence :—*copula, complement, phrase, predicate adjective, object.*

IV. Name the *principal parts* of a verb. Why are they so called ? Give the principal parts of the following :—Ring, swing, walk; eat, freeze, bore, trod, could, wist, chide.

V. Distinguish between *direct* and *indirect* quotation, illustrating your answer by examples of each.

VI. Use each of the following words in a sentence in which the other synonym could not properly be placed :—Balance, excuse, artizan, artist, remainder, apology.

VII. Correct the following, giving briefly your reasons for any change you may make :—

(1) I never was more aggravated.
(2) I would like to go very badly.
(3) This event transpired soon after my arrival
(4) It was done by John and me.
(5) Happiness is not complete, except it is shared with another.

I. Write a letter to a friend describing some event in your College life.

Pay particular attention to the placing and punctuation of the heading, salutation and conclusion. Body of letter not to exceed 250 words.

Arithmetic.

I. The list price for a binder is $120. The agent gives me a double discount of 15 per cent. and 8 per cent. off. How much less do I pay him than if he had given me a single discount of 20 per cent.

II. I wish to mix peas with 15 bushels of barley so as to have a mixture weighing 50 lbs. per bushel. How many bushels of peas will be required ?

Peas = 60 lbs. per bushel. Barley = 48 lbs. per bushel.

A mixture of peas and barley weighs 4,920 lbs. and measures 90 bushels. Find how many bushels of each there are in the mixture.

III. The rate of taxation in London is 18 mills on the dollar. Find the amount of my bill for taxes. My property is assessed at $3,200, and my income is $1,500, $500 of the income being exempted from taxation.

IV. $400.00. Guelph, May 5th, 1890.

Eighty days after date, I promise to pay R. W. Johnson, or order, four thousand dollars at Bank of Commerce here. Value received. R. JONES.

This note was discounted by Mr. Johnson at Dominion Bank, on May 15th, 1890, at 7 per cent. Find the net proceeds.

V. I invest $9,100 cash in bank stock at $90\frac{7}{8}$, brokerage $\frac{1}{8}$, and sell out when the stock has risen to 92, brokerage $\frac{1}{8}$. What did I gain ?

VI. Find the difference between *simple* and *compound* interest on $763.50 for 8 years at 5 per cent.

VII. A man built a house costing $2,400.00, on a lot costing $500. He insured the house for three-fourths of its cost at two-thirds per cent. Subsequently the house was burned and the insurance paid in full. He then sold the lot for $800.00. Find his total gain or loss on the transaction.

VIII. In Sept., 1893, I had 650 bushels oats, for which I was offered 40c. per bushel. I kept the oats and sold six months later at 41c. Did I lose or gain by holding them, money being worth 4 per cent.

For Division "A" only.

IX. What sum deposited each year for twenty years will amount, at the end of that time, to $2,000.00, money being worth 4 per cent., compounded annually?

And hence if a premium of $82.56 a year be paid for a policy of $2,000.00, twenty-year endowment, how much is paid simply for insurance?

X. A company has $1,000,000 capital stock, half of which is preferred stock on which is guaranteed an 8 per cent. per annum dividend. In 1897 this company made a clear profit of $75,000. What rate of dividend can they declare to the holders of ordinary stock if they transfer $5,000 to the reserve fund? What would be the market value of the ordinary stock, money being worth 4 per cent. and the risk being considered worth 2 per cent.?

For Division "B" only.

XI. How many bushels of oats can be put in a bin of the following dimensions: length, 30 ft.; breadth, 17 ft.; depth, 9 ft. NOTE.—A cubic foot of oats weighs 26.6 lbs.

XII. Find which of the following is the better offer for a binder: (a) Spot cash, $110.00. (b) Two equal annual payments of $57.00, first payment made now. Money worth 5 per cent.

Book-keeping.

Division A.

I. Define:—Assets, Liabilities, Inventory, Maturity, Lien Note, Draft, Cheque, Receipt, Net Capital, Net Insolvency.

II. A and B borrow $250 each, and each gives his note for 2 months, bearing interest at 8 per cent. A's note is dated Dec. 28th, 1897, and B's, Dec. 31st, 1897. When will each note become due and how much interest will each pay?

III. On May 1st, 1897, I sold A. Black a horse for $80. I receive in payment R. White's note dated April 10th, 1887, at 2 months for $60, and cash for the balance.

(*a*) Write the above note and the endorsement.

(*b*) On what date must the note be presented for payment?

(*c*) If it is not paid on the day of maturity, within what time must it be protested?

(*d*) What difference would it make to each person concerned, if it is not protested?

IV. Journalize:—

January 3rd—Bought from A. Smith on account, 30 bushels wheat at 75c.

January 5th—Bought on my note at 6 months, one team of horses at $160.

January 20th—Sold for cash, 250 bushels peas at 45c.

January 30th—Prepaid my note of Jan. 5th per cheque; discount allowed, 7 per cent.

February 10th—J. Jones who owed me $50 becomes insolvent and settles with his creditors at 60 cents on the dollar. I receive my share in cash.

V. Write a sight draft and a time draft, and write across the face of each the proper form of acceptance.

VI. Write Day-book entries to suit the following Journal entries:—

(*a*) Bank Dr. $98.
Interest and discount Dr. $2.
To billls received $100.

(*b*) Loss and gain Dr. $5.
To cash....$5.

(c) Bills received Dr. $100.
To bills received... $100.

(*d*) Bills received Dr. $40.
To Mdse.......$20.
To A. Smith.. 20.

(*e*) E. J. Brown Dr. $10.
To A White....$10.

VII. From the following trial balance show two distinct ways of finding the loss or gain :

Dr	Trial Balance.	Cr.
$ 8 50	Proprietor	$ 6409 42
2,319 00	Real Estate	
2,508 95	Live Stock	340 00
1,800 72	Cash	804 40
510 00	Bills Rec	125 00
	Bills Pay	340 00
87 10	J. Jones	67 60
735 05	Bank	311 50
408 00	Tools and Machinery	
1 13	Loss and Gain	3 48
22 95	Expense	

Real estate, $2,400. Tools and machinery, $330. Interest accrued on bills received, $2.50. Clerk's salary due and unpaid, $5. Interest accrued on bills pay., $2.40. Live stock, $2,200. Rent paid in advance, $10.

Book-keeping

DIVISION B.

I. Explain fully the following terms :—Business Transaction, Negotiable Paper, Ad Valorem, Certified Check, Dishonor, Indorse, Protest, Power of Attorney.

II. Give briefly the *requisites* of a *promissory note.*

Write the note received from R. Jones on April 1st, 1897, as per question V. of this paper.

III. Of what use is a Trial Balance? Explain fully. If in closing a set of accounts your trial balance shows $40 more *debits* than *credits*, state clearly what steps you would take to find the error

IV. Give Day Book entries for the following :

(*a*) Farm Expense Dr. $100.00.
To Cash $100.00.

(*b*) Loss and Gain Dr. $65.00.
To Cows $65.00.

(*c*) Cash Dr. $375.00.
To Farm Produce $375.00.

(*d*) Garden and Orchard Dr. $27.00.
To Cash $27.00.

V. Journalize the following :

Sold R. Jones on his note at 30 days, 40 bushels wheat at 90c.

3. Discounted J. Jones' note due 73 days hence. Face of note, $200.00. Discount rate, 6 per cent. Proceeds deposited.

4. Purchased plow for cash, $15.00.

5. Bought of R. Johnson, goods valued at $90.00. Gave in payment cash, $30 and check on Bank of Commerce for balance.

VI. Write the check referred to in question V. Explain what is meant by "marking" a check. Explain how you would pay a bill of $40.00 in Toronto by check.

VII. Make out a *Combined Statement* in complete form from the following data :—

Dr.	Trial Balance.	Cr.
$ 881 00	Stock	$ 5,000 00
5,794 67	Cash	4,800 00
1,500 00	Bills rec	1,000 00
3,500 00	Mdse	2,759 50
1,500 00	Bills pay	1,750 00
300 00	J. Mason	175 00
4,000 00	P. Smith	1,500 00
	R. Jones	867 00
375 83	Expense	

Goods unsold valued at $1,208 00.

VIII. What is the object of book-keeping, and of what importance is the subject to the farmer? Give a list of the books you would recommend for a stock farm.

Drawing.

I. Define the following terms, illustrating each definition by a drawing :—Quadrant, sector, chord, radius, circumference.

II. Construct an equilateral triangle on a given line AB, 3 inches long. Divide one side so that the two parts shall be to each other as 3 to 5.

III. Distinguish between a *vertical* and a *perpendicular* line. At the end of an oblique line 3 inches long erect a perpendicular without using a square. Trisect the angle thus formed.

IV. Show two methods of dividing a line 2 inches long into 5 equal parts.

V. For "B" only.

What is an *arc?* Draw an arc and bisect it.

For "A" only.

A man is standing opposite a point (in the wall) 5 feet from the end of a wall 20 feet long, and 15 feet from its nearer extremity. Represent his position by a point named D and the wall by a line AB, and find how far he is from the more distant end of the wall. Scale 1/48.

VI. Given a basement of a barn 104 x 66 ft. outside measurement, with walls 2 feet thick. Half the basement is arranged to feed 50 steers loose. The other half includes a stable for 11 cows, a stable for 7 horses, feed room, root house, and two box stalls, one for horses and one for cows. Outside the building, on the north side, is a round silo 23 ft. in diameter. Draw a ground plan of this basement, showing all the parts, including the silo. Show all necessary windows, doors, mangers, and partitions. Indicate important measurements. Scale, 1/96.

SECOND YEAR.

Agriculture.

I. Describe general characteristics of Dorset, Southdown, Lincoln, Merino, and Cheviot sheep.

II. If you were selecting a Shropshire ram, describe the kind of animal you would select.

III. Discuss the causes that have produced so many different breeds of live stock.

IV. Show how a knowledge of the principles of live stock breeding may be of assistance to the practical stock breeder.

V. Describe the general characteristics of Aberdeen-Angus and Devon cattle.

VI. Compare the Aberdeen-Angus with the Galloway, and the Devon with the Sussex.

VII. Describe a typical Hereford bull.

Bacteriology.

I. An animal dies of Anthrax in the stable. State how you would dispose of the carcass and disinfect the stable.

II. What hypotheses have been proposed to account for immunity? Which do you prefer?

III. Discuss the resistance of bacteria to external influences.

IV. What bacterial diseases are water-borne?
Sketch and describe the construction of an hygienic well.

V. Define pasteurization. What benefits are gained by the parteurization of milk?

VI. Discuss the bacterial contamination of milk.

VII. How do the legumes fix free nitrogen?

Animal Chemistry.

I. How are the porportions of the various constituents of the animal body affected by (a) growth, (b) fattening, (c) maturity?

II. Where and by what digestive agent, or agents, is each nutrient of the food digested?

III. What change is there in the composition and digestibility (a) of a plant as it approaches maturity, (b) of hay upon which rain has fallen, (c) of hay that has heated excessively in the mow, (d) of corn in the making of sweet silage, (e) of corn in the making of sour silage?

IV. Outline fully a method for the determination of the digestibility of clover hay.

V. What points should be stated in a feeding standard? Of what use are they to stockmen?

VI. Given an animal in poor flesh, outline your method of proceedure in fattening, and give your reasons for each step.

VII. An animal is being fed a maintenance ration. (a) What will be the effect of increasing the carbohydrates alone? (b) What would be the effect of increasing the albuminoids alone? (c) In what way would you change the rations to prepare the animal for work?

VIII. Discuss briefly the distribution of the manurial constituents of a fodder in the solid and liquid excrement.

IX. 500 lbs. of barley containing 53 lbs. of protein, of which 75 per cent. is digestible, will, in the case of a fattening pig, produce 100 lbs. of animal increase, containing 7.8 lbs. of albuminoids. How much nitrogen will appear in the urine? How much urea?

X. What are the different theories that have been held with reference to the formation of fat in the animal body? By whom were they advanced? Why is it so difficult to arrive at a definite conclusion in the matter?

Horticulture.

I. Describe with drawings two different methods of training the grape vine, and state the advantages of each.

II. (1) Enumerate the different kinds of fruits which should be found in the farmer's small-fruit garden, mentioning three of the leading varieties of each. (2) What do you consider the most suitable plan for the arrangement of these, and the proper distances for planting?

III. Give brief directions for the planting and care of a strawberry plantation.

IV. How would you make and manage (1) a hotbed, (2) a cold frame?

V. State in your own words some of the most important results obtained in the Experimental Department here upon the selection, treatment, planting, and cultivation of potatoes.

VI. Give full directions for the propagation, planting, cultivation, and cutting of asparagus.

VII. Write a brief, pointed article on the care and management of house plants.

Veterinary Pathology.

I. Define lameness, and give treatment for a horse lame from corn.

II. Name the diseases of the hock, and treat a case of curb.

III. Give treatment for a lacerated wound.

IV. Give your opinion as to the better course to be followed in a case of umbilical hernia in a colt three weeks old.

V. Give symptoms and treatment for tympanitis in the ox.

VI. State the precautions to be observed before performing castration in colts.

VII. Give causes, symptoms, and treatment for spasmodic colic.

VIII. Give symptoms and treatment for laryngitis.

IX. Give causes, symptoms, and treatment for diarrhœa.

X. Treat a case of dislocation of the eyeball in a dog.

English Literature.

I. Locate the following passages :

(*a*) To thee it shall descend with better quiet,
Better opinion, better confirmation ;
For all the *soil of the achievement* goes
With me into the earth.

(*b*) Some pigeons, Davy ; a couple of short-legged hens, a joint of mutton, and any pretty little tiny kickshaws, tell William cook.

(*c*) And, as you are a king, speak in your state,
What I have done that misbecame *my place*,
My person, or my *liege's sovereignty.*

(*d*) It was great pity, so it was,
This *villainous saltpetre* should be digged
Out of the bowels of the harmless earth.

(*e*) Never did *base and rotten policy*
Color her working with such deadly wounds.

(*f*) If I cannot once or twice in a quarter *bear out a knave against an honest man*, I have but a little credit with your worship.

(*g*) Reply not to me with a *fool-born jest:*
Presume not that I am the thing I was.

(*h*) An habitation giddy and unsure
Hath he that buildeth on the *vulgar heart.*

II. Write explanatory notes on the underlined passages in I.

III. Give a summary of (1) King Henry's address to Sleep.
(2) Prince Henry's farewell to Falstaff.

IV. Can the charge of immorality or indelicacy be fairly brought against any of the scenes in these two plays of Henry IV. ?
Discuss the question impartially.

V. What is the *nature*, and what is the *cause*, of the change from Prince Hal to Henry V., as represented by Shakespeare ?

VI. What final judgment does Shakespeare intend us to pass upon Falstaff ?

VII. Compare the following pairs of characters :
1. Glendower and Hotspur.
2. Hotspur and Prince Henry.

VIII. And by his light
Did all the chivalry of England move
To do brave acts ; he was, indeed, the glass
Wherein the noble youth did dress themselves.
He had no legs that practised not his gait ;
And speaking thick, where nature made his blemish,
Became the accents of the valiant.
For those that could speak low, and tardily
Would turn their own perfection to abuse,
To seem like him : So that, in speech, in gait,
In diet, in affections of delight,
In military rules, humors of blood
He was the mark and glass, copy and book,
That fashioned others.

(*a*) Name the speaker of this passage, and state in what connection it occurs. (*b*) Write the meaning in plain prose, being careful to make clear any difficulties or obscurities.

Composition and Prose Literature.

I. Correct or improve each of the following sentences, stating the principle of composition involved in each :

(*a*) As people realize the large returns derived from soiling they will gradually adopt the system.

(*b*) Planting the trees twenty feet apart allows them to spread more and not grow so high.

(c) There are various ways of preventing insects from developing among which are clean cultivation destroys their breeding-places, hogs kept in the orchard will eat fallen apples.

(d) The evaporation of the fruit has not yet started to any great extent in Ontario as the markets are capable of consuming all the product in a fresh state.

(e) At the age of 18, Tennyson's first peoms were published.

(f) His pen continued to flow until the death of Hallam in 1833.

(g) He proposes to Enid, and offers her food, drink, and riches.

(h) In considering the question as to whether this story could be dramatized, my answer would be in the affirmative, but not successfully.

(i) What the nineteenth century boy and girl requires is an education suitable to make him or her independent of their surroundings.

(j) After convincing himself that Sir Kenneth is not an imposter, they open an iron door.

II. "But good society is of very expensive production, requiring nothing less than a wide and arduous national life condensed in unfragrant, deafening factories, cramping itself in mines, sweating at furnaces, grinding, hammering, weaving under more or less oppression of carbonic acid, or else spread over sheep-walks, and scattered in lonely houses and huts on the clayey or chalky cornlands, where the rainy days look dreary. This wide national life is based entirely on emphasis—the emphasis of want, which urges it into the activities necessary for the maintainence of good society and light irony; it spends its heavy years often in a chill, uncarpeted fashion, amid family discord unsoftened by long corridors. Under such circumstances, there are many among its myriads of souls who have absolutely needed an emphatic belief; life in this unpleasurable shape demanding some solution even to unspeculative minds, just as you inquire into the stuffing of your couch when anything galls you there, whereas eiderdown and perfect French springs excite no question. Some have an emphatic belief in alcohol, and seek their *ekstasis* or outside standing-ground in gin; but the rest require something that good society calls "enthusiasm," something that will present motives in an entire absence of high prizes, something that will give patience and feed human love when the limbs ache with weariness, and human looks are hard upon us—something, clearly, that lies outside personal desires, that includes resignation for ourselves and active love for what is not in ourselves."

1. Restate the thoughts of this paragraph in simple direct language, without ornament.
2. Point out the characteristic qualities of style found in this quotation.

III. Describe the character of Stephen Guest.

IV. In what principal respects does this story (The Mill on the Floss) differ from one of Scott's (such as the 'Talisman' or 'Ivanhoe.')?

Political Economy.

I. Define: Wealth, capital, free silver, bi-metallism, and single tax.

II. Explain the origin of rent and state Ricardo's "Law of Rent."

III. Discuss the influences which affect the rate of wages.

IV. A manufacturer arranges to distribute among his employees three-quarters of his profits, after taking five per cent. on his capital.

(a) Wherein does this system resemble and wherein does it differ from co-operation?

(b) What would be the chief advantages and what the chief difficulties of such a plan?

V. "Value depends upon supply and demand." Criticise this statement.

VI (a) Distinguish between controvertible and incontrovertible paper money.

(b) Which of the two kinds of paper money is in use in this country, and why is it used?

(c) Why are banks not allowed to issue notes at will?

VII. State concisely the main points of the Canadian law regarding the issue and security for redemption of (1) Dominion notes,
(2) Canadian bank notes.

Physics

I. Give a scientific explanation of what is vulgarly called "suction."

II. Explain what is meant by "degrees of freedom" of a molecule. Illustrate with reference to the different states of matter.

III. Describe the hydraulic ram, and explain its action. Under what circumstances can it be used to advantage?

IV. Discuss the advantages of air, alcohol, and water, respectively, as thermometric fluids.

V. Explain the actions of heat, at increasing temperatures, upon wood and iron respectively.

VI. Define the term "elasticity" as applied to a gas.

VII. Describe and explain the phenomena observed after pouring water upon a column of soil through which water is rising by capillarity.

VIII. Define 'percolation' and 'capillarity.'

IX. "In soils taking up water from below, the maximum height of water is sooner or later reached, but is different for different soils." Explain.

X. Define 'specific heat.'
If the heat yielded by 1000 grams of water in cooling down from 100° to 0° C. were employed in heating 10,000 grams of mercury, initially at 20° C., to what temperature would the mercury be raised? Sp. H. of mercury = .033.

XI. Coefficient of expansion of milk between 20° and 40° C. = .00029.
Coefficient of expansion of cream between 20° and 40° C. = .00066,
Sp. Heat of milk = .92.
Sp. Heat of cream = .76.
Point out the relation between these facts and the separation of cream and milk by the gravity method, it being found that *cooling* hastens the separation.

XII. Determine the work done in pumping a column of water 1 sq. ft. in area, 10 ft. high, from a reservoir whose surface area is 1000 sq. ft.

II. Papers Set at Midsummer Examinations, 1898.

FIRST YEAR.

Agriculture.

I. Explain the effects upon the soil of cereal crops, root crops, and leguminous crops.

II. Give directions for growing fall wheat, barley, and mangels, stating their place in the rotation and the soils on which they may be grown.

III. (*a*) What are cover crops?
(*b*) Explain their utility, name crops suitable for the purpose, and give directions for growing each crop named.

IV. Describe fully the influence of red clover as a soil improver, and how to grow the crop successfully.

V. Give an example of a four-year, a five-year, and a six-year rotation, giving reasons for your arrangement of the crops in each case.

VI. Describe methods of improving farm crops, explaining as fully as possible.

VII. Give methods for eradicating the following weeds: Perennial sow thistle, wild mustard, couch grass, wild oats, and bindweed.

Experiments.

(First and Second Year.)

I. Of all the varieties which have been treated in the Experimental Department for several years in succession, name three of the most successful kinds of each of the following:—1, winter wheat; 2, barley; 3, oats; 4, peas; 5, early potatoes; 6, late potatoes, and 7, mangel wurzels.

II. Compare the general results of growing crops from large and small barley ; plump and shrunken wheat ; hulled and unhulled oats ; and weevilly and sound peas.

III. Give some of the principal conclusions from growing grain in mixtures for green fodder.

IV. Name two potato experiments which have been conducted for at least three years, and give the results of each experiment.

V. Four varieties of grasses and four varieties of clover are now being tested in different combinations for hay production ; name these varieties and tell which mixture is likely to give the best results, giving your reasons for the choice made.

Dairying.

I. Of what value are cow records ? Mention some of the highest records known of, giving names of owners, breed of cow, and any other facts of interest in connection with these records.

II. What does the author of "American Dairying" consider "the foundation of the whole dairy business?" Discuss the point briefly.

III. How often is it necessary to test cows ? Quote authorities on this point.

IV. Give methods of (a) estimating butter yield from Babcock test ; (b) estimating cheese yield from butter fat.

V. Do you recommend watering cows in the stable during winter ? What are some of the objections to this plan of watering ?

VI. Give the chief *general* points to look for in a dairy cow. Comment on each one.

VII. State a basis, or scale, on which cows in milk may be judged at exhibitions. Point out weaknesses in those used at present in Canada.

VIII. What are the chief points to be observed in the care of milk for cheese factory and creamery ?

IX. Compare city milk trade with patronizing a cheese factory or creamery.

Poultry.

I. How would you operate an incubator during the entire period of incubation ?

II. Name the different varieties of fowl in the Mediterranean class ; also give color of plumage.

III. Name the varieties and give the color of plumage of (1) four varieties of turkeys, (2) four varieties of ducks.

IV. Name the varieties of fowl in the Hamburg class, and give briefly the leading characteristics of this class.

V. Write a short article on starting a poultry plant : (1) location, (2) essentials in poultry buildings, (3) selection of stock.

VI. How would you keep, and to what length of time, eggs for hatching ?

VII. How would you get rid of, and how prevent, lice in poultry buildings and on the fowl and chicks ?

Apiculture.

I. Name the best varieties of Ontario honey ?

II. From what blossoms do bees secure honey and pollen for building up in spring and early summer ?

III. Explain the difference between honey and pollen in relation to the bee ?

IV. What influences the bees in building drone and worker comb ?

V. What are the essentials to successful cellar wintering ?

VI. Give the cause, symptoms, and treatment of the disease known as foul brood.

Inorganic Chemistry

DIVISION A.

I. Define : neutralization, neutral salt, normal salt, acid salt, basic salt, element, compound, atom, molecule, efflorescence, deliquescence, distillation, sublimation, allotropism, and combining weight. Where possible, give examples.

II. The discovery of two facts led Dalton to formulate the atomic theory. What are these facts? and state the theory.

III. What is the value of Mendeleeff's classification of the elements ?

IV. Is air a chemical compound ? Give reasons for your answer.

V. 22224 cubic centimeters of oxygen, under standard conditions of temperature and pressure, weigh approximately, 32 grams. It is desired to generate 100 litres of oxygen. What weight of potassium chlorate will be necessary ? Write reactions.

VI. Give occurrence, preparation, and properties of nitrogen and its principal compounds.

VII. Give chemistry underlying the transference of lime from the soil to the boilers where it forms an incrustation.

VIII. What is the difference between "ground rock phosphate". and "superphosphate" ? Give reactions.

IX. Write equations representing the action of :

(*a*) Zinc upon hydrochloric acid.
(*b*) Calcium oxide upon hydrochloric acid.
(*c*) Chlorine upon slaked lime.
(*d*) Water upon quick lime.
(*e*) Carbonic acid upon mortar.
(*f*) Ammonia gas upon sulphuric acid.
(*g*) Copper upon nitric acid.

Inorganic Chemistry.

DIVISION B.

I. Define and give an example of each of the following :—Chemical change, physical change chemical compound, element, base, acid, and normal salt.

II. What proof have we that air is a mechanical mixture and not a chemical compound ?

III. Give the physical and chemical properties of oxygen gas. How many grams of oxygen may be obtained from 40 grams of potassium chlorate ?

K, 39. Cl, 35.5. O—16.

IV. Give three methods by which hydrogen gas may be prepared. Outline any one of the methods, sketching the apparatus used.

V. (*a*) What form of combination does the nitrogen assume when animal matter decomposes slowly under proper conditions ?

(*b*) When subjected to destructive distillation ?

VI. How may chlorine be prepared ? Given 20 grams of common salt, how many grams of chlorine may be prepared from it ?

VII. Write a note on the naming of salts from their corresponding acid.

VIII. Complete the following reactions :

$HCl + Zn =$	$N_2O_2 + O =$
$HCl + ZnO =$	$KClO + H_2SO_4 =$
$CaH_2(CO_3)_2 + \text{Heat}$—	$KOH + CO_2 =$

Botany.

I. Describe the fruit and seed of the bean.

II. Discuss the effect of light on growing plants.

III. What features in the following plants render them difficult to eradicate : Brassica sinapistrum, Cynoglossum officinale, Chrysanthemum leucanthemum, Carduus arvensis ;

IV. Write notes upon the valuable plants of the Leguminosae. Are any of this order troublesome as weeds?

V. Describe the cellular structure and function of a leaf.

VI, Give a full description of the plant submitted.

VII. Identify the specimens. In each case state the order to which the plant belongs, and note any of the characteristics of the order shown by it.

Materia Medica.

I. State the manner in which medicines are believed to cure disease.

II. Define and give an example of (*a*) Styptics, (*b*) Diaphoretics, (*c*) Alteratives, (*d*) Soporifics, (*e*) Mydriatics.

III. How is ammonia produced? Give actions and uses of the carbonate of ammonia.

IV. Give actions, uses, and doses of eserine.

V. Give actions and uses of carbolic acid.

VI. Give actions, uses, and doses of Nux Vomica.

VII. State when opium is contraindicated.

VIII. Give actions and uses of potassium iodide.

IX. How is nitrate of silver obtained? Give uses.

X. Give actions, uses, and doses of sweet spirits of nitre.

Grammar and Composition.

I. Mention the circumstances under which you would use capital letters in English composition. Illustrate your answer fully by examples.

II. Give a list of the auxiliary verbs used in English. Underline such as may also be used as principal verbs. Write two sentences, the first containing a verb used as an auxiliary, the second containing the same verb used as a principal verb.

III. Indicate the points of *similarity* and *difference* between the *infinitive* in *ing* and the *imperfect participle*. Distinguish clearly their difference in use by writing sentences containing each.

IV. Write the verb *find* in the various forms, common, emphatic, passive, and progressive, using in each form the third person singular of the past tense.

V. Distinguish clearly between *compound* and *complex* sentences. Classify and analyze the following:

(1) Genius begins great works, but labor alone finishes them.
(2) My opinion is that poor memory is caused by poor attention.
(3) When you hear his footsteps, open the door.
(4) They knew the very minute when he left the city.
(5) The general landed the troops and fought a battle on the following day.

VI. Parse the underlined words in the following sentences:

It rained hard *yesterday*. *There* were a great many *present*.
He threw the *stone* at the dog.
James is a *man who* is sure to succeed.

VII. Insert the proper auxiliary verb (shall or will) in the following sentences:

(1) I......be drowned; nobody......help me.
(2) He....repent of his folly when it is too late.
(3) John thinks that he.... be sick to-morrow.
(4) John says James .... be sick to-morrow.
(5) Dorothy says that she .... be able to go with us,

VIII. Punctuate the following sentences:

(1) Who to the enraptured heart and ear and eye
Teach beauty virtue truth and love and melody.
(2) Vines like shadows towards the evening of life grow great and monstrous.

(3) Patience I say your mind perhaps may change.

(4) Rouse ye Romans rouse ye slaves.

(5) But she is in her grave and oh
The difference to me.—Wordsworth.

IX. Re-write the following quotations, giving reasons for any changes you may make :

(*a*) This they effected by conveying their letters to her (Mary Queen of Scots) by means of a brewer, that supplied the family with ale through a chink in the wall of her apartment.—Goldsmith.

(*b*) Who ever got through learning his mother tongue and could say "The work is done?"—Prof. Whitney of Yale

(*c*) It will be written in good English. In its pages papers of sterling merit will only appear.—Miss Braddon (in the prospectus of "Belgravia").

(*d*) The authority of Addison, in matters of grammar; of Bentley, who never made English grammar his study ; of Bolingbroke, Pope, and others, are as nothing. —Wm. Harrison.

(*e*) When do you find a well educated Englishman or Frenchman embarrassed by an ignorance of the grammar of their respective languages? They first learn it practically and unerringly ; and when they choose to look back, and smile at the idea of having proceeded by a number of rules, without knowing one of them by heart, or being conscious that they had any rule at all, this is philosophical amusement ; but who ever thinks of learning the grammar of their own tongue, before they are very good grammarians !—Sydney Smith.

English Literature.

Division A.

I. (*a*) And thy heaven that is over thy head shall be brass, and the earth that is under thee shall be iron.

(*b*) Thou shalt go out one way against them, and shall flee seven ways before them.

(*c*) The Eternal God is thy dwelling-place,
And underneath are the everlasting arms.

(*d*) A land whose stones are iron, and out of whose hills thou mayest dig brass.

(*e*) Man doth not live by bread only.

(*f*) For the land is not as the land of Egypt, where thou sowest thy seed and waterest is with thy foot, as a garden of herbs ; but the land is a land in hills and valleys, and drinketh water from the rain of heaven.

State the connection in which each of these passages occur.

Give clearly and fully the meaning of each.

II. "See, I have set before this day life and good, and death and evil."

Give a description, based upon the book you have read, of the *speaker* of this passage ; the *people addressed*; their mutual *relation* ; and the *circumstances* under which the words were uttered.

III. (*a*) He found him in a desert land,
And in the waste howling wilderness ;
He compassed him about, he cared for him,
He kept him as the apple of his eye ;
As an eagle that stirreth up her nest,
That fluttereth over her young ;
He spread abroad his wings, he took them.

(*b*) For, lo, the winter is past,
The rain is over and gone ;
The flowers appear on the earth
The time of the singing of birds is come ;
And the voice of the turtle is heard in our land ;

The fig tree ripeneth her green figs,
And the vines are in blossom,
They give forth their fragrance.

Would you class either or both of these passages as poetry? Give your reasons.

Point out any peculiarities of literary form here.

IV. Quote The Recessional, *or* the selection commencing "I passed by the field of the slothful."

Composition.

DIVISION B.

I. Punctuate passage (*a*); arrange passage (*b*) in lines of verse, and punctuate.

(*a*) The school master is generally a man of some importance in the female circle of a rural neighborhood being considered a kind of idle gentleman like personage of vastly superior taste and accomplishments to the rough country swains and indeed inferior in learning only to the parson his appearance therefore is apt to occasion some little stir at the tea table of a farm house and the addition of a supernumerary dish of cakes or perhaps the parade of a silver teapot.

(*b*) Blessings on the little man barefoot boy with cheeks of tan with thy turned up pantoloons and thy merry whistled tunes with thy red lip redder still kissed by strawberries on the hill with the sunshine on thy face through thy torn brim jaunty grace from my heart I give thee joy I was once a barefoot boy.

II. Write a composition of not less than five paragraphs, and covering not less than two pages. Subject:—"The Province of Ontario." Write separately the topics of your paragraphs.

Physics.

I. Define specific gravity.

Describe how the specific gravity of a soil is determined, and state approximately the specific gravity of sand and humus.

II. Show how and to what extent the necessity for underground drainage depends upon the nature and kind of soil.

III. Compare clay and humus as soil constituents.

IV. A soil has an excess of sand in its composition. To what dangers is a crop upon this soil exposed? By what methods would you proceed to improve this soil? Give reasons for your answers.

V. What are the causes of winds? Discuss their economical importance in farming.

Mensuration.

DIVISION B.

(1) A room is 26 x 28 feet. In the central part is a carpet 21 x 17 feet. Find the cost of painting the rest of the floor at 11c. per square yard.

(2) A cow is tethered in the corner of a field by a rope 112 feet long. Express in acres or decimal of an acre (correct in three places) the area of the ground to which she has access.

(3) Find the area of a triangular field whose sides are 10, 16, and 18 chains respectively.

DIVISIONS A AND B.

I. An open drain is $4\frac{1}{2}$ feet wide at the top, $1\frac{1}{2}$ feet wide at the bottom, 2 feet deep, and 112 rods long. Find cost of excavating it at 10c. per cubic yard of earth removed.

II. Compare the volumes of the following solid figures:

(1) a sphere 7 inches in diameter.

(2) a cone, $3\frac{1}{2}$ inches radius of base, 7 inches altitude.

(3) a cyclinder, $3\frac{1}{2}$ inches radius of base, 7 inches altitude.

III. An electric light is 20 feet above the sidewalk. A man 6 feet in height casts an eight foot shadow. Find the distance from the man to a point directly under the light.

IV. If it cost $307.20 to fence a square field at $3.20 a rod, what would it cost to fence the same amount of land in the form of a rectangle four times as long as broad.

V. How fast must water rise in a well whose diameter is 7 feet so that it may remain the same depth when a pump is emptying it at the rate of 1-5 of a ton per hour. Express answer in decimal of a foot per hour.

1 cubic foot=1000 ounces.

VI. A circular reservoir whose diameter is 28 feet is frozen over with ice 8 inches in thickness. If water expands 10 per cent. in freezing, find the weight of the ice in tons.

NOTE—Candidates for honors must solve one or more of the following problems :

VII. The diameter of the bottom of a pail 10 inches, the diameter of the top is 15 inches, the depth is 14 inches. Find its capacity in gallons, correct to third decimal place.

1 cubic foot—6.24 gallons.

VIII. Three poles stand upright on level ground, with their lower ends in the same straight line. The heights of the two extreme poles are 40 and 29 feet. The top of the former is 25 feet, and that of the latter is 15 feet from the top of the middle pole ; while the middle pole stands 12 feet distant from the lower of the other two, measured horizontally. (*a*) What is the height of the middle pole ; (*b*) What is the distance between the tops of the other two ?

IX. Compare the capacities of the following silos, each having a perimeter of 88 feet and a depth of 30 feet :

No. 1 is a round silo.
No. 2 is an octagonal silo (perpendicular from centre on side=13.3 feet).
No. 3 is a square silo.
No. 4 is a rectangular silo, sides in proportion of 4 to 7.

Drawing.

I. Draw an oval the greatest width of which will be four inches.

II. A farmer has a rectangular field 42 rods by 97 rods and exchanges it for a square one of the same area. Find by means of a drawing the length of the side of the square field.

III. Draw plan of a hurdle, such as is used by Mr. Rennie for dividing a section for grazing.

IV. Given a basement of a barn 110 x 70 outside measurement, with walls two feet thick.

Draw a plan showing the arrangement of this basement to accommodate 70 steers (fed loose), 8 milch cows, and 7 horses.

Show feed room, root house, manure shed, and two box stalls.

Show all necessary doors, windows, mangers, and partitions.

Scale, 1-192. Term work to count 50%.

SECOND YEAR.

Agriculture.

I. How do Ayrshire and Jersey cattle differ from Holstein Friesians ?

II. Write notes on the history and characteristics of Guernsey, Red Polled, and Kerry Cattle.

III. Describe Chester White, Tamworth, and Improved Yorkshire swine.

IV. Compare Poland-China and Berkshire swine.

V. Give a summary of the results of any experiments in connection with rearing calves on skim milk.

VI. Discuss methods of fattening cattle economically.

VII. Describe the type of hog suitable for the export bacon trade, and state how you would proceed to produce animals of this type.

VIII. Outline the feeding and management of lambs from birth to weaning.

Physics.

I. What are the characteristics of a good surface soil ?

II. What facts concerning a soil are revealed by a mechanical analysis ?

III. Name and define the various classes of soil, considered from a physical point of view.

IV. What is meant by 'water-capacity'? By what conditions is the water-capacity of the soil affected ?

V. What kinds of soil lose most water by underground drainage, natural or artificial ? Give an explanation of the differences you have observed in this respect.

VI. What physical functions are performed by the sun's energy, directly and indirectly, upon the soil and its contents ?

Cultivation of the Soil.

I. State three systems of rotation of crops advisable to adopt with a view to maintaining soil fertility and economic cultivation.

II. How would you prepare pea land for fall wheat ? When would you sow, and what quantity per acre ?

III. Give three methods of summer-fallowing, and state advantages and disadvantages of each.

IV. Give fall cultivation of sod land intended for corn, roots, and peas ; and two methods of applying barn-yard manure.

V. How would you prepare land in the fall after corn and roots, for spring grain ?

Experiments.

I. Name the different experiments which are being conducted in growing crops from different selections of seeds, and give the general result from growing, split and whole peas ; large and small oats ; and hulled and unhulled oats.

II. Name the different winter wheat experiments which are being conducted, and give the comparative results from sowing seed which had been sprouted in the head and that which had not been sprouted.

III. What is being done in the experimental department in growing spring grains in mixtures for the production of (1) green fodder ; (2) grain.

IV. Four varieties of grasses and four varieties of clover are now being tested in different combinations for hay production : name these varieties, and tell which mixture is likely to give the best results, giving your reasons for the choice made.

V. Describe briefly what is being done in the experimental department in testing varieties of farm crops, and tell how the leading varieties are introduced throughout Ontario.

Poultry.

I. Discuss raising poultry for profit under the following heads : Location ; selection of stock ; care and management ; disposal of stock.

II. Describe the plumage of Barred Rocks, and state the chief points to be observed in breeding.

III. Write a short article on artificial incubation, under the following heads : Location : temperature ; moisture ; and the mode of handling the eggs during the entire period of incubation.

Apiculture.

I. In purchasing a colony of bees, how would you select ? Give reasons for choice.

II. What is the best method of introducing a queen ?

III. Give method of preparing bees for winter.

IV. How should a hive of bees be packed for outside wintering ?

V. Explain the difference between natural and artificial queen rearing. Give method in full when pursuing the latter.

VI. What is the best method to observe to prevent a swarm from absconding ?

Dairying.

I. What are the main points necessary to be observed in order to have successful (a) whole milk creameries ; (b) cream gathering creameries ; (c) skimming stations ?

II. Describe the composite test.

III. Under what circumstances would you recommend pasteurization of milk or cream for butter-making ?

IV. (a) How would you make an acid test of cream ? (b) How would you prepare a 'starter' for ripening cream ?

V. What means have been adopted by separator manufacturers to increase the capacity and "close skimming" of their machines ? What do you think of "hot skimming" ?

VI. Define "the overrun," in a creamery. Give an illustration of your answer. If a patron delivered 50 inches of cream testing 90 per cent. "butter oil," how much butter should he be credited with ?

VII. What is meant by "The creaming co-efficient of milk" ? Illustrate your answer.

VIII. (a) If you have churned for two hours, the cream is foaming, and no butter coming, what would you do ? (b) If you forgot to color the cream and your butter is white, what would you do ?

IX. How may the sanitary condition of cheese factories and creameries be improved ?

X. What are the chief requirements in butter for Manchester, Bristol, London, Japan and West Indies markets ?

XI. In what way does the manufacture and sale of oleomargarine and filled cheese affect Canadian dairying ?

XII. Mention the chief points to be observed in supplying cream for a first-class city trade.

Practical Chemistry

I. What chemical properties of the metals of the first three groups are taken advantage of in arranging them into groups ?

II. Explain fully why the filtrate from group II. must be freed from H_2S and boiled with HNO_3 before precipitating the members of group III, A.

III. What effect has NH_4OH on a solution of Bi, Cu, and Cd (a) in small excess, (b) in large excess ?

IV. Why is the solution of Sn in concentrated HCl boiled with Cu before testing with $HgCl_2$?

V. Complete the following reactions :

$Pb(NO_3)_2 + HCl =$	$NH_4OH(warm) + Hg_2Cl_2 =$
$(NH_4)_2S_2 + As_2S_3 =$	$BiCl_3 + H_2O =$
$Al(OH)_3 + NaOH =$	$AlCl_3 + (NH_4)_2CO_3 =$
$FeCl + {}_3KCNS =$	

VI. Determine one acid and one base in A.

VII. Determime two bases in solution B.

Agricultural Chemistry.

I. In what forms do phosphorus, sulphur and silicon occur in the plant ?

II. Write a short note on the movement of salts in the soil.

III. How may the composition of the plant be affected by the composition of the soil upon which it grows ?

IV. (a) A solution of lime and phosporic acid is poured over a clay soil rich in organic matter; what constituents will be found in largest quantities in the drainage water ? (b) In what forms are phosphoric acid, potash, and ammonia most firmly held in the soil ? Show by equation, where possible, how this absorption takes place.

V. What circumstances will cause a variation in the composition of farm-yard manure ?

VI. Discuss the characteristics of crops which underlie the practice of rotation of crops.

VII. It is wished to prepare a complete fertilizer containing ammonia 4% ; phosphoric acid (P_2O_5), water soluble, 9% ; and potash (K_2O) 5%, using sodium nitrate 95% pure, superphosphate containing 30% water soluble (P_2O_5) and muriate of potash containing 50% of K_2O. Find the amount of these materials necessary for one ton of the fertilizer.

VIII. "The loss or gain of nitrogen in the soil is, to a considerable extent, under the farmer's control." Comment upon this statement.

Horticulture.

I. *Fruit Growing :*

1. Give full directions for top grafting an old apple tree.
2. When and how would you prune (a) raspberry bushes, (b) currant bushes?

II. *Vegetable Gardening :*

1. Give full directions for the propagation, culture, and cropping of rhubarb.
2, Mention the main points to be observed in growing tomatoes.

III, *Landscape Gardening :*

1. Outline briefly some of the main features to which attention should be given in beautifying the surroundings of a country home.
2. From observations made on the College grounds, mention (a) Ten of the most desirable ornamental shrubs. (b) Four ornamental trees desirable on account of their peculiar color. (c) Six of the most ornamental and useful evergreens

IV. *Forestry :*

1. What influence have forests upon the climate and general welfare of the country?
2. Name six of the most important commercial trees of Ontario, in the order of their value to the Province. Give reasons for your classification

V. *Floriculture :*

1. (a) Mention what you consider twelve of the most suitable plants for a house collection. (b) Give brief directions for their care and management.
2. Indentify the specimens before you, giving as far as possible botanical and common names.

Botany.

Physiology.

I. Discuss transpiration, its *cause*, its *function* in the plant, and the conditions which regulate it.

II. Explain the cause and phenomena of turgidity.

III. State what you know of the irritability of plants.

Histology.

IV. Discuss the histology of a leaf. What are stomata?

V. Relate the differences in structure between endogenous and exogenous stems. Describe their respective modes of growth.

VI. Give the different modifications that the cell wall may undergo, and note one microchemical reaction for each modification.

Structural and Systematic.

VII. *Define* : Caryopsis, amphitropous, exalbuminous seed, inflorescence, epiphyte.

VIII. Give the characters of the Composiatæ. How is the order subdivided? Describe the composite flower, and mention some of the common Canadian examples of this order.

IX. Write a short paper on the dissemination of seeds.

Veterinary Obstetrics.

I. State the difference between premature and immature birth, and state how you would proceed to prevent a case of threatened abortion in a cow.

II. Give the general symptoms of approaching parturition in a mare, and state what you consider to be the necessary aid in a case of normal parturition.

III. Give symptoms and treatment for metritis in the mare.

IV. Give symptoms and treatment for retention of the after-birth in a cow.

V. In a case of dystokia in the cow, caused by rigidity of the os uteri, how would you proceed to deliver ?

VI. Give causes and treatment for mammitis in the cow.

VII. In case of a mare being vicious with her foal, how would you act so as to overcome the trouble ?

VIII. Treat a case of diarrhoea in a foal about a week old ?

IX. Name the different causes of obstruction of the milk duct.

X. Give treatment for persistence of the urachus.

XI. Treat fistula of the teat in the cow.

English Literature.

I. Locate the following passages :

1. O not for thee, the glow, the bloom,
Who changest not in any gale.

2. And wildly dashed on tower and tree
The sunbeam strikes along the world.

3. Such precious relics brought by thee.

4. When science reaches forth her arms
To feel from world to world.

5. Or where the kneeling hamlet drains
The chalice of the grapes of God.

6. The land where girt with friends or foes
A man may speak the thing he wil.

7. Let what is broken so remain.

8. The Gods are hard to reconcile.

9. Yet all experience is an arch, where thro'
Gleams that untravelled world.

10. The lights begin to twinkle from the rocks.

11. And eyes grow dim with gazing on the pilot stars.

12. And we should come like ghosts to trouble joy.

II. Quote from memory any lyric from 'In Memorian' and comment briefly upon its meaning; and upon any beauties of thought or expression it may contain.

III. Write a brief appreciation of the form and substance of each of the following poems, setting forth the scope of Tennyson's genius: Goraint and Enid, Ulysses, The Revenge, You ask me why ? The Lotus Eaters.

IV.
Not a breath of air
Ruffles the bosom of the leafy glen.
From the brook's margin, wide around, the trees
Are steadfast as the rocks : the brook itself,
Old as the hills that feed it from afar,
Doth rather deepen than disturb the calm
Where all things else are still and motionless.
And yet, even now, a litttle breeze perchance
Escaped from boisterous winds that rage without,
Has entered, by the sturdy oaks unfelt,
But to its gentle touch so sensitive
Is the light ash ! that, pendent from the brow
O yon dim cave, in seeming silence makes
A soft eye-music of slow waving boughs,
Powerful almost as vocal harmony
To stay the wanderer's steps and soothe his thoughts.

(*a*) Describe in your own words the picture presented.
(*b*) Is this good poetry ? Give reasons for your answer.
(*c*) What interpretation of nature is here given ?
(*d*) Discuss the probability of authorship (Tennyson or Wordsworth).

Electricity.

I. Name the elements composing the Grenet cell. State the changes that take place in these elements during the working of the cell. What advantanges and disadvantages does this cell possess ?

II. 24 cells, E.M.F. of each = 1.2 volts, C = 2 amperes, R = 3 ohms, are arranged in series parallell 6-4 ; if the external resistance is 25 ohms, find the volume of current.

III. Define the following terms : local action, brushes, anode, induction, conductor, rheostat fuse wire, dyne.

IV. Point out the relation between electricity and magnetism.

V. Explain fully the principle of the dynamo used as a generator.

VI. Draw a diagram of the storage cells below the laboratory, the posts on the laboratory table, and the wiring between them.

VII. Draw a diagram of a dynamo suited to arch lighting, showing the winding on the machine, and the lamps in circuit. Write a brief description of the same.

VIII. Describe and explain the principle of the telephone-transmitter invented by Graham Bell and by Edison.

Carpentering

I. Give the names of a set of bench planes, and describe the cutting angle of the irons of each.

II. State the difference between crosscut and rip saws. Describe the mode of filing and setting saws, giving reasons, and state the degree of fleam required in filing.

III. Describe briefly the three tables on a steel square, and state the use of the diagonal scale in connection with the brace rule.

IV. The rise of a roof is half way between one quarter and one half pitch. What are the numbers to be taken on the blade and tongue of a steel square to give the plumb and level cuts of the common rafter ? and what is the number of applications of the square required to give the length of a rafter for a building 40 ft. wide ?

Steam Engine.

I. What is the difference in the working valve or valves on the two engines—the one in the college engine room and the one in the farm department ?

II. Has the college engine got a governor throttle ? Has the farm engine one ?

III. What is the use of the main throttle ?

IV. What is an injector used for ?

V. What is the object of having the steam-trap on top of the boiler, and what is it used for ?

VI. How often would you clean or 'swill out' a portable boiler if you were using it ten or twelve hours every day ?

VII. Which is the most important valve on a steam boiler ?

VIII. Describe in detail the different steps to be taken in firing up and starting an engine, and state the precautions to be taken in case the engine has not been in use for some time.

APPENDIX IV.

CLASS LISTS.—EASTER EXAMINATIONS, 1898.

FIRST YEAR.

Agriculture.—Division A.

CLASS I.

- 1 McMillan, E.J.
- 2 Ketchen, J. B.

CLASS II.

- 3 Hutchison, J. R.; Robertson, J. A.
- 4 Fawell, L. A.
- 5 Patterson, H. H.
- 6 Linklater, W.; Morturex, C.E. M.
- 8 Bowman, E.; Crerar, A. H.
- 10 McCorvie, E.A.
- 11 Carleton, J. A.; McIntyre, G. A.; Peters, C. R.
- 14 Moffet, J. F.
- 15 McCrimmon, J. R.; Taylor, G. R.
- 17 McEwen, D.
- 18 Goodchild, A.
- 19 Campbell, J.D.; Hutton, G.
- 21 Lewis, E. R.
- 22 Crow, J. W.; McCarthy, D. J.
- 24 Kidd, C.
- 25 Robinson, F. R.
- 26 Goble, F. W.
- 27 Bowers, J. C.
- 28 Hamilton, A.
- 29 Semple, W. C.

CLASS III.

- 1 Turner, F. P.
- 2 Stewart, A.
- 3 McFiggins, A. J.
- 4 Thompson, H.
- 5 Brokovski, A.J.
- 6 Eddy, A. F.
- 7 Willmott, H.B.
- 8 Wilkinson, H. S.
- 9 Murray, J. K.

Agriculture.—Division B.

CLASS II.

- 1 Vanatter, P.O.
- 2 Broomfield, R. J.
- 3 Balfe, J. J.; Wilson, R.

CLASS III.

- 1 Howson, J.W.
- 2 Stott, L.
- 3 Robertson, A. J.
- 4 Bancroft, G. R.; Christie, A.
- 6 Glasgow, R. J.
- 7 Dickenson, J. H.
- 8 Greenfield, J. K.
- 9 Eagle, J. F.
- 10 Picken, J. B.; Smith, F. L.
- 12 Allison, J. Bohwell.
- 13 Coté, J. C.

—

Sheppard, C.B.
Douglas, A.
Sullivan, H.
Hodgins, W.F.
Hains, J. M.

Poultry.—Division A.

CLASS I.

- 1 McMillan.
- 2 Linklater.
- 3 Fawell.; Robertson.
- 5 Crow.
- 6 McCarthy.

CLASS II.

- 1 Morturex.
- 2 Crerar.; McEwen.; McIntyre.
- 5 Robinson, F. H.
- 6 Carleton.
- 7 Ketchen.; McCorvie.; Peters.
- 10 Goble.
- 11 Gorrell.
- 12 Wilkinson.

CLASS III.

- 1 Turner
- 2 Hutchison.
- 3 Patterson.; Semple.
- 5 Brokovski.; McCrimmon.
- 7 Boman.; Goodchild.
- 9 Eddy.; Moffet.
- 11 Taylor.
- 12 Willmott.
- 13 McFiggins.
- 14 Lewis.
- 15 Hutton.
- 16 Campbell.
- 17 Thompson.
- 18 Kidd.
- 19 Bowers.
- 20 Stewart.

—

Hamilton.
Murray.

Poultry.—Division B.

CLASS II.

- 1 Vanatter.

CLASS III.

- 1 Balfe.
- 2 Stott.
- 3 Dickenson.; Smith.
- 5 Wilson.
- 6 Robertson.
- 7 Broomfield.; Glasgow.
- 9 Christie.
- 10 Eagle.
- 11 Allison.
- 12 Bancroft.; Picken.; Sheppard.
- 15 Hains.

—

Greenfield.
Sullivan.
Howson.
Douglas.
Hodgins.
Coté.

Chemistry.—Division A.

CLASS I.

- 1 Ketchen.
- 2 McMillan.
- 3 Goble.; Robertson.

CLASS II.

- 1 Morturex
- 2 Linklater.
- 3 Kidd.
- 4 Crerar.
- 5 Peters.
- 6 Bowman.; Lewis.

CLASS III.

- 1 Turner.
- 2 Brokovski.; Crow.
- 4 Semple.
- 5 McEwen.; McCorvie.
- 7 Goodchild.; Hutton.
- 9 Carleton.; Fawell
- 11 Robinson.; Wilkinson.
- 13 Gorrell.; Hamilton.
- 15 Eddy.; Hutchison.; McIntyre.
- 18 Patterson.
- 19 Campbell.; Willmott.
- 21 McCrimmon.; Thompson.
- 23 Bowers.
- 24 Taylor.
- 25 McCarthy.; Moffet.

—

McFiggins.
Stewart.
Murray.

Chemistry.—Division. B.

CLASS II.

- 1 Vanatter.

CLASS III.

- 1 Balfe.
- 2 Wilson.
- 3 Bancroft.

—

Douglas.
Christie.
Stott.
Sheppard.
Coté.
Dickenson.
Howson.
Allison.
Greenfield.
Glasgow.
Hains.
Hodgins.
Eagle
Picken.
Robertson.
Broomfield.
Smith.
Sullivan.

CLASS LISTS.—EASTER EXAMINATIONS, 1898.—*Continued.*

FIRST YEAR.

Zoology.

Division A.

CLASS I.

1 McMillan.

CLASS II.

1 Linklater.
2 Crow.
3 Ketchen.
4 Morturex.
5 Robertson.

CLASS III.

1 Fawell.
2 { Brokovski.
Lewis.
4 Kidd.
5 Eddy.
6 { McIntyre.
Turner.
8 { Crerar.
Peters.
10 Goodchild.
11 Carleton.
12 Hutton.
13 { Taylor.
Bowers.
15 Gorrell.
16 { Bowman.
Goble.
18 Moffet.
19 { Campbell.
McCorvie.
21 Semple.
22 { McEwen.
Patterson.
24 McCrimmon.
25 Hutchison.
26 { McCarthy.
Robinson.

—

Hamilton.
Thompson.
McFiggins.
Wilkinson.
Willmott.
Murray.

Division B.

CLASS III.

1 Vanatter.
2 Christie.
3 Balfe.
4 Wilson.
5 Bancroft.
6 Howson.
7 { Allison.
Stott.
Smith.

—

Douglas.
Glasgow.
Picken.
Dickenson.
Sheppard.
Robertson.
Coté.
Broomfield.
Hains.
Eagle.
Greenfield.
Hodgins.
Sullivan.

Horticulture.

Division A.

CLASS I.

1 McMillan.
2 Robertson.
2 Morturex.
4 { Peters.
Turner.
6 { Bowman.
Fawell.
Linklater.
9 { Campbell.
Goodchild.

CLASS II.

1 Ketchen.
2 { Crow.
Lewis.
4 Hutton.
5 { Brokovski.
Kidd.
7 McCarthy.
8 { Carleton.
Hutchison.
Moffet.
11 Goble.
12 Bowers.
13 McIntyre.
14 Crerar.

CLASS III.

1 { McCorvie.
Eddy.
3 Taylor.
4 { Patterson.
Robinson.
6 McCrimmon.
7 Sewell.
8 Thompson.
9 McEwen.
10 Wilkinson.
11 Willmott.
12 Murray.
13 Hamilton.
14 Stewart.

—

McFiggins.

Division B.

CLASS I.

1 Broomfield.

CLASS II.

1 Allison.
2 Glasgow.
3 Vanatter.
4 Hains.
5 { Bancroft.
Christie.
7 Robertson, A.J.
8 Wilson, R.
9 Sheppard.
10 Howson.
11 { Douglas.
Balfe.
Greenfield.
14 Stott.
15 { Eagle.
Picken.
17 Dickenson.

—

Hodgins.
Smith.
Coté
Sullivan.

Veterinary Anatomy.

Division A.

CLASS I.

1 Linklater.

CLASS II.

1 McMillan.
2 { Ketchen.
Morturex.
4 Kidd.

CLASS III.

1 Turner.
2 Crow.
3 Robertson, A.J.
4 Hutchison.
5 Goodchild.
6 Crerar.
7 { Brokovski.
Peters.
8 Lewis.
10 { Bowman.
Goble.
Robinson.
Taylor.
14 { McCorvie.
Semple.
16 { McCrimmon.
McEwen.
18 Moffet.
19 { Hutton.
McIntyre.
21 Fawell.
22 Patterson.
23 { Bowers.
Campbell.
Eddy.
26 { McCarthy.
Thompson.

—

Willmott.
McFiggins.
Stewart.
Wilkinson.
Murray.

Division B.

CLASS I.

1 Vanatter.
2 Balfe.
3 { Stott.
Wilson.

—

Bancroft.
Glasgow.
Howson.
{ Broomfield.
Christie.
Douglas.
Eagle.
Sheppard.
Allison.
Coté.
Picken.
Robertson.
Dickenson.
Hains.
Hodgins.
Sullivan.
Greenfield.
Smith.

CLASS LISTS—EASTER EXAMINATIONS, 1898.—*Continued.*

FIRST YEAR.

English Literature.

Division A.

Class I.

1 Morturex.

Class II.

1 Ketchen.
2 McMillan.
3 Linklater.
4 { Bowman.
  Patterson.
6 { Crow.
  Peters.
8 Hutton.
9 Crerar.

Class III.

1 Robertson.
2 Fawell.
3 { Carleton.
  Eddy.
5 { Brokovski.
  Gorrell.
7 { Lewis.
  McCorvie.
  McEwen.
  Willmott.
11 Turner.
12 { Campbell.
  Kidd.
14 Thompson.
15 Robinson.
16 Goble.
17 Wilkinson.
18 Moffet.
19 { Bowers.
  McCrimmon.
  McIntyre.
22 { Goodchild.
  McCarthy.
24 Semple.
25 Hutchison.
26 Taylor.

———

Hamilton.
McFiggins.
Murray.
Stewart.

Division B.

Class II.

1 Robertson, A. J.

Class III.

1 Douglas.
2 Hodgins.
3 Sheppard.
4 { Bancroft.
  Picken.
6 Greenfield.
7 { Allison.
  Christie.
  Vanatter.
10 { Hains.
  Wilson.

———

Dickenson.
Broomfield.
Smith.
Glasgow.
{ Coté.
  Stott.
  Sullivan.
Howson.
Balfe.
Eagle.

Grammar and Composition.

Division A.

Class I.

Morturex.

Class II.

1 Hutchison.
2 { Linklater.
  McCarthy.
4 Bowman.
5 { Goble.
  Gorrell.
  McMillan.
8 Peters.
9 { Ketchen.
  Willmott.
11 { McCorvie.
  McIntyre.
13 { Fawell.
  McEwen.

Class III.

1 Crow.
2 Brokovski.
3 { Bowers.
  Patterson.
5 { Robertson.
  Robinson.
7 Crerar.
8 { Carleton.
  Moffet.
10 Kidd.
11 Hutton.
12 Semple.
13 Lewis.
14 Turner.
15 Hamilton.
16 Wilkinson.
17 { Eddy.
  Murray.
  Stewart.
20 McCrimmon.
21 { Campbell.
  Goodchild.
  Taylor.

———

Thomson.
McFiggins.

Division B.

Class II.

1 Robertson.

Class III.

1 Christie.
2 Allison
3 Bancroft.
4 Greenfield.
5 { Stott.
  Wilson.
7 Balfe.
8 Hodgins.
9 Douglas.
10 Vanatter.
11 Sheppard.
12 { Dickenson.
  Picken.

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{ Bloomfield.
  Hains.
Glasgow.
Hodgins.
Coté.
Eagle.
Smith
Sullivan.

Arithmetic.

Division A.

Class I.

1 Linklater.
2 Robertson.
3 Goble.
4 McEwen.
5 { Lewis.
  McCorvie.
  McMillan.
8 McCarthy.
9 Patterson.

Class II.

1 Hutchison.
2 { Bowman.
  Crerar.
  Fawell.
  Ketchen.
6 Peters.
7 Semple.
8 { Brokovski.
  McIntyre.
10 Gorrell.
11 { Bowers.
  Morturex.
  Turner.
14 Wilkinson.
15 Crow.
16 Hutton.

Class III.

1 { Carleton.
  Moffet.
3 Kidd.
4 { Goodchild.
  Robinson.
6 Stewart.
7 Hamilton.
8 Willmott.
9 McCrimmon.
10 Taylor.
11 Murray.
12 McFiggins.
13 { Campbell.
  Eddy.

———

Thompson.

Division B.

Class II.

1 Wilson.
2 Hodgins.
3 Balfe.
4 Vanatter.

Class III.

1 Broomfield.
2 Sheppard.
3 Robertson, A. J.
4 Bancroft.
5 { Christie.
  Coté.
7 Allison.

———

Glasgow.
Eagle.
Stott.
Howson.
Dickenson.
Smith.
Hains.
Picken.
Sullivan.
Greenfield.
Douglas.

CLASS LISTS—EASTER EXAMINATIONS, 1898.—*Continued.*

FIRST YEAR.

Bookkeeping.

Division A.

CLASS I.

1. McCarthy.
2 McMillan.
  Patterson.

CLASS II.

1 Fawell.
2 Willmott.
3 McCorvie.
  Turner.
5 Wilkinson.
6 Goble.
  Linklater.
8 McIntyre.
  Robertson, A. J.
10 Peters.
11 Crow.
12 Gorrell.

CLASS III.

1 Ketchen.
  Lewis.
  McEwen.
4 Crerar.
5 Semple.
6 Bowman.
  Hutton.
  Kidd.
9 Hamilton.
  Hutchison.
11 Stewart.
12 Bowers.
  Robinson.
14 Carleton.
  Morturex.
16 Brokovski.
  Moffet.
18 Campbell.
19 Thompson.
20 Goodchild.
21 McCrimmon.
22 Murray.
  McFiggins.
24 Eddy.
  Taylor.

Division B.

CLASS III.

1 Sheppard.
2 Wilson.
3 Vanatter.
4 Broomfield.
5 Bancroft.
  Hodgins.
7 Allison.
  Douglas.
9 Coté.
10 Robertson, A. J.
11 Christie.
12 Dickenson.
  Stott.
14 Balfe.
15 Glasgow.
  Picken.

——

Eagle.
Greenfield.
Howson.
Hains
Sullivan.
Smith.

Drawing.

Division A.

CLASS I.

1 Linklater.
2 Ketchen.
3 Crow.
4 Hutchison.

CLASS II.

1 McMillan.
2 Goble.
3 Lewis.
  Robinson.
5 Bowman.
6 Patterson.
7 Morturex.
8 Fawell.
9 Peters.
10 Crerar.
  Hamilton.
12 Brokovski.
13 Semple.
14 Gorrell.
15 McCorvie.
  McCrimmon
  McIntyre.
  Wilson.

CLASS III.

1. Willmott.
2 Goodchild.
  Hutton
4 Robertson, A. J.
  Taylor.
6 Kidd.
  McEwen.
  Wilkinson.
9 Carleton.
10 McCarthy.
11 Murray.
12 Bowers.
  Turner.
14 Moffett.
15 Campbell.
  McFiggins.
  Stewart.
  Eddy.

——

Thompson.

Division B.

CLASS II.

1 Bancroft.
2 Robertson.
3 Wilson.

CLASS III.

1. Vanatter.
2 Stott.
3 Sheppard.
4 Allison.
5 Glasgow.
  Howson.
7 Dickenson.
8 Greenfield.
9 Christie.
  Douglas.
10 Balfe.
  Broomfield.
  Coté.

——

Hodgins.
Eagle.
Hains.
Smith.
Picken.
Sullivan.

Proficiency.

Diivsion A.

1 McMillan.
2 Linklater.
3 Ketchen.
4 Morturex.
5 Robertson, J A.
6 Crow.
7 Peters.
8 Fawell.
9 Bowman.
10 Goble.
11 Crerar.
12 Lewis.
  McCorvie.
14 Patterson
15 Hutchison.
16 Gorrell.
17 McIntyre.
  Turner.
19 McCarthy
  McEwen.
21 Kidd.
22 Brokovski.
23 Carleton.
24 Hutton.
25 Robinson.
26 Semple.
27 Goodchild.
28 Moffet.
29 Bowers.
30 McCrimmon.
31 Campbell.
32 Taylor.
33 Eddy.

Division B.

Vanatter.
Wilson.

CLASS LISTS—EASTER EXAMINATIONS, 1898 (*Continued*). SECOND YEAR.

Agriculture.

CLASS I.

1 Grisdale, J. H.
2 Hume, H. H.
3 Kennedy, J. J.

CLASS II.

1 Hutt, W. N.
2 Hopkins, A. G.
3 Price, W. J.
4 Wagg, A. J.
5 Williams, W. E.
6 Raynor, M.
7 Harris, C. H.
8 Marshall, F. R.
9 Mallory, T. R.
10 Thompson, G. T.
11 Murdock, G. H.

CLASS III

1 Snider, C. H.
2 Scott, N. C.
3 Zavitz H. V.
4 Ross, D. A.
5 Livingst ne, J. M.
6 Westgate, H. P.
7 Hawke, A. H.
8 McLaurin, J. D.
9 Tozeland, J. H.
10 Hammell, W. H.
11 Anderson, J. B.
12 Deike, H. V.
13 Wilson, E. S.
14 { Hollis, J. H.
Jarvis, T.
16 Taylor, G. R.
17 Jarvis, C.
18 Fowler, R. C.
19 Hutchison, L. W.
20 Gethen, G.
Allison, J. B.

Judging Cattle.

CLASS I.

1 Hume.
2 Kennedy.
3 Hutt.
4 Ross.
5 { Hammell.
Hawke.
Raynor.

CLASS II.

1 { Snider.
Thompson.
3 { Grisdale.
Westgate.
5 Zavitz.
6 { Hopkins.
Price.
8 Wagg.
9 Hollis.
10 Scott
11 Harris.
12 Taylor.
13 Jarvis, C.
14 Jarvis, T.
15 Marshall.

CLASS III.

1 Anderson.
2 { Murdock.
Williams.
4 Tozeland.
5 McLaurin.
6 Mallory.
7 Fowler.
8 Robinson.
9 Deike.
10 Allison.
11 Gethen.
12 Wilson.
13 Livingstone.
Hutchison (absent.)

Judging Sheep.

CLASS I.

1 Thompson.
2 Snider.
3 Hume.
4 Kennedy.
5 Hutt.
6 Ross.
7 Murdoch.

CLASS II.

1 Taylor.
2 Fowler.
3 Westgate.
4 { Hollis.
Raynor.
6 Hawke.
7 { Anderson.
Hopkins.
9 Zavitz.
10 Tozeland.
11 { Hammell.
Price.
13 Grisdale.
14 Jarvis, T.

CLASS III.

1 Robertson.
2 Williams.
3 Wagg.
4 McLaurin.
5 Jarvis, C.
6 Harris
7 Mallory.
8 Marshall.
9 Livingstone.
10 Wilson.
11 Scott
12 Deike.
13 Allison.
14 Gethen.
15 Hutchison.

Bacteriology.

CLASS I.

1 Hutt.

CLASS II.

1 Grisdale.
2 { Hopkins.
Hume.
4 Price.

CLASS III.

1 Kennedy.
2 Hawke.
3 Anderson.
4 { Hammell.
Livingstone.
6 Thomson.
7 Hollis.
8 Harris.
9 Raynor.
10 Dieke.
11 Tozeland.
12 Marshall.
13 Williams.
14 { Ross, D. A.
Wagg.
16 Wilson, E. S.
17 Murdoch.
18 Westgate.
19 Gethen.
20 Jarvis.
21 { Snider.
Mallory.
23 Taylor.
24 Jarvis, T.
25 Scott.
26 { Fowler.
Robertson.
28 Zavitz.
McLaurin.
Allison.

Animal Chemistry.

CLASS I.

1 Grisdale.

CLASS II.

1 Kennedy.
2 Marshall.
3 { Hopkins.
Williams.
5 Hume.
6 Hutt.

CLASS III.

1 { Harris.
Raynor.
3 Mallory.
4 Price.
5 Tozeland.
6 Wagg.
7 Livingstone.
8 Taylor.
9 Jarvis, C.
10 { Deike.
Jarvis, T.
Westgate.
Wilson.
14 Scott.
15 { Anderson.
Thomson.
17 Hollis.
18 Murdoch.
19 { Hammell.
Ross.
21 McLaurin.
22 Zavitz.
23 { Gethen.
Hawke.
Snider.

Hutchison.
Allison.
Robertson.
Fowler.

Horticulture.

CLASS I.

1 Hutt.
2 Hume.
3 { Hopkins.
Wiliams.
5 Grisdale.
6 Jarvis, C.
7 Mallory.

CLASS II.

1 Kennedy.
2 Price.
3 Raynor.
4 Zavitz.
5 Livingstone.
6 Jarvis, T.
7 { Gethen.
Snider.
9 Thompson.
10 Harris.

CLASS III.

1 Tozeland.
2 Wagg.
3 { Ross.
Westgate.
5 { Marshall.
McLaurin.
7 Taylor.
8 { Fowler.
Hawke.
10 Hammell.
11 Anderson.
12 { Murdoch.
Wilson.
14 { Hollis.
Robertson.
16 Deike.
17 Hutchison.
18 Scott.

Allison.

Vet Pathology.

CLASS I.

1 Hopkins.
2 Grisdale.
3 Hume.
4 Price.

CLASS II.

1 Marshall.
2 Kennedy.
3 Raynor.
4 Deike.
5 Jarvis, C.
6 Murdoch.
7 Ross.
8 Hutt.

CLASS III.

1 { Anderson.
Jarvis.
3 Tozeland.
4 { Thomson.
Hollis.
6 { Taylor.
Wagg.
Williams.
9 { Harris.
Hutchison.
11 { Mallory.
Wilson.
13 Livingstone.
14 Westgate.
15 Robertson.
16 Snider.
17 Fowler.
18 Scott.
19 Hammell.
20 McLaurin.
21 Hawke.
22 Zavitz.
23 { Allison.
Gethen.

CLASS LISTS—EASTER EXAMINATIONS, 1898 (*Continued*). SECOND YEAR.

Practical Horse.

Class I.

1 Hopkins.
2 Kennedy.

Class II.

1 Jarvis.
2 Grisdale.
3 { Hume. / Livingstone. / Marshall.
6 { Westgate. / Wagg.
8 Williams.
9 { Fowler. / Hollis.
11 { Price. / Gethen. / Harris. / Hutt
15 Snider.
16 Hawke.
17 Mallory.
18 { Hutchison. / Raynor.
20 Scott.
21 Jarvis.
22 { Deike. / Murdoch.
24 Zavitz.

Class III.

1 Wilson.
2 McLaurin.
3 { Anderson. / Ross.
6 { Allison. / Hammell. / Robertson. / Tylor. / Tomson. / Tozeland.

English Literature.

Class I.

1 Williams.
2 Hume.
3 Hopkins.
4 Grisdale.
5 Hutt.
6 Wagg.
7 Price.

Class II.

1 Raynor.
2 Marshall.
3 Mallory.
4 { Deike. / Livingstone.

Class III.

1 Snider.
2 Fowler.
3 { Hammell. / Robertson.
5 { Anderson. / Westgate.
7 Murdoch.
8 Kennedy.
9 { Scott. / Tozeland. / Wilson.
12 Hawke.
13 { Harris / Thomson.
15 Taylor.
16 Gethen.
17 Zavitz.
18 Jarvis, C.
19 Hollis
20 Jarvis, T.
21 { Allison. / Ross.

McLaurin.
Hutchison.

Composition and Prose Literature.

Class I.

1 Hume.
2 Grisdale.

Class II.

1 Hutt.
2 Hopkins.
3 Williams.

Class III.

1 Price.
2 Marshall.
3 { Deike. / Scott.
5 Fowler.
6 Kennedy.
7 Wagg.
8 { Anderson. / Raynor.
10 Hawke.
11 { Hammell. / Mallory. / Wilson.
14 { Murdoch. / Westgate.
16 Gethen.
17 Tozeland.
{ Harris. / Hollis. / Jarvis, C. / Jarvis, T. / Livingstone. / Robertson. / Ross / Snider. / Taylor / Thomson. / Zavitz.

Allison.
McLaurin.
Hetchison.

Political Economy.

Class I.

1 Grisdale.
2 Kennedy.
3 Hopkins.
4 Hume.

Class II.

1 Price.
2 Williams.
3 Raynor.
4 Hutt.
5 Livingstone.
6 Westgate.
7 Murdoch.
8 Marshall.

Class III.

1 Scott.
2 Harris.
3 { Hawke. / Mallory. / Wagg. / Wilson.
7 Fowler.
8 { Deike. / Thompson.
10 { Anderson. / Taylor.
12 Hollis.
13 Ross.
14 Tozeland.
15 Jarvis, C.
16 Gethen.
17 Hammell.
18 Jarvis, T.
19 McLaurin.
20 { Snider. / Zavitz.
Robertson.
22 { Allison.
23 Hutchison.

Physics.

Class I.

1 Grisdale.
2 Price.
3 Williams.
4 Hume.

Class II.

1 Hutt.
2 Raynor.
3 Hopkins.
4 Kennedy.
5 Murdoch.
6 Marshall.
7 { Anderson. / Deike.

Class III.

1 Jarvis, C.
2 { Harris. / Tozeland
4 Zavitz.
5 Mallory.
6 Hawke.
7 Livingstone.
8 Westgate.
9 Ross.
10 Scott.
11 { Wagg. / Wilson.
13 Thomson.
14 Gethen.
15 Snider.
16 Robertson.
17 Fowler.
18 Taylor.
19 Hammell.
20 McLauren.
21 Jarvis, T.
22 Allison.
23 Hollis.
24 Hutchison.

Proficiency.

1 Grisdale.
2 Hume.
3 Hopkins.
4 Kennedy.
5 Hutt.
6 Price.
7 Williams.
8 Raynor.
9 Marshall.
10 Wagg.
11 Mallory.
12 Harris.
13 Livingstone.
14 Westgate.
15 Murdoch.
16 Deike.
17 Thompson.
18 Tozeland.
19 Jarvis, C.
20 Anderson.
21 Ross.
22 Hawke.
23 { Jarvis, T. / Snider.
25 Taylor.
26 Scott.
27 Wilson.
28 Hammell.
29 Hollis.
30 Zavitz.
31 Gethen.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1898.
FIRST YEAR.

Agriculture.

Division A.

CLASS I.

1 McMillan.
2 Robertson, J A.
3 Ketchen.
4 Hutton.
5 Goble.

CLASS II.

1 Fawell.
2 Bowman.
3 { Crerar. / McEwen.
5 Wilson.
6 { McIntyre. / Vanatter.
8 Hamilton.
9 { Linklater. / Morturex.
11 { Goodchild. / Gorrell.
13 { Carleton. / Lewis.
15 Hutchison.
16 Stewart.

CLASS III.

1 Kidd.
2 Peters.
3 { Campbell. / Crow.
5 McCorvie.
6 Beckstedt.
7 McCarthy.
8 Eddy.
9 Taylor.
10 Bowers.
11 Willmott.
12 Murray.
13 Christie.
14 Semple.
15 Balfe.
16 McFiggins.
17 Wilkinson.
18 Bancroft.

Division B.

CLASS II.

1 Forrester.

CLASS III.

1 Mills.
2 Broomfield.
3 Greenfield.
4 Coté.
5 Stott.
6 { Robertson, A. J. / Sheppard.

———

Eagle.
{ Picken. / Smith.
Allison.
Sullivan.
Hains.
Isaacs.

Experiments.

Division A.

CLASS I.

1 McMillan.
2 { Linklater. / Vanatter.
4 Beckstedt.
5 Stewart.
6 Robertson, A. J.

CLASS II.

1 McEwen.
2 Morturex.
3 Crerar.
4 Campbell.
5 { Gorrell. / Hutchison.
7 Taylor.
8 Goodchild.
9 Ketchen.
10 Bowman.

CLASS III.

1 { Carleton. / Peters.
3 McIntyre.
4 { Hamilton. / Lewis.
6 Hutton.
7 { Fawell. / Wilson.
9 McCorvie.
10 { Crow. / Goble.
12 { Bowers. / McFiggins.
14 { McCarthy. / Murray.
16 Bancroft.
17 Semple.
18 { Balfe. / Eddy.
20 Kidd.
21 { Christie. / Willmott.

———

Wilkinson.

Division B.

CLASS II.

1 Forrester.

CLASS III.

1 Mills.
2 Broomfield.
3 Smith.
4 Sullivan.
5 Stott.
6 Picken.

———

Allison.
Coté.
Sheppard.
Greenfield.
Robertson.
Isaacs.
Eagle.

Dairying.

Division A.

CLASS I.

1 McMillan.
2 Robertson, J. A.
3 Fawell.
4 Ketchen.
5 McIntyre.
6 { Crerar. / Peters.

CLASS II.

1 Lewis.
2 Campbell.
3 { Carleton. / Morturex.
5 Linklater.
6 Hutton.
7 Kidd.
8 Beckstedt.
9 { Stewart. / Vanatter.
11 { Gorrell. / Hamilton. / McCorvie.
14 { Bowman. / Hutchison. / McCarthy.
17 { Eddy. / McEwen.

CLASS III.

1 Christie.
2 { Semple. / Willmott.
4 Balfe.
5 Goodchild.
6 Bowers.
7 Wilkinson.
8 Bancroft.
9 { Goble. / Murray.
11 { Taylor. / Wilson.
13 McFiggins.
14 Crow.

Division B.

CLASS III.

1 Mills.
2 Forrester.
3 Broomfield.
4 Robertson, A. J.
5 Stott.
6 { Greenfield. / Smith.
8 Eagle.
9 { Allison. / Coté. / Picken. / Sheppard. / Sullivan.

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Hains.
Isaacs.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1898—*Continued.*
FIRST YEAR.

Poultry.

Division A.

CLASS I.

1 Robertson, J. A.
2 Fawell.
3 Linklater.
4 McMillan.
5 Ketchen.
6 { Beckstedt.
Crow. }

CLASS II.

1 { Morturex.
Lewis.
Taylor. }
4 { Goodchild.
Hutton.
Stewart. }
7 McCarthy.
8 { McIntyre.
Crerar. }

CLASS III.

1 { Bancroft.
Peters.
Wilson. }
4 McFiggins.
5 Eddy.
6 { Campbell.
Willmott. }
8 { Goble.
Vanatter. }
10 { Hutchison.
McEwen. }
12 Semple.
13 Bowers.
14 Carleton.
15 Gorrell.
16 McCorvie.
17 Wilkinson.
18 Murray.
19 Kidd.
20 { Balfe.
Hamilton. }
22 Bowman.
23 Christie.

Division B.

CLASS II.

1 Stott.

CLASS III.

1 Smith.
2 Forrester.
3 Allison.
4 Harris.
5 Robertson, A. J.
6 { Greenfield.
Sheppard. }
8 Eagle.
9 { Mills.
Picken. }

Broomfield.
Coté.
Sullivan.
Isaacs.

Bee-keeping.

Division A.

CLASS I.

1 Crerar.
2 McMillan.
3 Hutchison.
4 Peters.
5 Bowers.
6 Hutton.
7 Morturex.
8 Linklater.
9 Willmott.
10 McCorvie.
11 Gorrell.
12 { Goodchild.
McEwen. }

CLASS II.

1 Crow.
2 Beckstedt.
3 Wilson.
4 Kidd.
5 Stewart.
6 { Fawell.
Goble. }
8 { Lewis.
Robertson. }
10 { McIntyre.
Taylor. }

CLASS III.

1 Ketchen.
2 Balfe.
3 Campbell.
4 { Carleton.
Murray. }
6 Hamilton.
7 Vanatter.
8 Wilkinson.
9 Bowman.
10 Semple.
11 Eddy.
12 Greenfield.
13 McCarthy.
14 McFiggins.

Bancroft.

Division B.

CLASS II.

1 Forrester.

CLASS III.

1 Mills.
2 Christie.

Robertson, A. J.
Eagle.
Picken.
Smith.
Allison.
Broomfield.
Isaacs.
Stott.
Coté.
Hains.
Sheppard.
Sullivan.

Chemistry.

Division A.

CLASS I.

1 McMillan.
2 Mortureux.
3 Linklater.

CLASS II.

1 Crerar.
2 Robertson.
3 Goble.
4 Gorrell.
5 Ketchen.
6 Peters.

CLASS III.

1 Goodchild.
2 Vanatter.
3 Kidd.
4 McCorvie.
5 Hutton.
6 { Hutchison.
Wilson.
Fawell. }
9 { Bowman.
Campbell. }
11 { McIntyre.
Stewart. }
13 Crow.
14 Lewis.
15 Bowers.
16 { Balfe.
McEwen.
Semple. }
19 Taylor.
20 { Carleton.
McCarthy. }
22 Eddy.
23 Hamilton.
24 Bancroft.

Willmott.
Christie.
Murray.
Wilkinson.
McFiggins.

Division B.

CLASS II.

1 Mills.
2 Broomfield
3 Stott.
4 { Allison.
Hains. }

Coté.
Sheppard.
Greenfield.
Forrester.
Eagle.
Picken.
Robertson.
Smith.
Sullivan.
Isaacs.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1898.—*Continued.*

FIRST YEAR.

Botany.

Division A.

Class I.

1 McMillan.
2 Linklater.
3 Bowman.
4 Lewis.

Class II.

1 Morturex.
2 Fawell.
Ketchen.
4 Crerar.
Hutton.
Robertson.
7 McCarthy.
8 Hutchison.
Peters.
10 Goodchild.
11 Taylor.
12 McEwen.
13 Carleton.
Stewart.
15 Crow.

Class III.

1 Campbell.
Gorrell.
McIntyre.
4 Willmott.
Kidd.
Goble.
7 McCorvie.
8 Bowers.
9 Vanatter.
10 Eddy.
11 Semple.
12 Wilson.
13 Balfe.
McFiggins.
15 Christie.
16 Bancroft.
17 Hamilton.
18 Murray.
19 Wilkinson.

Division B.

Class I.

1 Forrester.
2 Mills.
3 Stott.
4 Coté.

—

Greenfield.
Broomfield.
Robertson
Allison.
Sullivan.
Sheppard.
Picken.
Hains.
Eagle.
Isaacs.

Materia Medica.

Division A.

Class I.

1 Morturex.

Class II.

1 McMillan.
2 Linklater.

Class III.

1 McEwen.
2 Beckstedt.
3 Hutton.
4 Robertson, J. A.
5 Ketchen.
6 Stewart.
Taylor.
8 Crerar.
Goble.
10 Fawell.
11 Goodchild.
12 Bowman.
Gorrell.
McIntyre.
15 Crow.
Lewis.
17 Balfe.
Vanatter.
19 Kidd.
Peters.
McCorvie.
Wilson.
23 Carleton.
24 Campbell.
Semple.
26 Willmott.
27 Hutchison.
28 Hamilton.
Eddy.
McCarthy.

—

Christie.
Bancroft.
Murray.
Wilkinson.
Bowers.
McFiggins.

Division B.

Class III.

Mills.
Forrester.

—

Robertson.
Picken.
Scott.
Greenfield.
Smith.
Sheppard.
Allison.
Eagle.
Broomfield.
Coté.
Sullivan.
Isaacs.

Grammar and Composition.

Division A.

Class I.

1 Morturex.
2 McMillan.
3 Linklater.

Class II.

1 Kitchen.
2 Bowman.
3 McIntyre.
4 Hutton.
5 Hutchison.
6 Goble.
7 Lewis.
8 McCarthy.

Class III.

1 Gorrell.
2 Wilkinson.
3 Crerar.
Fawell.
5 Carleton.
McEwen.
7 Kidd.
8 Crow.
McCorvie.
10 Peters.
Willmott.
12 Bowers.
Wilson.
14 Goodchild.
15 Robertson.
Semple.
17 Hamilton.
Vanatter.
19 Taylor.
20 Bancroft.
21 Balfe.
Eddy.
23 Campbell.
Eddy.
Stewart.
Murray.
McFiggins.

Division B.

Class III.

1 Mills.
2 Robertson, A. J.
3 Greenfield.
4 Cote.
5 Stott.
6 Forrester.

Failed.

Picken.
Sheppard.
Allison.
Isaacs
Broomfield.
Sullivan.
Hains.
Eagle.
Smith.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1898.—*Continued.*

FIRST YEAR.

Literature.

Division A.

Class I.

Morturex.
2 Fawell.

Class II.

1 Hutton.
2 Bowman.
3 McMillan.
4 Goble.
5 Crow.
6 Campbell.
Robertson.
8 Ketchen.
9 McEwen.
10 Gorrell.
McCorvie.
12 Linklater.

Class III.

1 Crerar.
Goodchild.
3 McIntyre.
Peters.
5 Lewis.
6 Christie.
7 McCarthy.
8 Eddy.
Hutchison.
10 Bancroft.
11 Semple.
Vanatter.
13 Balfe.
Kidd.
15 Stewart.
16 Hamilton.
17 Taylor.
18 Carleton.
Wilkinson.
20 Wilson.

—

Wilmott.
McFiggins.
Bowers.
Murray.

Division B.

Class II.

1 Forrester.
2 Allison.
3 Mills.

Class III.

1 Picken.
2 Coté.
3 Greenfield.
Robertson.
5 Stott.
6 Hains.
7 Smith.
8 Sheppard.

—

Broomfield.
Isaacs.
Sullivan.
Eagle.

Physics.

Division A.

Class I.

1 McMillan.
2 Morturex.

Class II.

1 Goble.
2 Bowman.
Linklater.
4 Campbell.
5 McCorvie.
6 McEwen.
7 Robertson.
8 Ketchen.
9 Hutton.
10 Eddy.
Vanatter.
12 Goodchild.
McCarthy.

Class III.

1 Peters.
2 Catleton.
3 Hutchison.
4 Crow.
5 Taylor.
Wilson.
7 Wilkinson.
Crerar.
9 Fawell.
10 Kidd.
Stewart.
Beckstedt.
13 Balfe.
Lewis.
15 McIntyre.
Murray.
Gorrell.
18 Semple.
19 McFiggins.
20 Bancroft.
Christie.
Hamilton.

—

Willmott.
Bowers.

Division B.

Class II.

1 Mills.

Class III.

1 Greenfield.
2 Allison.
9 Forrester.
4 Picken.
5 Robertson.
6 Stott.
7 Coté.

—

Smith.
Sheppard.
Eagle.
Broomfield.
Isaacs.
Sullivan.
Hains.

Mensuration.

Division A.

Class I.

1 McMillan.
2 Gobel.
Ketchen.
4 Linklater.
5 Hutchison.
6 Lewis.

Class II.

1 Gorrell.
2 Wilkinson.
3 Fawell.
Morturex.
5 Crow.
Semple.
7 McCarthy.

Class III.

1 McIntyre.
2 McCorvie.
3 Robertson, J.
4 Stewart.
5 McEwen.
6 Carleton.
Crerar.
Vanatter.
9 Bowman.
10 Willmott.
11 Goodchild.
12 Bowers.
13 Balfe.
14 Hamilton.
Peters.
Wilson.
17 Hutton.
Taylor.
19 Campbell.
Eddy.
Kidd.
McFiggins.

—

Murray.
Bancroft.
Christie.

Division B.

Class III.

Forrester.
Mills.

—

Picken.
Robertson, A. J.
Bromfield.
Sheppard.
Coté.
Stott.
Eagle.
Allison.
Hains.
Isaacs.
Smith.
Greenfield.
Sullivan.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1898.—*Continued.*

FIRST YEAR.

Drawing.

Division A.

Class I.

1 { Hutchison.
  { Linklater.
3 McMillan.
4 Morturex.

Class II.

{ Crow.
{ Goble.
3 { Ketchen.
  { Lewis.
5 Robertson.
6 Crerar.
7 { Fawell.
  { McCarthy.
9 { Carleton.
  { Hutton.
  { McEwen.
12 McIntyre.

Class III.

1 Stewart.
2 { Bowman.
  { Goodchild.
  { Willmott.
5 { Gorrell.
  { Murray.
7 McCorvie.
8 { Semple.
  { Taylor.
10 Campbell
11 Eddy.
12 Vanatter.
13 Kidd.
14 Bowers.
15 { Hamilton.
  { Wilson.
17 Peters.
18 Bancroft.
19 McFiggins.
20 Balfe.

—

Christie.
Wilkinson.

Division B.

Class III.

1 Broomfield.
2 Stott.
3 Coté.
4 Picken.
5 { Forrester.
  { Sheppard.
7 Greenfield.
8 { Mills.
  { Robertson, A.
10 Sullivan.

—

Hains.
Eagle.
Allison.
Smith.
Isaacs.

General proficiency.

Midsummer proficiency.

1 McMillan.
2 Linklater.
3 Morturex.
4 Ketchen.
5 Robertson.
6 Crerar.
7 Hutchison.
8 Fawell.
9 Hutton.
10 Goble.
11 McEwen.
12 Lewis.
13 Gorrell.
14 { Goodchild.
  { McIntyre.
16 Bowman.
17 Peters.
18 Crow.
19 McCorvie.
20 Stewart.
21 Vanatter.
22 Campbell.
23 Carleton.
24 McCarthy.
25 Taylor.
26 Semple.
27 Eddy.
28 Hamilton.
29 Balfe.

In "B" Division.

Kidd.
Wilson.
Mills.

Proficiency for year.

1 McMillan.
2 Linklater.
3 Morturex.
4 Ketchen.
5 Robertson.
6 Goble.
7 Bowman.
8 Crerar.
9 Crow.
10 Fawell.
11 Hutton.
12 McEwen.
13 Peters.
14 Lewis.
15 Hutchison.
16 McIntyre.
17 Gorrell.
18 Carleton.
19 McCorvie.
20 McCarthy.
21 Goodchild.
22 Kidd
23 Semple.
24 Campbell.
25 Taylor.
26 Eddy.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1898.—*Continued.* SECOND YEAR.

Agriculture.

Class I.

1 Grisdale.
2 Kennedy.
3 Marshall.
4 Hopkins.
5 Hume.
6 Harris.

Class II.

1 Raynor.
2 Wagg.
3 Snider.
4 Hammell.
5 Thomson.
6 Livingstone.
7 Wilson.
8 Hawke.
9 Tozeland.
10 Murdoch.
11 Hutt.

Class III.

1 Taylor.
2 Mallory.
3 Price.
4 Brokovski.
5 Ross.
6 Westgate.
7 Zavitz.
8 Robertson.
9 Hollis
10 Jarvis, C.
11 McLaurin.
12 Scott.
13 Jarvis, T.
14 Deike.
15 Ketchen.

Soil Physics and cultivation of the soil.

Class I.

1 Kennedy.
2 { Grisdale. / Raynor.

Class II.

1 Hume.
2 { Thomson. / Wagg.
4 Hopkins.
5 { Harris. / Zavitz.
7 Price.
8 { Robertson. / Ross
10 { Hawke. / Taylor.
12 { Murdoch. / Wilson.
13 Hutt.

Class III.

1 { Livingstone. / Marshall.
3 Scott.
4 { Mallory. / Westgate.
6 Tozeland.
7 Snider.
8 Hammell.
9 { Gethen. / Brokovski.
11 McLaurin.
12 Hollis.
13 Deike.
14 Jarvis, T.
15 Jarvis, C.

Experiments.

Class I.

1 Thomson.
2 Kennedy.

Class II.

1 Raynor.
2 Taylor.
3 { Hutt. / Murdoch. / Westgate. / Zavitz
7 { Grisdale. / Hume. / Jarvis, C. / Jarvis, T.
11 { Hammell. / Hopkins.
13 { Hawke. / Ross. / Tozeland.
16 Snider.

Class III.

1 { Marshall. / Robertson. / Wilson.
4 { Harris. / Mallory. / Wagg.
7 Price.
8 { Brokovski. / Scott.
10 { Hollis. / Livingstone.
12 McLaurin.
13 Deike.
14 Gethen.

Dairying.

Class I.

1 Kennedy.
2 Hopkins.
3 Price.
4 Grisdale.

Class II

1 Murdoch.
2 Hume.
3 Livingstone.
4 Taylor.
5 { Snyder. / Ross.
7 Thomson.
8 Jarvis, C.
9 { Brokovski. / Hutt.

Class III.

1 Marshall.
2 Raynor.
3 { Tozeland. / Wagg.
5 Hollis.
6 McLaurin.
7 Zavitz.
8 Robertson.
9 Deike.
10 { Harris. / Wilson.
12 { Hawke. / Mallory.
14 Gethen.
15 Jarvis, T.
16 Hammell.
17 Scott.
18 Westgate.

Poultry.

Class I.

1 Jarvis, C.
2 Jarvis, T.
3 { Grisdale. / Kennedy.
5 Hopkins.
6 { Hollis. / Hume. / Marshall.
9 Price.
10 { Raynor. / Thomson.
12 Hutt.

Class II.

1 { Mallory. / Wilson.
3 Snider.
4 Hawke.
5 Brokovski.
6 Harris.
7 { Livingstone. / Taylor. / Wagg.
10 Robertson.
11 { Gethen. / Hammell. / Ross. / Scott.

Bee-Keeping.

Class I.

1 { Hutt. / Jarvis. / Kennedy.
4 Wagg.
5 { Murdoch. / Raynor. / Snider.
8 Scott.
9 Livingstone.

Class II.

1 { Thomson. / Price.
3 Jarvis, T.
4 { Hammell / Mallory.
6 Deike.
7 { Harris. / Hopkins.

Class III.

1 Marshall.
2 Hawke.
3 Grisdale.
4 { Brokovski. / Hume. / McLaurin.
7 Robertson.
8 Wilson.
9 Zavitz.
10 Gethen.
11 Ross.
12 { Hollis. / Taylor. / Westgate.

Tozeland.

Agricultural Chemistry.

Class I.

1 Grisdale.
2 Kennedy.

Class II.

1 Price.
2 Raynor.
3 Livingstone.
4 Mallory.
5 Jarvis, C.
6 Marshall.
7 Westgate.
8 Hume.
9 Scott.
10 Hopkins.
11 Taylor.

Class III.

1 Hutt.
2 Murdoch.
3 Jarvis, T.
4 Deike.
5 Wagg.
6 Zavitz.
7 Brokovski.
8 Harris.
9 Tozeland.
10 Ross.
11 Thomson.
12 Robertson.
13 Hollis.
14 McLaurin.
15 Hammell.
16 Hawke.
17 Wilson.
18 Snider.
19 Gethen.

Practical Chemistry.

Class I.

1 Price.
2 Kennedy.
3 Grisdale.
4 Mallory.

Class II.

1 Deike.
2 { Livingstone. / Rayner.
4 Harris.
5 Westgate.
6 Murdoch.

Class III.

1 Jarvis, C.
2 Taylor.
3 { Hutt. / McLaurin.
5 { Marshall. / Robertson.
7 Ross.
8 Jarvis, T.
9 { Brokovski. / Hume.
11 Scott.
12 Wilson.
13 Hopkins.
14 Tozeland.
15 { Hammell. / Zavitz.
17 Gethen.
18 { Hollis. / Thomson.
20 Snider.
21 Wagg.
22 Hawke.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1898—*Continued*. SECOND YEAR.

Horticulture.

CLASS I.

1 Hutt.
2 Hume.
3 Jarvis, C.
4 Grisdale.
5 Raynor.

CLASS II.

1 Price.
2 Kennedy.
3 Mallory.
4 Thomson.
5 Hopkins.

CLASS III.

1 Snider.
2 Livingstone. / Tozeland.
4 Jarvis, T.
5 Gethen.
6 Zavitz.
7 Marshall.
8 Taylor. / Harris.
10 Hawke. / Westgate.
12 Wagg.
13 Hammell.
14 Murdoch.
15 Deike.
16 Wilson.
17 McLaurin.
18 Brokovski.
19 Robertson.
20 Scott.
21 Ross.
22 Hollis.

Botany.

CLASS II.

1 Hume.
2 Grisdale.
3 Hutt.
4 Kennedy.
5 Price.
6 Hopkins.
7 Hammell.

CLASS III.

1 Livingstone.
2 Mallory.
3 Jarvis, C.
4 Raynor.
5 Murdoch.
6 Westgate.
7 Marshall.
8 Tozeland.
9 Harris.
10 Brokovski
11 Jarvis, T. / Wagg.
13 Zavitz.
14 Hawke.
15 Gethen. / Thomson.
17 Robertson.
18 Deike.
19 Wilson.
20 Taylor.
21 Scott.
22 McLaurin.
23 Ross.
24 Snider.
25 Hollis.

Practical Botany.

CLASS I.

1 Hume.
2 Raynor.
3 Hutt.

CLASS II.

1 Jarvis, C.
2 Hawke. / Mallory.
4 Grisdale.
5 Marshall. / Price. / Thomson.
8 Kennedy. / Livingstone. / Tozeland.
11 Brodovski. / Snider.
13 Scott. / Zavitz.

CLASS III.

1 Ross.
2 Murdoch.
3 Taylor.
4 Hammell. / Tozeland.
6 Deike. / Hopkins.
8 Gethen.
9 Harris.
10 Jarvis, T. / Wilson.
12 Robertson.
14 McLaurin. / Westgate. / Hollis.

Veterinary Obstetrics.

CLASS I.

1 Hopkins.
2 Hume.
3 Kennedy.
4 Price.

CLASS II.

1 Grisdale.
2 Taylor. / Marshall.
4 Livingstone.
5 Raynor.
6 Jarvis, C. / Murdoch.
8 Hutt.
9 Harris. / Tozeland.

CLASS III.

Thomson. / Westgate.
Wilson.
Hollis.
Deike. / Wagg.
Zavitz.
Brokovski. / Hammell.
Gethen. / Jarvis, T. / Mallory.
McLaurin.
Ross. / Snider.
Hawke.
Scott.
Robertson.

English Literature.

CLASS I.

1 Hume.
2 Hutt. / Marshall.

CLASS II.

1 Price.
2 Grisdale.
3 Raynor.
4 Hopkins.
5 Wilson.
6 Mallory.
7 Livingstone.

CLASS III.

1 Wagg.
2 Harris.
3 Kennedy.
4 Jarvis, C.
5 Scott.
6 Hawke.
7 Tozeland.
8 Deike.
9 Hammell.
10 Brokovski.
11 Jarvis, T. / Murdoch. / Ross. / Taylor.
15 Westgate.
16 Robertson.
17 Gethen.
18 Hollis. / Snider. / Thomson. / Zavitz.

———

McLaurin.

Thesis.

CLASS I.

1 Price (*b*).
2 Gethen.

CLASS II.

1 Kennedy.
2 Raynor.
3 Wagg.
4 Thomson.
5 Harris.
6 Hollis. / Marshall.

CLASS III.

1 Hawke.
2 Snider. / Tozeland. / Zavitz.
5 Livingstone. / Robertson. / Westgate.
8 Hammell. / Jarvis.
10 Taylor.
11 Deike
12 Scott.
13 McLaurin.
14 Ross.
15 Mallory.
16 Wilson.
17 Murdoch.

———

Valedictory Contest:

1 Hume (*a*).
2 Hutt.
3 Grisdale. / Hopkins.
5 Jarvis.

Electricity.

CLASS I.

1 Price.
2 Grisdale.

CLASS II.

1 Hopkins.
2 Raynor.
3 Hume.
4 Kennedy.
5 Hutt.

CLASS III.

1 Mallory.
2 Deike
3 Hawke. / Marshall.
5 Jarvis, T / Westgate.
7 Zavitz.
8 Livingstone.
9 Hammell. / Murdoch.
11 Scott.
12 McLaurin. / Wilson.
14 Thomson.
15 Ross. / Tozeland.
17 Hollis.
18 Harris.
19 Jarvis, C.
20 Brokovski.
21 Gethen.
22 Wagg.
23 Robertson.
24 Snider. / Taylor.

Midsummer Proficiency.

1 Grisdale.
2 Hume.
3 Kennedy.
4 Price.
5 Hopkins.
6 Raynor.
7 Hutt.
8 Marshall.
9 Livingstone.
10 Jarvis, C.
11 Mallory.
12 Harris.
13 Murdoch.
14 Wagg.
15 Thomson.
16 Taylor.
17 Hammell. / Westgate.
19 Zavitz.
20 Hawke
21 Jarvis, T.
22 Wilson.
23 Deike.
24 Scott.
25 Snider.
26 Ross.
27 Robertson. M
28 Hollis.
29 Gethen.

Proficiency for year.

1 Grisdale.
2 Hume.
3 Kennedy.
4 Hopkins.
5 Price.
6 Hutt.
7 Raynor.
8 Marshall.
9 Mallory.
10 Livingstone.
11 Jarvis, C.
12 Wagg.
13 Harris.
14 Westgate.
15 Murdoch.
16 *Tozeland.
17 Thompson.
18 Taylor.
19 Deike.
20 Jarvis, T.
21 Hawke.
22 Snider.
23 Wilson,
24 Hammell.
25 Robertson.
26 Zavitz.
27 Ross.
28 Scott.
29 Hollis.
30 †McLaurin.

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* To take supplemental in bee-keeping.

† To take supplemental in English literature.

(*a*)—Valedictorian for 1898. (*b*)—Entitled to publication, as best thesis, in the next issue of the O. A. C. Review.

TWENTIETH ANNUAL REPORT

OF THE

ONTARIO

AGRICULTURAL AND EXPERIMENTAL UNION

1898.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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1899.

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TWENTIETH ANNUAL REPORT

OF THE

AGRICULTURAL AND EXPERIMENTAL UNION

ONTARIO

1898.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to present herewith the Twentieth Annual Report of the Ontario Agricultural and Experimental Union.

Your obedient servant,

C. A. ZAVITZ,
Secretary.

Ontario Agricultural College,
Guelph, Dec. 31st, 1898.

ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

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ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION

ANNUAL MEETING.

The twentieth annual meeting of the Ontario Agricultural and Experimental Union was held at the Agricultural College, Guelph, commencing on the evening of December 7th, and closing on the afternoon of December 9th, 1898.

As the President, Mr. Geo. Harcourt, Editor of the *Nor'-West Farmer*, Winnipeg, Manitoba, was unable to get to the meeting, the Vice-President, Mr. H. L. Beckett, Hamilton, Ontario, occupied the chair.

PRESIDENT'S ADDRESS.

By Geo. Harcourt, B. S. A., Editor "Nor'-West Farmer," Winnipeg, Manitoba.

Since last we met, another year has rolled by, with all its opportunities and difficulties, leaving behind it the lessons for the future. I have to congratulate you on the fact that it has been a most prosperous one. The returns from the soil, the flocks, and the herds have been, with one or two exceptions, the best for a number of years, and the prospects before us are bright with promise. I have also to congratulate you on the step in advance that has been made in the curriculum of our Alma Mater, and above all, I would congratulate you cn the excellent showing that the work of the Union makes this year.

It is therefore with great pleasure that I welcome you, visitors, students and ex-students of our beloved Alma Mater, to this our twentieth annual meeting to hear the results of the year's work As our Union is about to enter on the year of its majority, we may well pause to look back upon the feeble efforts of our younger days, and the gradual growth into the promise and strength of young manhood. Like many a young man, we were able to plan great things, but for lack of the necessary money, were not able to carry out our projects. The lack of means for carrying out our schemes has been one of the best things that could have happened our Union—a blessing in disguise—as it often is for young men; for as a child often tries to do things far beyond his strength, so our young organization might have attempted that which it had neither the strength nor ability to carry through to a successful issue. From the very first, therefore, only such work was undertaken as could be carried out successfully, and that came within the possibilities of the small money grant available. Thus, in early life, as it is with many a boy, the Union was taught to depend upon itself, to make the most of its opportunties, and to do its work thoroughly. With growing years, and with an increasing number of members and experimenters, the work we were able to accomplish has been extended. Just as a young man grows capable of doing more work, and assuming greater responsibilities, so the Union was able to show the Government that it could make good use of an increased grant, and it was given. Thus year by year, the work we were able to do increased with our growing abilities, until to-day, in the strength of our young manhood, work is being carried forward under no less than eight different committees, six of which will report to you at this meeting the work carried out by them during the year.

Our work now reaches out in field tests to some 3028 farms throughout our fair Province, to some 225 in the cultivation of small fruits, into our far famed cheese-factories, and among the beekeepers. Besides this, information is being spread abroad about the most troublesome weeds, work is being carried on in the study of the physical properties of the soil, in live stock, and in entomology. There is not a branch of farm life that does not feel the influence of the work of the Union in some way or other. What the results of that influence may be, we know not, we may never know, but we feel satisfied that it is an influence for good. The results of our work are eagerly watched and studied by farmers all over the Province. Those 3,253 farms, where experiments are being conducted, are so many illustration stations scattered over the Province, each one closely watched by the farmers around it, and quietly exerting an influence for good, the value of which only years can show.

We have built upon a solid foundation work which is bound to last. We have grown slowly, but none the less surely. After twenty years of work, what have we accomplished? In the first place we have perhaps the most complete and reliable information regarding the action of certain commercial fertilizers upon the soil of all parts of the Province. In the second place we have a knowledge of the adaptability of a number of leading varieties of grain and roots to the varying soils of Ontario. In the third place, we have a corps of trained experimenters in all parts of the Province, the value of which to our farmers cannot be estimated in money. In the fourth place we have an influence for good, which we should take good care is used aright; and lastly we are in a position to do more and better work than ever we have done before. Thus we stand on the threshold of our majority, like a young man in all his strength, ready for life's battles, and we may well ask, what of the future? The Union has been the pioneer in co-operative experimental work, and we have developed very nicely, but what of the future? Rapid as has been our growth the last few years, it is nothing compared with what is possible in the years to come. If in the years of our youth and experience we have gained so proud a position, and accomplished so much, what may we not attain to during the years of more mature judgment and ripe experience? I believe our possibilities are almost boundless, and limited only by our resources.

Referring for a moment to the work of the past year, I am pleased, indeed, to be able to state that there are more good reports from experimenters than ever before. This is most gratifying, indeed, as, owing to the heavy frost in July, which did damage in many places, it was feared that the co-operative field experiments had been injured. In nearly all classes, however, we have more good reports than at any other time. The experimenters are improving very much in their work, and are evidently taking a greater amount of interest in their experiments.

As to work for the future, I certainly think that the work of the committee on soil physics should be extended as rapidly as the committee can do so. Experimenters will have to be trained in this work, as they have been trained in conducting field experiments with grain. Out of the large number of trained observers in the ranks of the Union, there should be found a sufficient number to greatly extend the experimental work of this committee. The conservation of soil moisture is an important item to every tiller of the soil, and some experiments along this line might be devised by the committee.

The live stock committee have a more difficult field to work than some of the other committees. Many of the members of the Union, while perhaps willing and quite capable of conducting experiments successfully, are still with their fathers on the farm, and have not got the entire control of the stock. This makes it more difficult to get experimenters. During the past season soft bacon has been a live question. As there is a large amount of bacon grown in all parts of the Province, it might be possible to arrange some kind of a co-operative feeding experiment among the members of the Union, with a view to throwing light upon this vexed question. Could the experimenters be found, co-operative experiments should be of great value. Another question that the live stock committee might be able to do something with is the subject of lucerne. The acreage of this useful plant sown in the Province is steadily increasing, and there is bound to be a call for practical experience in pasturing it in a safe way, the dangers to be guarded against, and remedies that may be applied. I can think of no persons better qualified to conduct experiments along this line than the students and ex-students of the College.

I believe the committee in economic botany have been distributing, or is preparing to distribute, samples of some of our most noxious weed seeds. This suggests to me the idea that the ex-students and students of a township might co-operate under the direction of the committee in gathering a collection of the noxious weeds in their district, and making an exhibition of them, properly named, at the local show. Samples of weeds not found in the township might be supplied by the committee, or through the committee from places where they are found. At the Winnipeg, Brandon, and some of the fall shows in Manitoba, a weed exhibit was a great drawing card this past season. The booth containing the weed specimens was constantly surrounded by a crowd of farmers anxious to know the appearance of different weeds, and to learn any new ones. I feel satisfied that an exhibit of weeds in the green and dried state, with a sample of the seed, all properly named, would be one of the best means of teaching the farmers the appearance of the different weeds. It would at the same time be a great drawing card at every local show, and, I think, would meet with the approval of its directors.

I am very sorry that distance prevents me joining in this year's reunion. I hope, however, that you all may have a pleasant and profitable time. Be ready to take part in the discussions, or to ask questions, and thus do your part to make the meetings successful. In conclusion, let me urge upon every one the wisdom of taking some part in the experimental work, and thus help to carry on and develop the good work so well begun.

CO-OPERATIVE FRUIT TESTING.

H. L. Hutt, B.S.A., Director of Co-operative Experiments in Horticulture, Ontario Agricultural College, Guelph.

The co-operative testing of small fruits was begun in 1894 with sixty experimenters. Every year since then the work has gradually been increasing, and this year plants were sent to 225 experimenters.

The following table will give some idea of the scope and progress of the work during the past five years:

Co-operative Fruit Testing.

——	1894.	1895.	1896.	1897.	1898.	Total.
Experimenters	60	100	120	150	225	665
Plants distributed—						
Strawberries	720	960	960	2,400	4,800	9,840
Raspberries	360	480	480	480	600	2,400
Black Raspberries	360	480	480	480	600	2,400
Blackberries	....	....	480	480	600	1,560
Currants	180	240	240	240	300	1,200
Gooseberries	....	240	240	240	300	1,020
Totals	1,620	2,400	2,880	4,320	7,200	18,420

The interest in the work is rapidly growing, as may be judged by the increased number of applications for plants. For although the plant distribution has increased each year, yet the number of applications for plants has increased more rapidly, and for the past two years the applications have been more than double of the supply available for distribution.

The good done by a work of this kind is greater than is generally supposed. The ostensible object of finding out the varieties best adapted to the soil and locality of the experimenter is a worthy one, but probably even more good is done by the encouragement given to fruit growing on farms, where it might otherwise never have been given a thought. One experimenter to whom gooseberries were sent last year says: "I am greatly interested in the work, and well satisfied with the results, which cannot but be paoductive of great good. There are probably not more than half-a dozen people in this township who are growing gooseberries." In this way many are given a start in fruit growing, and this means better supplied tables and more wholesome living.

Some are making good use of the start given, and are propagating the plants for themselves. Another experimenter, speaking of the currant bushes sent him, says: "All of the plants have lived and done well. I have been propagating from them, and now have a nice little nursery of young plants coming on."

The work also has an educational value not to be lightly estimated. To observe closely, compare results, and keep records, as must be done by all who give any attention to the work, is an education of the most practical kind.

From the very nature of the work there are, of course, many difficulties to contend with, and we have many individual failures. Some unaccustomed to the handling of plants lose a number of them at the time of transplanting. Others, burdened with regular farm work, neglect the plants until they have succumbed to drouth or lack of cultivation. Again, others report that the cattle broke in and destroyed the plants, or that the labels have been lost, and that they do not now know the names of the varieties. Some who have succeeded up till the fruiting season are then disappointed because the hens or fruit-hungry children get the start of them. One unwary father, speaking of his first crop of currants, says: "The baby ate them green." Many reporting this year say that the crop was light on account of the drouth. On the whole, however, the reports sent in this year are very much better than they have ever been before. And we have reason to believe that the general nature of the reports will improve from year to year as the work becomes established.

The following is a list of plants distributed for co-operative testing last spring:

I. 100 lots of strawberries—Haverland, Clyde, Woolverton, and Van Deman—twelve plants each.

II. 25 lots of raspberries—Marlboro', Cuthbert, Shaffer's Colossal, and Golden Queen—six plants of each.

III. 25 lots of black raspberries—Souhegan, Gregg, Palmer, and Hilborn—six plants of each.

IV. 25 lots of blackberries—Kittatinny, Snyder, Taylor, and Gainor—six plants of each.

V. 25 lots of currants—Fay's Prolific, Victoria, Raby Castle, and White Grape—three plants of each.

VI. 25 lots of gooseberries—Houghton, Downing, Whitesmith, and Industry—three plants of each.

No report of crop could, of course, be expected from these this fall, but the majority of the experimenters report that the plants were received in good condition, and have done well. Many of them report a full stand of plants.

The yields reported are from plants which have been sent out in 1897, 1896, and 1895, and can be briefly summarized in the following tables.

STRAWBERRIES.—The following table shows the number of ounces per dozen plants in the average of several experiments:

Varieties.	Planted 1897.	Planted 1896.
	15 experiments.	2 experiments.
1. Haverland	147.0	58.0
2. Woolverton	128.8	110.0
3. Bubach	125.7	80.0
4. Van Deman	84.4	56.0

With reference to this experiment we might add that the first crop of strawberries is always the most satisfactory. And it is upon this only that we make our records of yields in our College experiments, All of the varieties in this test have particular qualities that make them worthy of a place in every plantation. *Van Deman*, athough the lowest in the list, has proved in our experiments here to be one of the best very early varieties. *Bubach* makes few runners, and may not yield as much as some others, but the fruit is always of large size and fine appearance. *Woolverton* has wonderful vigor of plant, which enables it to withstand drouth well, and for this reason usually does better than most varieties at the second crop. *Haverland*, on account of its vigor and productiveness, is a favorite in every home collection.

RASPBERRIES.—The average number of ounces per six bushes is given below :

Varieties.	Planted 1897.	Planted 1896.	Planted 1895.
	8 experiments.	1 experiment.	3 experiments.
1. Shaffer	39.2	80.0	151.6
2. Cuthbert	37.3	80.0	82 2
3. Golden Queen	29.3	32.0	83.2
3. Marlboro'	20.9	48.0	88.8

Here again the one at the bottom of the list is one of the best early varieties, and should be in every collection, while the Golden Queen next above it is one of the best of the yellow fruited raspberries.

BLACK RASPBERRIES.—The average number of ounces per six bushes is here given :

Varieties.	Planted 1897.	Planted 1896.	Planted 1895.
	4 experiments.	5 experiments.	1 experiment.
1. Palmer	61.8	145 8	197.5
2. Hilborn	50.4	109.2	....
3. Gregg	44.0	106.2	138.0
4. Souhegan	43.8	91.2	182.5

BLACKBERRIES.—The next table shows the average number of ounces per six bushes :

Varieties.	Planted 1896.
	1 experiment.
1. Kittatinny	246.7
2. Taylor	205.2
3. Gainor	129.9
4. Snyder	103.7

Blackberries usually require two years to come into bearing, hence no crop could be expected from the plants set out last year.

CURRANTS.—The following gives the average number of ounces per three bushes :

Varieties.	Planted 1897.	Planted 1896.	Planted 1895.
	10 experiments.	6 experiments.	5 experiments.
1. Baby Castle	46.0	28.0	50.0
2. Victoria	42.5	32.4	48.0
3. White Grape	21.5	21.4	32 0
4. Fay's Prolific	19.0	25.0	40.0

Fay's Prolific, although inferior to Raby Castle in productiveness, bears extra large fine berries, and for that reason would by many growers be preferred to the others which outyield it. White Grape is one of the finest of the currants, and although holding a somewhat inferior position in the co-operative tests, yet it has, in our tests at the College during the past two years, given a larger crop than any other variety of any color.

GOOSEBERRIES.--The average number of ounces per three bushes is shown below :

Varieties.	Planted 1897.	Planted 1896.	Planted 1895.
	5 experiments.	3 experiments.	5 experiments.
1. Houghton	70.0	88.3	161.8
2. Downing	46.0	58.6	146.4
3. Industry	30.0	29.6	50.8
4. Whitesmith	26.0	53.0	48.6

The two varieties at the head of the list are of American origin. They are, as a rule, more productive than the English varieties, and are very seldom affected with mildew, which is so troublesome on the latter, but the fruit is only about half the size of English varieties at the bottom of the list. Of the two American varieties, Downing bears much the larger, finer fruit, and for that reason is always preferred to the Houghton. The English varieties, Industry and Whitesmith, bear beautiful large berries, but they must be sprayed with the Bordeaux mixture or potassium sulphide to prevent the mildew.

ADDRESSES.

HON. SIDNEY FISHER, M.P., DOMINION MINISTER OF AGRICULTURE, OTTAWA.

I feel very guilty in coming in this way to interrupt such an interesting and instructive address as Mr. Zavitz is putting before you, but I feel that perhaps my interest in this gathering, not only of students, but graduates of Guelph College, on this occasion, and my interest in the institution itself, may cause you to pardon this interruption. It has been my good fortune more than once to come to Guelph, and I have felt so strongly that Guelph was the model of an Agricultural College to be taken by any and every one who could have the opportunity of examining it, and when I received the invitation to attend this meeting of the Experimental Union, I asked my friends, the Hon. Mr. Dechene, Minister of Agriculture in Quebec, and the Hon. Mr. Duffy, Minister of Public Works in Quebec, to come here with me and have an opportunity of seeing and examining this institution. I say this advisedly, as during the last season it was my good fortune in a matter of business to go to Europe, and while there I took the opportunity of seeing the Agricultural Colleges in England, and going over to France to examine the well-known and far-famed Agricultural College at Grignon, near Paris. I have also had the opportunity of seeing some of the Agricultural Colleges in the United States—not all of them—but I am glad to be able to tell you, who are here enjoying the advantages of education in this institution, that as a model, this is the one to which I would like to turn, and to which I would advise everybody to look. I say this especially, not for the benefit of the Hon. Mr. Dryden, who has had such a hand in its improvement, not for the benefit of Mr. Mills, who has had it under his foster-care almost since its inception, but I want to say it to the students who are here enjoying the benefits of this institution, and I want to say it to the old students, who to-day are working out the agricultural destiny of this Province of Ontario in various parts of the Province, so that when they go back to their homes on their farms, they can take this word from one who has had some opportunities of observation, and has had some experience and knowledge in connection with agriculture, and tell it as my deliberate and well-considered opinion.

The work you are doing here to-day in this Experimental Union is an intensely interesting and useful work to the Province, and it is gratifying to those who have anything to do with the College at Guelph to find that the old students here to day, instead of drifting away, as they sometimes used to do in the first years of the institution, into other professions and other businesses, are going back to their farms, and are there putting into practice and carrying on experiments such as these in their work, which are for the benefit of the whole country. I, perhaps, make rather a hobby of agricultural education. I have rather a deep interest in agriculture, and am glad always to be able to say this, and to say it with full meaning of sincerity: that those who wish to give themselves scope, not only for the exercise and the working up of their muscles and their hands in the drudgery of farm work, but those also who wish to give their brains and their mental capacity the best and fullest scope, have abundant opportunities in agriculture in Canada, and do not need to leave that business to go into any other profession or business to attain to the highest position socially, politically, or in business in the Dominion of Canada. Keep to the farm, and by that show that you are reaping the fullest and best benefit of the education you have received here, and you will be able to show that in the practical business of farming it is brains and education that tell, and not simply hard work—I mean not simply the hard and drudgery work of old-time farming in our country. I shall not detain you longer, but I have such an intense sympathy with the educational work which is going on in our Agricultural Colleges in this country, such a full knowledge of the benefit which the farmer of Canada is reaping from this educational work, that I feel I must say these few things to you to encourage you, and if possible influence the boys who are coming to this College to stay in agricultural work, and never dream of leaving it for anything else.

Hon. F. G. M. Dechene, Commissioner of Agriculture for Quebec.

The Hon. Mr. Dechene, on being introduced by President Mills, said that when Mr. Fisher told him that Guelph was the greatest institution, not only in this country, but in Europe, he had some hesitation in accepting the statement. He thought Mr. Fisher was exaggerating; but now he saw that Mr. Fisher was right. When it was known in his Province that he was coming to Guelph, some of the papers opposed to him said that he was going to Guelph to learn agriculture. There was always something to learn in agriculture more than in other things, because in Quebec in the past the science of agriculture had been neglected. He spoke of the natural advantages enjoyed by Quebec, and the need of education in agriculture. In some parts of his Province the farmers had been growing the crops for years in succession, the conseqence being that the yield became poorer each year; but the farmers in Quebec were going to make a great fight in the near future to equal Ontario in agriculture. It would be a friendly rivalry, and there would be no quarrel between the two Provinces. Quebec liked Ontario, and hoped Ontario liked her, and he hoped to live long enough to see all the questions of race and creed buried, and all working together to build up the grand country that he was sure Canada would be.

Hon. H. T. Duffy, Commissioner of Public Works for Quebec.

I certainly had no expectation of being called upon to speak on this occasion. However, I can assure you that I am exceedingly pleased to come here and find so many who are interested in agriculture in this Province of Ontario. The Department of Public Works, perhaps, is not very intimately connected with agriculture, still in this Dominion we are all interested in what after all is the great interest of the country, and the industry upon which the future prosperity of Canada is at present, and in the future, bound to rest. In Ontario I daresay you are in some respects in advance of us. You are certainly in advance of us so far as this magnificent school is concerned. Mr. Fisher, who has travelled around and examined schools all over the world, told us that he had no hesitation in saying that for practical utility and for really efficient training, this school was ahead of any other school in the world. I think, perhaps, after all, that Quebec is not so far behind Ontario in many things as even a good many people of Ontario imagine. When you want a good Prime Minister you come to the Province of Quebec to get him, and I think no one will deny that the Province of Quebec has filled the bill very well. When you want the best Minister of Agriculture Canada has ever had you come to the Province of Quebec to get him, and I think again that the Province of Quebec has filled the bill. I have the honour to represent the same county as Mr. Fisher. Perhaps I am not going too far in saying that the county of Brome is ahead of any other county in the Dominion so far as agriculture is concerned. We went to the World's Fair a few years ago, and came in contact with all the world, and perhaps a great many of you did not recognize the fact that the county of Brome took more prizes, so far as cheese was concerned, than any other part of the world. However, this is a kind of rivalry that may very well be encouraged. Canada is a great country; that remark is often made, but I believe we cannot make it too often; we cannot too often remember the magnificent resources that are placed at our disposal, our magnificent resources in timber, minerals, fisheries, and all the rest; but the industry which stands above all is the great agricultural industry. In this country we have agricultural crops sufficient to supply the markets of the world. Every man who has the true interest of Canada at heart should give all his time and attention to building up that particular industry.

CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

By C. A. Zavitz, B.S.A., Director of Experiments, Agricultural College, Guelph.

Co-operative experiments in agriculture, which were commenced in 1886, have been increasing in magnitude and importance each year since that time. This is, therefore, the twelfth year during which this system of practical field experiments has been carried on in this Province; and I am pleased to state to you that of all these years, the past one has been the best for our co operative work. The value of these co-operative experiments to those engaged in practical farming is inestimable. Not only is this system of experiments being appreciated by the experimenters themselves, but it is recognized as being one of the best sources of practical information for practical men by those of the highest authority in the Departments of Agriculture of both Canada and the United States, as may be seen from the following quotations:

"In the great Province of Ontario there is a most effective aud useful organization known as "The Experimental Union," which is connected, more or less, with the Guelph Agricultural College."—Hon. Sidney Fisher, M.P., Dominion Minister of Agriculture.

"The work undertaken by the Union discovers information of the most apt and practical sort for the farmers of Ontario."—Prof. James W. Robertson, Agricultural and Dairy Commissioner.

"Because it, (the Union) has grown step by step, it has grown surely, and no money which the Legislature annually gives for the purpose of the development of any of our industries is doing greater service than that which is annually given to the Union."—Hon. John Dryden, M. P. P., Minister of Agriculture for Ontario.

"I consider that there is no other work being done in the Province of Ontario to-day that is fraught with so much benefit to the farming community as the work which is being carried on by the Experimental Union."—C. C. James, Deputy Minister of Agriculture for Ontario.

"I am happy to see the evidence of your continually increasing activity and usefulness. Your record of co-operative experiments is magnificent."—Prof. W. O. Atwater, Director of the oldest Experiment Station on the American continent.

SOME ADVANTAGES OF THE CO-OPERATIVE EXPERIMENTS TO FARMERS CONDUCTING THEM.

1. Experimenters obtain information regarding varieties of farm crops, methods of cultivation, ways of increasing soil fertility, etc., for their own particular farms which they cannot possibly get in any other way.

2. Experimental work encourages careful handling, close observation, accurate calculation, and economical methods.

3. Experimenters get a start in pure seed of the best varieties of grain crops which rapidly increases in quantity, thus furnishing seed for sowing on large areas, and for selling at good prices.

4. Results of experiments conducted by other farmers, and by the experiment stations, are read and studied with increased interest.

5. Properly conducted experimental work adds pleasure to farm life and dignity to the profession, and forms a very wholesome influence in keeping the boys on the farm.

SOME ADVANTAGES TO FARMERS NOT ACTUALLY ENGAGED IN THE WORK.

1. The co-operative experiments located on three thousand Ontario farms form object lessons for the farmers in their respective neighborhoods.

2. Important features of the experiments are frequently discussed in the field, at the fire-side, and the meetings of farmers' institutes.

3. Summary results of, and important conclusions from, successfully conducted co-operative experiments are printed annually in the report of the Experimental Union, which is distributed in great numbers from the Department of Agriculture, Toronto, Ontario.

4. Farmers are frequently enabled to purchase pure seed of leading varieties of grain from their neighbors who are successful experimenters.

The whole system leads to a substantial increase in farm profits and to a steady advance in agricultural education throughout Ontario.

FARM CROPS IN ONTARIO. The figures in the table here presented furnish information regarding the principal farm crops grown in Ontario in 1898; the varieties grown in the experimental grounds at the Agricultural College within the past twelve years; and the number of varieties of each class of crop sent out over Ontario in connection with the co-operative experiments in the past year.

Crops.	Acres in Ontario, 1898.	Varieties tested.	
		At O. A. C. within 12 years.	Over Ontario, 1898.
Hay and clover	2,453,503	71	9
Oats	2,376,360	210	5
Winter wheat	1,048,182	148	7
Peas	865,951	100	5
Corn	520,696	219	6
Barley	438,784	94	4
Spring wheat	389,205	144	3
Potatoes	169,946	236	6
Rye	165,089	6	1
Turnips	151,601	179	4
Buckwheat	150,394	6	3
Mangel wurzels	47,923	102	4
Beans	45,220	41	3
Carrots	12,418	60	5

Besides the number of varieties indicated in the table here presented, there wer e also included in the co-operative experiments in 1898 the following: millet, four varieties; sugar beets, one variety; and leguminous crops, three varieties.

It is the summary results of the co-operative experiments with these leading varie- tested on various farms, and in different localities, to which we wish to draw your attention at the present time:

CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

Years.	Experiments.	Experimenters.	Satisfactory reports.
1886	1	12	8
1888	1	90	40
1891	12	203	126
1892	12	754	295
1893	13	1,204	416
1894	14	1,440	504
1895	15	1,699	513
1896	16	2,260	501
1897	18	2,835	610
1898	19	3,028	667

It will be observed that not only is the number of experimenters increasing, but the number of good reports of successfully conducted experiments is also increasing from year to year. The nineteen experiments, which were conducted in 1898 represent nearly all the farm crops which are grown in Ontario. Each experimenter made his choice of one of the nineteen different experiments used in 1898. There were from three to six varieties used in every experiment. Some good information regarding the co-operative work is furnished in the following circular, which was sent out to those who desired to join in the work in 1898:

Agricultural College, Guelph, March, 1898.

DEAR SIR:—

The members of the Committee on Co-operative Experiments in Agriculture are pleased to state that for 1898 they are again prepared to distribute into every township of Ontario material for experiments with fertilizers, fodder crops, roots, grains, grasses, and clovers. Upwards of 1,000 varieties of farm crops have been tested in the Experimental Department of the Ontario Agricultural College, Guelph, within the past twelve years. These consist of nearly all the Canadian sorts, and several hundred new varieties imported by the Experimental Department, from different parts of Europe, Asia, Africa, Australia, and the United States. Some of these have done exceedingly well in the carefully conducted experiments of several years and are now being used for co-operative experiments throughout Ontario.

This system of co-operative experimental work in Agriculture was started in 1886 with 60 plots, which were situated on twelve different farms in Ontario. Since that date, however, the work has increased from year to year, and in 1897 there were 11,497 plots, which were situated on 2,835 farms throughout Ontario.

Each person in Ontario who wishes to join in the work may choose any one of the experiments for 1898, 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 desires to ask that each experimenter will sow all the plots belonging to the particular experiment which he has chosen for 1898, 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 fertilizers and seeds 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. It might be well for each applicant to make a second choice for fear the first could not be granted. The experiments selected should be indicated by using the number given in the left hand column in the list of experiments.

Yours truly,

C. A. ZAVITZ,
Director of Co-operative Experiments in Agriculture.

The following is a list of the nineteen experiments used in connection with this work in the past year:

List of Experiments.	No. of plots required for each.	Size and shape of each plot.
1. Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure with Corn	5	2 rods x 1 rod.
2. Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure with Mangels	5	2 rods x 1 rod.
3. Growing three Leguminous crops for Green Fodder	3	2 rods x 1 rod.
4. Growing three mixtures of grain for Green Fodder	3	2 rods x 1 rod.
5. Testing four varieties of Millet	4	2 rods x 1 rod.
6. Testing four varieties of Grasses	4	1 rod x 1 rod.
7. Testing four varieties of Clovers	4	1 rod x 1 rod.
8. Testing three varieties of Buckwheat	3	1 rod x 1 rod.
9. Testing three varieties of Spring Wheat and one variety of Spring Rye	4	1 rod x 1 rod.
10. Testing four varieties of Barley	4	1 rod x 1 rod.
11. Testing five varieties of Oats	5	1 rod x 1 rod.
12. Testing four varieties of Peas	4	1 rod x 1 rod.
13. Testing three varieties of Beans	3	1 rod x 1 rod.
14. Testing five varieties of Carrots	5	1 rod x 1 rod.
15. Testing four varieties of Mangels and one variety Sugar Beets	5	1 rod x 1 rod.
16. Testing two varieties of Swedish and two varieties of Fall Turnips	4	1 rod x 1 rod.
17. Testing six varieties of Corn	6	1 rod x 1 rod.
18. Testing six varieties of Potatoes	6	1 row 4 rods long
19, Testing three varieties of Winter wheat	3	1 rod x 1 rod.

Material for either No. 1 or No. 2 experiment was sent by express, and for each of the others it was forwarded by mail.

No varieties were sent out except those which had done exceptionally well in the trial plots in the experimental department.

We have examined all the reports which have been received, and have discarded every report which showed any sign whatever of inaccuracy. Every experimenter who did not conduct the experiment with the full amount of material; who did not use plots uniform in size and according to instructions; who did not give the exact yield, etc, of the different plots, will not find his name in the following list as being one of those whose reports were included in the summaries which will be here given. We have, therefore, included in the summary, which is to be considered at this time, nothing but the results which were obtained from carefully conducted experiments. While the summaries should be of great value to the farmers on the whole, still those who conducted the experiments have obtained much additional information regarding the results of their experiments as adapted to their individual circumstances.

The experimenters deserve much credit in successfully conducting the various experiments during the past season; and the farmers of Ontario owe much to these experimenters for the valuable reports which they have furnished, and which are here presented in summary form.

LIST OF SUCCESSFUL EXPERIMENTERS.

The following list gives the names of those who furnished satisfactory reports of carefully conducted experiments in 1898 :

Experimenter.	Post office.	County.	Experiment.
1. Burnham, L. V	Sombra	Lambton	Fertilizers with corn.
2. Whetter, J. R	Lorneville	Victoria	"
3. Huntsman, L. E	Tintern	Lincoln	"
4. Turner, W. H	Ridgetown	Kent	"
5. Patterson, F. H	Smithville	Lincoln	"
6. Affleck, John	Harvey	Renfrew	"
7. Whealey, Thomas	Clarksburg	Grey	"
8. Bailey, Jas. T	Severn Bridge	Muskoka	"
9. Lawson, Allen J	Brighton	Northumberland	"
10. Andrew, John F	Lucknow	Huron	"
11. Mallory, B	Frankford	Hastings	"
12. O. A. C	Guelph	Wellington	"
13. Gould, G. P	Goderich	Huron	Fertilizers with roots.
14. Unwin, Walker	Bannockburn	Hastings	"
15. Kiernan, David	Banda	Dufferin	"
16. McCollin, John	Marysville	Hastings	"
17. Knight, Joshua	Elginburg	Frontenac	"
18. Purvis, D. N	Lyn	Leeds	"
19 Gerrow, Elijah, sr	Uxbridge	Ontario	"
20. Gerrow, J. F	"	Ontario	"
21. O. A. C	Guelph	Wellington	"
22. Warren, John	Gamebridge	Ontario	Leguminous crops.
23. Paterson, Robert	Belton	Middlesex	"
24. Rowand, Wm. A	Walkerton	Bruce	"
25. Tupper, G. B	Waterford	Norfolk	"
26. O. A. C	Guelph	Wellington	"
27. O. A. C	"	Wellington	Grain for green fodder
28. Lawson, Jas. T	Kearney	Parry Sound	"
29. Shipley, L. J. W	Denfield	Middlesex	Millet.
30. Patterson, Wm	Birtle	Manitoba	"
31. Fair, John	Frankford	Hastings	"
32. Landon, F. T	North Augusta	Leeds	"
33. O. A. C	Guelph	Wellington	"
34. McQueen, Wm	South River	Parry Sound	Grasses sown in 1897.
35. Stimpson, Fred	Lancelot	Muskoka	"
36. Simpson, A. E	Hamilton	P.E.I	"
37. O. A. C	Guelph	Wellington	"
38. Hartman, Walter	Clarksburg	Grey	"
39. Lawrence, Isaac	Londesboro	Huron	"
40. McArthur, Matthew	Poplar	Manitoulin Island	Grasses sown in 1898.
41. Taylor, W	St. Marys	Perth	"
42. Humphrey, F. C	Kamloops	British Columbia	"
43. Carroll, John	Joynt	Wright, Quebec	"
44. Golding, H	Thamesford	Oxford	"
45. Cranley, sr., John	Douro	Peterboro	"
46. Butterworth, Ed	Horncastle	Victoria	Clovers sown in 1897.
47. McLean, S	Little Current	Manitoulin	"
48. Miller, Simon	Unionville	York	"
49. Clipsham, M	Sparrow Lake	Muskoka	"
50. O. A. C	Guelph	Wellington	"
51. Smale, S. C	Oakdale	Lambton	"
52. McLaurin, P. S	McGarry	Lanark	"
53. Feeley, Thos	Eganville	Renfrew	Clovers sown in 1898.
54. Priddle, John	Frogmore	Norfolk	"
55. Reid, R. H	Reaboro	Victoria	"
56. Hawkesworth, Peter	Thornloe	Nipissing	"
57. Ward, A. E	Huntsville	Muskoka	"
58. Lyall, Geo	Oro Station	Simcoe	Buckwheat.
59. Fisher, Bros	South Middleton	Norfolk	"
60. Trickey, P. S	Athens	Leeds	"
61. Schwitzer, Jacob	Rodney	Elgin	"

LIST OF SUCCESSFUL EXPERIMENTERS.—*Continued.*

Experimenter.	Post office.	County.	Experiment.
62. Middleton, Chas	Mount Hope	Bruce	Buckwheat.
63. Brenton, Joel	Corbyville	Hastings	"
64. McIntosh, A. G	Chesley	Bruce	Spring wheat.
65. Piper, John	Effingham	Welland	"
66. Howe, Joseph	Powassan	Parry Sound	"
67. Clemis, Robert	Lady Bank	Grey	"
68. Scott, Robert	Malvern	York	"
69. Grady, J. W	Annan	Grey	"
70. Smith, Jas	Edgar	Simcoe	"
71. Wilson Chas	Snelgrove	Peel	"
72. Watson, Chas	Dromore	Grey	"
73. Whetter, F. A	Lorneville	Victoria	"
74. Eastwood, David	Peterboro	Peterboro	"
75. Bettles, Thos. S	Porter's Hill	Huron	"
76. Campbell, J. D	Victoria Cross	King's, P.E.I	"
77. Scott, Richard	Powassan	Parry Sound	"
78. Ward, A. E	Big Fork	Rainy River District	"
79. Strachan, Geo	"	Rainy River District	"
80. McNaughton, Wm	Balderson	Lanark	"
81. McCormack, Jas	Trenton	Northumberland	"
82. Walker, Thos	Hawthorne	Russell	"
83. Sensabaugh, D. H	Attercliffe	Welland	"
84. Wilson, John	Marsville	Dufferin	"
85. Butterworth, Ed	Horncastle	Victoria	"
86. Dickens, W. W	Hybla	Hastings	"
87. Patterson, T. A	Agincourt	York	"
88. Dunn, W. J	Mount St. Louis	Simcoe	"
89. Prout, Edmund	Bowmanville	Durham	"
90. Pope, Geo	Clinton	Huron	"
91. Forrester, J	Port Elgin	Bruce	"
92. Tripp, Thos	Fingerboard	Victoria	"
93. Manson, Chas	Eddy Mills	Lambton	"
94. Miller, Alfred	Boxall	Elgin	"
95. Stewart, A	Ailsa Craig	Middlesex	"
96. Shepherd, Frank	Pickering	Ontario	"
97. Dryden, Wm	Paisley	Bruce	"
98. Collins, J. H	Beaverton	Ontario	"
99. Scissons, Thos	Dunrobin	Carleton	"
100. Chamberlain, Geo	Purtrook	Victoria	"
101. Teskey, Jas	Croydon	Addington	"
102. Island, Jas M	Orangeville	Dufferin	"
103. Hulbig, John	Minden	Haliburton	"
104. Lane, John	Gore Bay	Manitoulin	"
105. Doherty, Chas	Wildfield	Peel	"
106. Tuplin, Wm	Sundridge	Parry Sound	"
107. Dickin, John	Milton	Halton	"
108. Purcell, Duncan M	Aberardar	Lambton	"
109. Rynard, Wm	Zephyr	Ontario	"
110. Groth, G. R	Scotia	Parry Sound	"
111. Collins, Chas	Lindsay	Victoria	"
112 Finegan, Jas	Umfraville	Hastings	"
113. Tuplin, John	Sundridge	Parry Sound	"
114. Jessup, John W	Rockingham	Renfrew	"
115. Law, R. E	Thornloe	Nipissing	"
116. Berry, Mrs Wm	Bellingham	Algoma	"
117. McKim, Thos. M	Maberly	Lanark	"
118. Hughes, W. E	Schomberg	York	"
119. Robson, Alfred	Norwood	Peterboro	"
120. Hutton, G. H	Easton's Corners	Grenville	"
121. Ireland	Amiens	Middlesex	"
122. Kronz, Nicholas	Golden Lake	Renfrew	"
123. Tabott, Freeman	Bloomfield	Prince Edward	"
124. Rock, Jas	Hutchinson	Middlesex	"
125. Duncan, Jas	Drayton	Wellington	"
126. Armstrong, J. R	Smithville	Lincoln	"
127. Magee & Son	Janetville	Durham	"
128. Maxwell, G. W	Melville Cross	Peel	"

LIST OF SUCCESSFUL EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
129. Kirkton, Wm	Perm	Dufferin	Spring wheat.
130. Shuh, Frank	Waterloo	Waterloo	Barley.
131. Hick, Walter	Goderich	Huron	"
132. Madden, Alex.	North Williamsburg	Dundas	"
133. Lott, Geo.	Napanee	Lennox	"
134. Bennett, S. G.	Midland	Simcoe	"
135. McKessock, John	Massie	Grey	"
136. Kidd, Chas	Langman	Simcoe	"
137. Ferguson, J. D	Valetta	Kent	"
138. Craven, J. A	Shelburne	Dufferin	"
139. Riddell, John	Bensfort	Northumberland	"
140. McCrie, W. A.	Durham	Grey	"
141. Johnston, S.	Monkton	Perth	"
142. Hutson, H.	Horning's Mills	Dufferin	"
143. Williams, L.	Munro	Perth	"
144. Lawrence, O. H.	Sprucedale	Parry Sound	"
145. McCloskey, Wm	Essex	Essex	"
146. Stewart, John.	Kendall	Durham	"
147. Brent, Geo	Warwick	Lambton	"
148. McKenzie, John C.	Lucknow	Bruce	"
149. McPhee, W. J.	Kilworthy	Simcoe	"
150. Bryce, Thos.	Emsdale	Parry Sound	"
151. Timmins, Andrew	Winchester	Dundas	"
152. Russell, W. W.	Uhthoff	Simcoe	"
153. Otis, C. W.	Springford	Oxford.	"
154. Toffelmire, John	Amherstburg	Essex	"
155. Fach, Fred	Walsingham Centre	Norfolk	"
156. Buttler, G.	Langbank	Lambton	"
157. Benstead, J.	Walnut	Lambton	"
158. Oke, W. J	Hay	Huron	"
159. Liddy, Jas.	Chatham	Kent	"
160. Wilson, Thos	Pine River	Bruce	Oats.
161. Falconer, R. J	Orangeville	Dufferin	"
162. Sirr, John	Hurdville	Parry Sound	"
163. Stroh, G. R.	Conestogo	Waterloo	"
164. Krick, J.	Elcho	Lincoln	"
165. Watson, Robert	Isherwood	Rainy River	"
166. Ferguson, Arch	Priceville	Grey	"
167. Martineau, Jos.	Alfred	Prescott	"
168. Bondman, R. A.	Fingal	Elgin	"
169 Anderson, D.	Hepworth Station	Bruce	"
170. Eastwood, Jas.	Tarbert	Dufferin	"
171. Barbour, John	Varney	Grey	"
172. Davis, F.	Foxboro	Hastings	"
173. McCracken, J. F.	Bluevale	Huron	"
174. Purdon, T. K.	McDonald's Corner	Lanark	"
175. McGibbon, Alex.	L'Amable	Hastings	"
176. Ryder, J. H.	Delhi	Norfolk	"
177. Alton, J.	Kirkfield	Victoria	"
178. Renwick, Wm.	Quinn	Kent	"
179. Tiegs, Theodore	Augsburg	Renfrew	"
180. Smyth, Geo.	St. Augustine	Huron	"
181. Last, Geo.	Louise	Grey	"
182. McCrimmon, J. R.	Vankleek Hill	Prescott	"
183. Aitchison, J. D	Seaforth	Huron	"
184. Sebben, Geo.	Ingersoll	Oxford	"
185. Lemon, Jas.	Walter's Falls	Grey	"
186. Young, John.	Chepstow	Bruce	"
187. Duggan, W. A.	Schomberg	York	"
188. Smithrim, R. H.	Cairngorm	Middlesex	"
189. Neilson, John D.	Thedford	Lambton	"
190. Allen, Daniel	Chesley	Bruce	"
191. Carson, C. J	Charleville	Grenville	"
192. James, Alexander	Milton West	Halton	"
193. Findlay, Wm	Salem	Wellington	"
194. Thompson, Hugh	Wroxeter	Huron	"
195. Henry, C. E.	Sombra	Lambton	"

LIST OF SUCCESSFUL EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
196. Servos, A. D. K.	Niagara	Lincoln	Oats.
197. Lawson, J. T.	Kearney	Parry Sound Dist.	"
198. Murray, Jas.	Avening	Simcoe	"
199. Horn, J. L.	Monkton	Perth	"
200. Kelly, I. W.	Weir	Wentworth	"
201. Copeland, Geo.	Everton	Wellington	"
202. Cameron, R. R.	Ailsa Craig	Middlesex	"
203. Moffatt, John S.	Bognor	Grey	"
204. Cragg, A. F	Cambray	Victoria	"
205. Wickett, J. G.	Meldrum Bay	Algoma Dist.	"
206. McKessock, J. S.	Massie	Grey	"
207. Armstrong, W. E.	Stanley Dale	Muskoka	"
208. McQueen, Wm.	South River	Parry Sound	"
209. Bard, Chas.	Bardsville	Muskoka	"
210. Clute, Peter	Wyevale	Simcoe	"
211. Van Sickle, Orton	Trinity	Wentworth	"
212. Hunter, Wm. H.	Dromore	Grey	"
213. Gibbs, Reginald	Tenby Bay	Algoma	"
214. McColl, P. H.	Petrolea	Lambton	"
215. Lloyd, John	Kilgorie	Dufferin	"
216. Forbes, C. W	Jeannette's Creek	Kent	"
217. Lawrence, Chas. W.	Belgrave	Huron	"
218. Peters, Samuel	Atwood	Perth	"
219. Hood, W. N.	Ashgrove	Halton	"
220. Douglas, W. J.	Tara	Bruce	"
221. Merkley, Wm.	Irena	Dundas	"
222. Whiteside, T.	Corbett	Huron	"
223. Jackson, Wm.	Brussels	Huron	"
224. McKeown, John	McKellar	Parry Sound	"
225. Jamieson, Wm.	Kintail	Huron	"
226. McClintock, J. F.	Manchester	Ontario	"
227. Wilson, John	Utterson	Muskoka	"
228. Wisner, A.	Jordan Station	Lincoln	"
229. Dennis, W. C.	Bracebridge	Muskoka	"
230. Crawford, D. S.	Purple Valley	Bruce	"
231. Krueger, C	Williamsford	Grey	"
232. Fuller, F. L.	Truro	Colchester, N.S.	"
233. Gorrell, W. A.	Gore Bay	Manitoulin Island	
234. Charlton, E. S.	St. George	Brant	"
235. Stewart, Alex.	Ivan	Middlesex	"
236. Dix, J. F.	Little Britain	Victoria	"
237. Connolly, Richard	Ingersoll	Oxford	"
238. Stephen, Alex.	Desboro'	Grey	"
239. Clark, J. C.	Agincourt	York	"
240. Binnie, Geo.	Bunessan	Grey	"
241. Bowers, J. L.	Ripley	Bruce	"
242. Tiegx, Chas.	Eganville	Renfrew	"
243. Wood, W. G.	Belton	Middlesex	"
244. Stevens, J.	Bartonville	Wentworth	"
245. Campbell, W. A.	Yearly's	Muskoka	"
246. Gillespie, W. H.	Orangeville	Dufferin	"
247. Hewitt, John	Edge Hill	Grey	"
248. Gillespie, John	Orangeville	Dufferin	"
249. Kidd, E.	Langman	Simcoe	"
250. Robb, James	Clarina	Peterboro	"
251. Huggins, D. H.	Elba	Dufferin	"
252. Metcalf, Wm.	Port Hope	Durham	"
253. Hampson, R.	Mount Forest	Wellington	"
254. Bowles, Walter R.	Randolph	Simcoe	"
255. McCollum, M.	Darling Road	Haldimand	"
256. Eckardt, Edward	Midlothian	Ontario	"
257. Smith, Wellington	Meaford	Grey	"
258. Howie, William	Powassan	Parry Sound	"
259. White, T. A.	Cashtown	Simcoe	"
260. Speir, J.	Brussels	Huron	"
261. McKellar, A.	Kertch	Lambton	"
262. Taylor, W. E.	Beaverton	Ontario	"

LIST OF SUCCESSFUL EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
263. Blaser, E	Rye	Parry Sound	Oats.
264. Rose, J. D	Blackheath	Wentworth	"
265. Hutton, Geo	Easton's Corners	Grenville	"
266. Kidd, John, jr	Langman	Simcoe	Peas.
267. Boyd, Wm	Hopetown	Lanark	"
268. Connors, A, C.	Sargin:on	Hastings	"
269. Adolph, L	Wallace	Perth	"
270. Wilson, J	Peterboro	Peterboro	"
271. Speiran, John	Henfryn	Huron	"
272. Cook, T. E	Rosedene	Lincoln	"
273. Cook, John	Rosedene	Lincoln	"
274. Reed, D. H	Mimosa	Wellington	"
275. Saddler, Wm	Harrietsville	Middlesex	"
276 Hunter, Alex	Egerton	Wellington	"
277. Sharp, John	Hampden	Grey	"
278. McMahon, Jas	Wyoming	Lambton	"
279. Houston, J. R	Paisley	Bruce	"
280. Ross, H. R	Gilead	Hastings	"
281. Brown, J. T	Thistletown	York	"
282. Julien, J. A	Thamesville	Kent	"
283. May, John	Exeter	Huron	"
284. Beckett, G. W	Effingham	Welland	"
285. Nisbitt, H. G	Lakehurst	Peterboro	"
286. Williamson, T	Mount Wolfe	Ontario	"
287. Stewart, A. A	Fisherville	Haldimand	"
288. Manning, H. E	Parkhill	Middlesex	"
289. Rock, Wm	Spring Bay	Manitoulin Island	"
290. Sharp, Wm. H	Shallow Lake	Grey	"
291. Lyness, J	Flesherton Station	Grey	"
292. Davis, Geo	Foxboro	Hastings	"
293. Vining, E	Thorndale	Middlesex	"
294. Elliott, G. E	Boston Mills	Peel	"
295. Clow, L. H	Hepworth	Bruce	"
296. Wilson, J	Whitechurch	Bruce	"
297. Hipwell, T. M	Price's Corners	Simcoe	"
298. Gossel, C	Pine River	Bruce	"
299. Hayden, F. A	Sheppardton	Huron	"
300. Krick, J	Elcho	Lincoln	"
301. Williams, W. E	Clandeboye	Middlesex	"
302. Daniels, J. A	Ancaster	Wentworth	"
303. Mosser, Otto	Bosworth	Wellington	"
304. Granger, J. H	Nottawa	Simcoe	"
305. Henderson, John	The Ridge	Hastings	"
306. Larden, James	Cache Bay	Nipissing	"
307. Hewton, Wm. T	Hope Bay	Bruce	"
308. Stringer, W. M	Dunnville	Haldimand	"
309. Campbell, D. H	Ivan	Middlesex	"
310. Marshall, Daniel	Allenford	Grey	"
311. Smith, Mrs. G. W	Bellingham	Algoma	"
312. Smith, Robert	Monkton	Perth	"
313. Burkholder, E. C	Tapleytown	Wentworth	"
314. Spencer, Robert	Glen Major	Ontario	"
315. Hutton, Geo	Easton's Corners	Grenville	"
316. Mallory, W. J	Weston	York	"
317. Leishman, A. N	Marnoch	Huron	"
318. Mountain, Wm	Avonbank	Perth	"
319. Lennox, Samuel	Rushview	Dufferin	"
320. Julian, Geo	Heathcote	Grey	"
321. Houldershaw, J	Manilla	Victoria	"
322. Whittaker, J. J	Guelph	Wellington	"
323. Kelly, Robert	Wabash	Kent	"
324. Walker, Wilmer	Bowling Green	Dufferin	"
325. Sutherland, G	L'Avenir	Drummond, Que.	"
326. Johnson, C. G	Rosedene	Lincoln	"
327. Hall, Johnson	Keady	Grey	"
328. Mosser, John	Bosworth	Wellington	"
329. McComb, Jas. E	Arnott	Grey	"

LIST OF SUCCESSFUL EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
330. Crookshanks, Fred	Lion's Head	Bruce	Peas.
331. Ross, John	Ilderton	Middlesex	"
332. McNairn, John	Cranbrook	Huron	"
333. Fearon, Issac	Barwick	Algoma	"
334. Piper, William	Stafford	Oxford	"
335. Jeffs, H. B	Bond Head	Simcoe	"
336. Baird, George	Clinton	Huron	Beans.
337. Traviss, Herbert	Queensville	York	"
338. Laxton, William	Burk's Falls	Parry Sound	"
339. Fisher, W. N	South Middleton	Norfolk	"
340. Snure, J. R	Jordan Station	Lincoln	"
341. Lunn, James	Burtch	Brant	"
342. Beckett, George	Effingham	Welland	"
343. Hamilton, John	Russell	Ontario	"
344. Livingstone, L. L	Frankville	Leeds	"
345. Carrie, H	Massie	Grey	"
346. Dickson, J. R	Seaforth	Huron	"
347. Parsons, John	Nairn	Middlesex	"
348. Fike, Lorenzo	Lambeth	Middlesex	"
349. Hunter, Henry	Norval	Halton	Carrots.
350. Mowbray, J. W	Eagle	Elgin	"
351. Brown, C	Drumquin	Halton	"
352. Bray, G. J	Huntsville	Muskoka	"
353. Smith, J. F	Stirling Falls	Parry Sound	"
354. Kincaid, Peter	Peabody	Grey	"
355. Robertson, W. G	Morrisburg	Dundas	"
356. Bishop, Ralph	Algonquin	Grenville	"
357. Way, W. J	Merlin	Kent	"
358. Robson, Robert	Annan	Grey	"
359. Paterson, Ritchie	Kirkwall	Wentworth	"
360. Cowie, J. G	Caledonia	Haldimand	"
361. Pettigrew, James	Barrow	Bruce	"
362. Williamson, John	Norwood	Peterboro	"
363. Leitch, Colin D	Kilmartin	Middlesex	"
364. Solloway, Owen	Mission City	British Columbia	"
365. Sutherland, Chas	Strathroy	Middlesex	"
366. Rumbelow, S. E	Minden	Victoria	"
367. Brodie, R. J. C	Vandeleur	Grey	"
368. Ewens, R	Chatsworth	Grey	Mangels and sugar beets
369. Thurman, Arthur	Yearley's	Muskoka	"
370. Graham, Andrew	Bornholm	Perth	"
371. Kitson, J. T	Stayner	Simcoe	"
372. Lemm, J	Burtch	Brant	"
373. McLeod, William	Bognor	Grey	"
374. Brown, D. M	Strathroy	Middlesex	"
375. Miller, Henry	Unionville	York	"
376. Smith, Jas	Ripley	Bruce	"
377. Munro, Angus, sr	Powassan	Parry Sound	"
378. Lawrence, C. D	Sprucedale	Parry Sound	"
379. Ridler, T	Fort William	Algoma	"
380. Hunter, John	Wyoming	Lambton	"
381. Cooper, J. A	Ventry	Grey	"
382. Beirne, E	Fort William	Algoma	"
383. Hankinson, J. A	Grovesend	Elgin	"
384. McGregor, W. C	Tilbury	Kent	"
385. Doane, C. M	Shanty Bay	Simcoe	"
386. Phippen, Francis	Port Sidney	Muskoka	"
387. Hopf, Geo	Moltke	Grey	"
388. Whiles, Mrs. Alice	Scotia	Muskoka	"
389. Wright, E	Bath	Lennox	"
390. Haines, Wm. F	Parry Sound	Parry Sound	"
391. McKenzie, W. W	Mitchell	Perth	"
392. McCallum, J. R	Iona Station	West Elgin	"
393. Priest, Harry	Minesing	Simcoe	"
394. Keffer, Jas. H	Sherwood	York	"
395. Willson, S. L	Palmerston	Perth	"
396. Smith, W. A	Stirling Falls	Parry Sound	"

LIST OF SUCCESSFUL EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County.	Experiment.
397. Osborne, Jos	Wyoming	Lambton	Mangels & sugar beets.
398. Blake, Wm	Benmiller	Huron	"
399. Bayne, L. R. S	Beaver Creek	Alberni, B. C	"
400. Knowles, W. H	Highland Creek	York	Turnips.
401. Neville, C. W	Newburgh	Lennox & Addington.	"
402. Snyder. G. A	St. Anns	Lincoln	"
403. Slorach, Wm., jr	Scotia	Parry Sound	"
404. Murray, John	Gooderham	Peterboro	"
405. Wilkinson, G. W	Echo Bay	Algoma	"
406. Dalton, John	Victoria Harbor	Simcoe	Corn.
407. McCrae, Jas. N	Merrickville	Lanark	"
408. Gingrich, S	Preston	Waterloo	"
409. Howell, T. F	Brantford	Brant	"
410. Dunlop, John, sr	Sheguindah	Algoma	"
411. Ritchie, Alex	Inverary	Frontenac	"
412. McCreath, Mat	Kincardine	Bruce	"
413. Scott, Geo	Waubuno	Lambton	"
414. Varcoe, J. A. S	Carlow	Huron	"
415. Purvis, L. A	Soperton	Leeds	"
416. Hoath, R. A	Hyde Park	Middlesex	"
417. Kosmark, F	Northcote	Renfrew	"
418. Adams, W. H	Cardinal	Grenville	"
419. Challis, W. J., J. P	Thamesville	Kent	"
420. Brennan, E. A	Orillia	Simcoe	"
421. Poole, Chas L	Fruitland	Wentworth	"
422. Sider Darius	Perry Station	Welland	"
423. Wheeler, H. E	Wheeler	Lambton	"
424. Bowman, T. E	Berlin	Waterloo	"
425. Dorland, A. M	Bloomfield	Prince Edward	"
426. Morrison, J. S	Colinville	Lambton	"
427. Andrew, Isaac	Lucknow	Huron	"
428. Rutherford, G. W	Balmoral	Haldimand	"
429. Kemp, R. H	Beamsville	Lincoln	"
430. Hicks, John	Glanford	Wentworth	"
431. McNair, J. D	Cranbrook	Huron	"
432. Gow, J. T	Warsaw	Peterboro	"
433. Hamilton, J. A	Thedford	Lambton	"
434. Brayter, J	St. Paul's Station	Perth	"
435. Stewart, R. C	Coldwater	Simcoe	"
436. Ford, Chas. C	Wallacetown	Elgin	"
436. Blake, Chas	Ompah	Frontenac	"
438. Lochore, Jas	Thompson	Algoma	"
439. Brioley, Wm	Thamesville	Kent	"
440. Elmore, Wm	Strathburn	Middlesex	"
441. Jackson, E. J	Fulton's Mills	Wellington	"
442. Tracey, E. J	Grenfel	Simcoe	"
443. Field, Wm	Napier	Middlesex	"
444. Bray, Joseph	Huntsville	Muskoka	"
445. Townsend, R. J	Bayfield	Huron	"
446. Ray, Lester	Sarnia	Lambton	"
447. O'Connor, P. H	Fingal	Elgin	"
448. Prance, W. J	Hutchinson	Middlesex	"
449. Wilson, A. C	Greenway	Huron	Potatoes
450. Henry, G. S	Lansing	York	"
451. Taylor, T. P	Burford	Brant	"
452. Mallory, F. R	Frankford	Hastings	"
453. Warren, Richard	Balderson	Lanark	"
454. More, Jas	Kirkton	Perth	"
455. Shantz, Allan	Waterloo	Waterloo	"
456. Walker, Fred	Norwich	Oxford	"
457. Muirhead, D	O. A. C., Guelph	Wellington	"
458. Henry, J. W	Thornton	Simcoe	"
459. Ross, Thos. E	Guthrie	Simcoe	"
460. Westgate, H. P	Watford	Lambton	"
461. McCullough, H. A	Nantyr	Simcoe	"
462. Sherrington, A. E	Walkerton	Bruce	"
463. Robertson, G. A	St. Catharines	Lincoln	"
464. Scott, Robt. B	Seaforth	Huron	"
465. Zavitz, E. M	Coldstream	Middlesex	"

LIST OF SUCCESSFUL EXPERIMENTERS.—*Continued.*

Experimenter.	Post Office.	County,	Experiment.
466. Willson, F. T	Coldstream	Middlesex	Potatoes.
467. Paterson, H. H	Jermyn	Peterboro	"
468. Buchanan, Wm	Hensall	Huron	"
469. Mason, Wesley	Springbrook	Hastings	"
470. Keil, C. A	Chatham	Kent	"
471. Ryan, Jas	Guelph	Wellington	"
472. Burton, A. E	Port Stanley	Elgin	"
473. McLaurin, P. S	McGarry	Lanark	"
474. Knox, William	Wroxeter	Huron	"
475. Clare, S	Coldstream	Middlesex	"
476. Williams. W. E	Clandeboye	Middlesex	"
477. Lucas, W. T	Bailieboro	Northumberland	"
478. Burns, J. H	Kirkton	Perth	"
479. James, Arthur	Guelph	Wellington	"
480. Stott, Fred	Wyevale	Simcoe	"
481. McCallum, E. G	Martintown	Glengarry	"
482. Hillock, R. J	Kincardine	Bruce	"
483. Campbell, J. A	Simcoe	Norfolk	"
484. Waugh, Jas S	Chatham	Kent	Winter wheat (Set 1)
485. Green, Bismark	Oak Leaf	Leeds	" "
486. Hewitt, J	Sarnia	Lambton	" "
487. Dale, R. B	Chatham	Kent	" "
488. Wilson, J	Kalapore	Grey	" "
489. Foley, J	Uphill	Victoria	" "
490. Hull, G. S	Kerwood	Middlesex	" "
491. Stephen, Alex.	Desboro	Grey	" "
492. Kinchen, Arthur	Kilsyth	Grey	" "
493. McDonald, R. A	Watford	Lambton	" "
494. Lamarsh, P	Wheatley	Essex	" "
495. Ferguson, J	Vesta	Bruce	" "
496. Cameron, A	Edge Hill	Bruce	" "
497. Henderson, S	Burford	Brant	" "
498. Reid, I. W	Reaboro	Victoria	" "
499. Madden, Alex	North Williamsburg	Dundas	" "
500. Falkingham, W. L	Edge Hill	Grey	" "
501. Teskey J	Croydon	Addington	" "
502. Hoover, S. L	Ringwood	York	" "
503. Dickhout, C	Aylmer	Elgin	" "
504. Aikin, Adam	Allenford	Bruce	" "
505. Cruickshank, J	Shallow Lake	Grey	" "
506. Bagshaw J	Vallentyne	Ontario	" "
507. Stimpson, W. G	Lancelot	Muskoka	" "
508. Bearsall, J. S	Crofton	Prince Edward	" "
509. Wheeldon, B. S	Arnott	Grey	" "
510. Hardy, W. J	Huntsville	Muskoka	" "
511. Emory, Chas	Meaford	Grey	" "
512. Pottage, Garton	Kettleby	York	" "
513. Hughes, J	Hanover	Grey	" "
514. Steen, J. G	Baldoon	Kent	" "
515. Gossell, C	Pine River	Bruce	" "
516. Rae, Alex	Invermay	Bruce	" "
517. Atkinson, E. A	Lifford	Durham	" "
518. Wright J. H	Stewartville	Renfrew	" "
519. Murphy, Gerald	Bobcaygeon	Victoria	" "
520. Robson, A	Norwood	Peterboro	" "
521. Hamilton, Wm	Park Head	Bruce	" "
522. Ward, Wesley	Colpoy's Bay	Bruce	" "
523. Miller, Jno	Creemore	Simcoe	" "
524. Harris, Wm., Sr	Cultus	Norfolk	" "
525. Klockman, Chas	Burns	Perth	" "
526. Knight, Thos	Rodney	Elgin	" "
527. McDonald, Wm	Jericho	Lambton	" "
528. Lindsay, J	Dunedin	Simcoe	" "
529. Harvey, Wm	New Decatur	Alabama, U. S. A.	" "
530. Medd, David	Dresden	Lambton	" "
531. Thompson, Wm. J	Oil Springs	Lambton	" "
532. Brooks, R. A	North Port	Prince Edward	" "
533. Robinson, Jno	Hepworth Station	Bruce	" "
534. Wilkinson, Geo	Parry Sound	Parry Sound	" "

LIST OF SUCCESSFUL EXPERIMENTERS —*Continued.*

Experimenter.	Post Office.	County.	Experiment.
535. Michener, Grant	Lowbanks	Haldimand	Winter wheat (Set 1)
536. Rennie, Chas	Seagrave	Ontario	" "
537. Hawkins, Wm	Alton	Peel	" "
538. Dunkin, D. W	Greensville	Wentworth	" "
539. Burroughs, W. J	Blenheim	Kent	" "
540. Saunders, Thos. R	Guthrie	Simcoe	" "
541. Bennett, Chas. E	Rodney	Elgin	" "
542. Bray, Jos	Huntsville	Muskoka	" "
543. McGregor, Chas	Colborne	Northumberland	" "
544. Johnston, J	Lavander	Dufferin	" "
545. Benwick, Wm	Quinn	Kent	" "
546. Middleton, Chas	Mount Hope	Bruce	" "
547. McGirr, R. S	Feversham	Grey	" "
548. Dawson, A	Mohawk	Brant	" "
549. Young, Gordon	Carlow	Huron	" "
550. Stevens, H. B	Shetland	Lambton	" "
551. Shields, W. M	O'Connell	Ontario	" "
552. McDougall, D	Shipness	Bruce	" "
553. Sparrow, C. F	Williscroft	Bruce	" "
554 Mills, David	Bayview	Grey	" "
555. Abbott, Geo	Wooler	Northumberland	" "
556. Way, W. J	Merlin	Kent	" "
557. McGill, A. F	Hillsburg	Wellington	" "
558. Johnston, S. F	St. Catharines	Lincoln	" "
559. Talcot, Freeman	Bloomfield	Prince Edward	" "
560. Campbell, J. F	Ormond	Dundas	" "
561. Jones, Albert	Mcrdale	Grey	" "
562. Buchan, T. A	Drayton	Wellington	" "
563. Horagan, J	Kinkora	Perth	" "
564. Kaiser, Morden	Sunnidale Cor	Simcoe	" "
565. Scott, Paul	Norwood	Peterboro	" "
566. Mellow, Felix	Sandhurst	Lennox	" "
567. Backhouse, W. A	Jaffa	Elgin	" "
568. McLean, Alex	Peabody	Grey	" "
569. Saunders, W. J	Owen Sound	Grey	" "
570. Joyner, J. E	Novar	Muskoka	" "
571. McIntyre, O. E	St. George	Brant	" "
572. Nunnerley, J. A	Mill Grove	Wentworth	" "
573. Bartlett, Geo	Hybla	Hastings	" "
574. Baschfeld, L. D	Grimsby	Lincoln	" "
575. Smith, David	Eugenia	Grey	" "
576. Spencer, Robt	Glen Major	Ontario	" "
577. Edwards, Wm	Balsam	Ontario	" "
578. Robinson, F	Mount Wolfe	Peel	" "
579. Grigg, Wm	Thessalon	Algoma	" "
580. Camaign, J	Stanton	Dufferin	" "
581. Vary, Ira	Hepworth Station	Bruce	" "
582. Cook, Jos	Carnarvon	Haliburton	" "
583. Thomas, Jno	Eady	Simcoe	" "
584. McIntyre, Duncan	Campbellton	Elgin	" "
585. Fyfe, Jno	Richard's Landing	Algoma	" "
586. Shultz, H. A	Clontarf	Renfrew	" "
587. Butler, Thos	Flesherton Station	Grey	" "
588. O. A. C	Guelph	Wellington	" "
589. Tucker, C. W	Liskeard	Nipissing	" "
590. Bock, Wm	Spring Bay	Manitoulin Island	" "
591. Prout, E	Bowmanville	Durham	" (Set 2)
592. Sanderson, D	Riverview	Dufferin	" "
593. Woods, G. H	Blount	Dufferin	" "
594. Spencer, S	Shallow Lake	Grey	" "
595. Folster, A	Tara	Bruce	" "
596. Burrill, R	Paisley	Bruce	" "
597. Hartley, D	Milton West	Halton	" "
598. Herbst, G	Alsfeldt	Grey	" "
599. Walker, Geo	Bowling Green	Dufferin	" "
600. Cattel, G C	Wycombe	Norfolk	" "
601 Curwen, H	Goderich	Huron	" "
602. Joyner, H. G	Novar	Muskoka	" "
603. Damm, Geo	Alsfeldt	Grey	" "
604. Martin, R. R. A	Douglas	Renfrew	" "

LIST OF SUCCESSFUL EXPERIMENTERS.—*Concluded.*

Experimenters.	Post Office.	County.	Experiment.
605. Sutherland, H	Strathroy	Middlesex	Winter wheat (Set 2)
606. McCombs, J. M	Franconia	Monck	" "
607. Haines, W. F	Parry Sound	Parry Sound	" "
608. Greenway, W. J	Cambray	Victoria	" "
609. Becker, August	Rochefort	Renfrew	" "
610. Brett, Robt	Gore Bay	Algoma District	" "
611. McLean, N. D	Aberdeen	Grey	" "
612. Rous, D. P	Lynden	Wentworth	" "
613. Ross, Ewen	Turtle Lake	Parry Sound	" "
614. Geiger, J	Lebanon	Wellington	" "
615. Osborne, H	Echo Bay	Algoma	" "
616. Osborne, F	Echo Bay	Algoma	" "
617. Robson, H. S	Wicksteed	Haliburton	" "
618. Montag, A	Carlsruhe	Bruce	" "
619. O. A. C	Guelph	Wellington	" "
620. Moir, P	Hurondale	Huron	" "
621. Morrison, Malcolm	Elmvale	Simcoe	" (Set 3)
622. Gies, E	Zurich	Huron	" "
623. Pope, Geo	Clinton	Huron	" "
624. Russell, Wm	Uhthoff	Simcoe	" "
625. Anderson, G. B	Medina	Oxford	" "
626. Robertson, R. T	Bobcaygeon	Victoria	" "
627. Staples, J	Durham	Grey	" "
628. Clark, W. H	Franconia	Monck	" "
629. McDonald, M	Lucknow	Huron	" "
630. McDonald, H. C	Fernhill	Middlesex	" "
631. Trace, Jno	Elmvale	Simcoe	" "
632. Reesor, J	Markham	York	" "
633. Kline, Philip	Effingham	Welland	" "
634. Cassidy, E. F	Maynooth	Hastings	" "
635. Stone, J. B	Norham	Northumberland	" "
636. McVannell, Duncan	St. Marys	Perth	" "
637. McDonald, Angus	Lucknow	Burce	" "
638. Purcell, D. M	Aberarder	Lambton	" "
639. Locke, W. H	Campbellford	Northumberland	" "
640. Allen, D	Chesley	Bruce	" "
641. Hill, Geo	Port Hope	Durham	" "
642. Hutchison, J	Pond Mills	Middlesex	" "
643. Sargent, W. J	Oakville	Halton	" "
644. Triebner, Frank	Exeter	Huron	" "
645. McIlwain, J. W	Heather	Lambton	" "
646. Atkin, R	Shetland	Lambton	" "
647. Atkinson, E	Boston Mills	Peel	" "
648. Musclow, Chas	Bancroft	Hastings	" "
649. McKim, A	South Middleton	Norfolk	" "
650. McDonald, Geo	Kimball	Lambton	" "
651. Roper, H	Altona	Ontario	" "
652. Maddock, J. R	Randolph	Simcoe	" "
653. Maddock, E. A	Randolph	Simcoe	" "
654. Sutherland, E	Strathroy	Middlesex	" "
655. Cook, J	Thompson	Algoma	" "
656. McLeod, A	Campbell's Cross	Peel	" "
657. Trachsel, G	Shakespeare	Perth	" "
658. Somers, Wesley	St. Mary's	Perth	" "
659. Willows, H. J	Carlingford	Perth	" "
660. Brent, Geo	Warwick	Lambton	" "
661. Brent, W. D	Birnam	Lambton	" "
662. Mountain, Wm	Avonbank	Perth	" "
663. Sutherland Jno	Strathroy	Middlesex	" "
664. Sutherland, Chas	Strathroy	Middlesex	" "
665. McIntyre, D. P	Napier	Lambton	" "
666. Pegg, J. V	Rodney	Elgin	" "
667. Atkins, J. W	Weidman	Lambton	" "
668. Campbell, Alex	Aberdour	Bruce	" "
669. Gibson, Wm	Duncrief	Middlesex	" "
670. Gliddon Wm	Wicksteed	Haliburton	" "
671. Montag, Jos	Carlsruhe	Bruce	" "
672. O. A. C	Guelph	Wellington	" "
673. McConnell, M	Anson	Hastings	" "
674. Jones, J	Glen Major	Ontar o	" "

REPORTS OF EXPERIMENTS.

The instructions for each experiment, the summary results of successful experiment in 1898, and the conclusions from each experiment are here presented.

No. 1. — Testing Nitrate of Soda, Superphosphate Muriate of Potash, Mixture, and no Fertilizers with Corn.

1. Upon uniform land which has received no manure for at least four years, mark of five plots, each two rods long by one rod wide.

2. Mark out each plot into ten rows one way by five rows the other way, allowing 3 feet 4 inches between the rows.

3. Sow the different fertilizers as indicated by the labels on the packages.

4. Plant 6 kernels of the Salzer's North Dakota Corn at each of the places where the lines touch, and thus make fifty hills on each plot.

5. When the plants are about 4 inches tall, thin out to 4 p'ants per hill.

6. Cut the corn before it is injured by frost.

7. Weigh the whole crop from each plot as soon as cut, and then husk, weigh and count the ears, and examine the condition of the grain.

No. 2.—Testing Nitrate of Soda, Superphosphate, Muriate of Potash, Mixture, and no Fertilizer with Mangels.

1. Upon uniform land which has received no manure for at least four years, mark off five plots, each two rods long by one rod wide.

2. Leave a path 3 feet wide between each two plots.

3. Make 8 drills, 25 inches apart and 2 rods long in each plot.

4. Sow the different fertilizers as indicated by the labels on the packages.

5. Sow the Carter's Champion Yellow Intermediate Mangel seed as evenly as possible on the five plots

6. Thin the young plants when about 3 inches tall to a distance of 10 inches apart in the drills, and leave 316 roots in each plot.

7. Again count the plants when about 8 inches tall, and, if necessary, remove a few of the plants from some plots in order that the number of roots on the different plots will be exactly the same.

Fertilizers.	Quantity of fertilizer used per acre.	Cost of fertilizer used per acre.	Average yield per acre.					
			Bushels of oats, 5 yrs., 74 tests.	Tons of mangels.		Tons of corn.		
				1898, 9 tests.	Average 2 years, 19 tests.	Ears, 1898, 8 tests.	Total crop.	
							1898, 12 tests.	Average 2 yrs., 23 tests.
	lbs.	$						
No fertilizer	....	....	38.90	16.34	17.32	2.47	5.56	6.68
Nitrate of soda	160.0	3 84	46.30	22.72	23.06	2.54	5 59	7.75
Muriate of potash	160.0	3 84	43.80	20.00	20.90	2.65	6.30	8.00
Superphosphate	320.0	3 68	43.60	19.11	21.01	2.63	6.05	7.43
Mixed fertilizer	213 3	3 79	48.70	21.74	21.92	2.80	6.25	7.78

For the five years, 1892, 1893, 1894, 1895 and 1896, co-operative experiments were conducted throughout Ontario by testing commercial fertilizers with oats; and, in 1897 and 1898, by testing the same kinds and quantities of fertilizers with mangels and corn. Both the fertilizers and the seed were sent from the College to the experimenters during each of the seven years. The "mixed" or "complete" fertilizer was composed of Nitrate of Soda $53\frac{1}{3}$ pounds, Muriate of Potash $53\frac{1}{3}$ pounds and Superphosphate $106\frac{2}{3}$ pounds; making in all $213\frac{1}{3}$ pounds. The Nitrate of Soda was applied when the plants were about two inches in height, and the Muriate of Potash and Superphosphates at the time of sowing the seed. The figures presented in the foregoing table give the amount of fertilizer used, the market price of the amount of fertilizers used, the average results of the experiments for 1898, and the summary results for the number of years during which the experiments have been carried on.

Conclusions.

1. The summary results from the application of fertilizers show that the largest evage yield was produced by sowing the "mixed" or "complete" fertilizer with oats, potassic fertilizer with corn, and the nitrogenous fertilizer with mangels.

2. The largest average increases in yields of crops per acre from using the fertilizers were as follows: 9.8 bushels of oats from sowing 213⅓ pounds per acre of the mixed fertilizer, costing $3.79 ; or 38.7 cents for each extra bushel produced ; 1.32 tons of corn from sowing 160 pounds per acre of muriate of potash, costing $3.84, or $2.92 for each extra ton produced ; and 5.74 tons of mangels from sowing 160 pounds per acre of nitrate of soda, costing $3.84, or 66.9 cents for each extra ton produced. It will be seen that in this calculation, the entire cost of the fertilizer was charged to the crop of the first year, and that no additional cost was added for freight charges and expense of applying the fertilizer.

3. The unfertilized land gave a less yield than fertilized land in each year for the experiments, and in each of the three crops—oats, mangels and corn.

4. On some soils the application of fertilizers had but little influence, and on others the crops were about double in yield.

5, The use of practical experiments in growing crops on different kinds of soil with the use of commercial fertilizers appear to be a good way to obtain information regarding the fertility of the soil and of the requirements of different crops.

6. By the time the fertilizers have been used on different farms throughout Ontario with corn and mangels for five years in succession, as in the case of oats, some most valuable information should be obtained.

No. 3.—Growing Three Leguminous Crops for Green Fodder.

1. Prepare for sowing all the packages of seeds upon three uniform plots, each plot being exactly two rods long by one rod wide.

2 Drive wooden stakes at the four corners of each plot, and leave a clean path three feet wide between each two plots.

3. When the land becomes sufficiently warm in the spring, run a strong cord around each plot and sow the different packages upon their respective plots and inside of the cord.

4. After the plants are up two or three inches run a cord around each plot and cut off every plant outside of the cord.

5. The Crimson Clover should be cut as soon as the heads are well out, and the Grass Peas and the Tares as soon as the pods are about one half grown, and the green crop from each plot should be weighed immediately after being cut.

6. Feed the green crop separately to farm animals and take notice of which varieties are liked the best.

Varieties.	Comparative value by experimenters, 2 yrs.	Yield per acre—tons. 1898, 5 tests.	Yield per acre—tons. Averege 2 years, 13 tests.
Grass peas	100	5.9	7.9
Tares or vetches	79	4.8	7.2
Crimson clover	55	2 7	5.4

As the subject of green fodder is an important one in Ontario, an experiment has been conducted for two years in succession by sending out three leguminous crops in order that farmers could ascertain for themselves which is likely to give the best results in the production of green fodder for feeding to their animals. Grass peas have been grown in the experimental department for several years and have produced a good yield of green fodder. Tares, or Vetches, have not grown very well in all seasons. In some years when the dry, hot weather of the summer occurs, the tares do very poorly indeed; while in other years the growth is quite satisfactory. Much, however, has been said regarding this variety through the newspapers. There is, perhaps, no crop about which more has been said within the past few years than the crimson clover. In the experiments at the College for several years in succession it has been found that it is not a safe crop to grow in the autumn of the year in our experiments as about forty per cent. of the plants become winter-killed on the average.

Conclusions.

1. The grass peas produced the largest yield of green crop per acre of the three varieties under experiment in each of the past two years.

2. When both yield and feeding qualities are taken into consideration, the experimenters placed the grass peas better than either the tares or crimson clover in 1897 and in 1898.

3. The crimson clover, regarding which we have recently heard so much, made a poor record in the experiments of each of the two years.

No. 4.—Testing Three Mixtures of Grain for Green Fodder.

1. Prepare for sowing the packages of seeds upon three uniform plots, each plot being exactly two rods long by one rod wide.

2. Drive wooden stakes at the four corners of each plot and leave a clean path three feet wide between each two plots.

3. Run a strong cord around each plot and sow the different packages upon their respective plots and inside of the cord.

4. After the plants are up 2 or 3 inches, again run the cord around each plot and cut off every plant outside of the cord.

5. The crops should be cut as soon as the heads are well out and the grain is in the milk stage, and immediately weighed in the green condition.

Mixtures.	Comparative value by experimenters 3 years.	Yield per acre—tons	
		1898. 2 test.	Average 3 years. 20 tests.
Oats 1½ bushels per acre Peas ½ " " Tares ½ " "	88	4.8	9.3
Oats 1½ " " Peas 1 " "	100	5.7	8.9
Oats 1½ " " Tares 1 " "	77	5.1	8.2

In the Experimental Department of the College, a great many experiments have been conducted by using different combinations of spring grain in the production of green fodder, and the reader is referred to the report of the experimentalist in the Annual Report of the Agricultural College for the results of these experiments. For three years in succession an experiment has been conducted throughout Ontario by using three mixtures of grain for the production of green fodder, oats and peas forming one mixture, oats and tares another, and oats, peas and tares the third. The Siberian oats, Prussian Blue peas and common tares or vetches were used for the experiments. The average yield per acre of each mixture for 1898, and for the average of three years, is given in the foregoing table. The figures under the heading " Comparative value by experimenters " represent the estimate of these mixtures by the experimenters, all things being taken into consideration, the most popular mixture being represented by 100.

Conclusions.

1. Oats and peas produced the largest yield of green crop per acre in 1896 and in 1898; and oats, peas and tares the largest yield in 1897.

2. Oats and peas form the most popular mixture for green fodder in the experiments of 1896, of 1897 and also of 1898.

3. One and one-half bushels of oats, and one bushel of peas per acre make a very good mixture for the production of green fodder.

No. 5.—Testing Four Leading Varieties of Millet.

1. Upon soil prepared as for corn, sow all the varieties upon four uniform plots, each two rods long by one rod wide.

2. Drive wooden stakes at the four corners of each plot, and leave a clean path three feet wide between each two plots.

3. Run a strong cord around each plot, and sow the different varieties upon their respective plots and inside of the cord. Aim at seeding one inch deep.

4. After the plants are up 2 or 3 inches, again run the cord around each plot and cut off every plant outside of the cord.

5. The crops should be cut as soon as the heads are in appearaace, and immediately weighed in the green condition.

Varieties.	Comparative value by experimenters.	Height of crops (ins.)	Yield of green crop per acre. 5 test (tons).
Japanese Panicle	100	26.8	8.4
" Barnyard	77	26.0	8.0
" Common	100	24.2	7.9
Hungarian Grass	31	23.2	5.6

In 1898, an experiment was conducted with three varieties of millet for the fifth time in succession. There were four tests in 1892, two in 1893, five in 1894, five in 1895, and four in 1896. The average results for the five years show the Salzer's Dakota gave 7.7 tons, Golden Wonder 6.5 tons, and the common millet 5.2 tons per acre. The Japanese varieties of millet have been introduced recently, and have made high records in the experiments conducted at the College. These three varieties of Japanese millets, along with the common Hungarian grass, were, therefore, sent out over Ontario for co-operative experimental work in 1898 for the first time.

Conclusions.

1. In the average of five experiments with four varieties of millet, the results show that the Japanese Panicle variety gave the highest, and the Hungarian grass the lowest yield of green crop per acre: the difference in favor of the Japanese Panicle variety being 2.8 tons.

2 The Japanese Panicle and the Japanese common varieties of millet were the favorites with the experimenters, and Hungarian grass was considered the poorest in 1898.

3. The season of 1898 appeared to be unfavourable for the usual growth and development of the Japanese Barnyard millet.

No. 6.—Testing Four Varieties of Grasses for Hay.

1. Measure off four uniform plots, each one rod square, in a position that they may remain undisturbed for a number of years.

2. Drive wooden stakes at the four corners of each plot, and have a clean path three feet wide between each two plots.

3. Run a strong cord around each plot, and sow the different varieties upon their respective plots and inside of the cord.

4. Sow one-half pound of some kind of spring grain on each plot at the same time that the other seeds are sown, and then rake the ground well.

5. After the grain is up four inches, again run the cord around each plot, and cut off every plant out side of the cord.

6. Cut the grain when ripe, and remove it from the plots at once.

7. Again run a cord around each plot, and trim off the edges of the plot as evenly as possible.

8. Any weeds growing in the plots should be pulled out by hand or cut out by the spud.

Varieties.	Height of crop.		Yield per acre—second season.	
	First season, average 2 years.	Second season, 1 year.	Freshly cut grass, 4 tests.	Hay, 6 tests.
	ins.	ins.	tons.	tons.
Tall oat grass	15	42	5.4	3.0
Timothy	8	34	5 2	2.7
Meadow Fescue	13	31	4.3	2.1
Orchard grass	14	31	4.3	2.0

For two years in succession the seed of four varieties of grasses have been sent out to those who wish to conduct an experiment with these varieties of grasses upon their own farms. As nearly two and a half million acres of land are devoted to grasses and clovers for hay each year, it is of the utmost importance that the best varieties be used. Sixty-eight varieties of grasses and clovers have been tested in the Experimental department of the Agricultural College within the past twelve years. Some of these have shown themselves to be very hardy, and to be large producers of hay of very good quality. Four varieties were carefully selected for distribution in the spring of 1897, and the same four varieties were used in the co-operative experiments of the present year. Each experimenter was asked to have his plots so located that he could leave them undisturbed for several years. We hope, therefore, to obtain some valuable information from these experiments after they have been conducted for a few years in succession.

Conclusions.

1. In average yield of hay per acre in the second year after seeding, each variety of grass produced two tons or upwards per acre; the Tall Oat grass giving the highest, and the Orchard grass the lowest yield.

2. The Tall Oat grass produced the tallest growing crop in both the first and second year after seeding.

3. Of the four varieties under experiment, the Timothy produced the shortest crop in the first year, and the second tallest crop in the second year after seeding.

No. 7.—Testing Four Varieties of Clovers for Hay.

(For "Instructions," see experiment No. 6.)

Varieties.	Height of crop.		Yield per acre—second season.	
	First season, average 2 years.	Second season, 1 year.	Freshly cut grass, 5 tests.	Hay, 6 tests.
	ins.	ins.	tons.	tons.
Mammoth Red	11	32	9.2	3.0
Common Red	8	26	8.5	2.5
Alsike	8	25	7.5	2.4
Lucerne	9	26	7.7	2.0

As with grasses, an experiment has been conducted for two years in succession throughout Ontario with four varieties of clovers. We have, therefore, the average height to which the clovers grew in 1897 and in 1898 from seed which was sown in the spring of each year. We also have the height of the crop and the yield of the freshly cut grass, and also of hay for 1898 from seed which was sown in the spring of 1897. It should be understood that the results here presented give only the yield of one cutting. When Lucerne gets well established, it frequently gives two, three, and sometimes four cuttings in a single summer. The Common Red clover usually gives two cuttings. The second growth of the Mammoth Red and the Alsike varieties is generally small.

Conclusions.

1. In average yield of hay per acre in the second year after seeding, each variety of clover produced two tons or upwards per acre ; the Mammoth Red giving the highest and the Lucerne the lowest yield.

2. The Mammoth Red clover produced the tallest growing crop in both the first and the second year after seeding.

3, The average yield of hay per acre from the four varieties of clover was thirty per cent. as great as the average yield of the freshly cut grass.

No. 8. Testing Three Varieties of Buckwheat.

1. Prepare for sowing all the varieties upon three uniform plots, each plot being exactly one rod square.

2. Drive wooden stakes at the four corners of each plot, and leave a clean path three feet wide between each two plots.

3. Run a strong cord around each plot, and sow the different varieties upon their respective plots and inside of the cord.

4. After the plants are up two or three inches, again run the cord around each plot and cut off every plant outside of the cord.

5. The crops should be cut as soon as they ripen, and when dry, weighed and threshed by flail immediately on being brought in from the heat of the sun, and then the grain should be weighed by itself.

Varieties.	Average height 2 years.	Yield of grain per acre.	
		1898. 5 tests.	Average 2 years. 11 tests.
	ins.	bush.	bush.
Japanese	31.8	16.4	22.8
Silver Hull	29.9	17.0	22.7
Common Grey	26.1	16.1	21.3

Three varieties of buckwheat were used for the co-operative experiments over Ontario in each of the past two years. The area devoted to the cultivation of buckwheat in Ontario in 1898 was 150,394 acres, which was greater than that used for mangels, sugar beets, carrots, beans and millet combined.

Conclusions.

1. In the co-operative experiments throughout Ontario, as well as in the experiments at the College, the Japanese variety of buckwheat came first; the Silver Hull second; and the Common Grey third in the average yield of grain per acre.

2. There is a difference of only 1.5 bushels per acre between the average yield of the Japanese and the Common Grey varieties of buckwheat throughout Ontario in the results for two years.

3. The average yield of buckwheat per acre in 1898 was much less than that of 1897.

No. 9. Testing Three Varieties of Spring Wheat and one of Spring Rye.

(For "Instructions," see experiment No. 8.)

Varieties.	Comparative value by experimenters.	Yield per acre.	
		Straw (tons) 57 tests.	Grain (bush.) 68 tests.
Spring Rye	59	1.43	18.9 (56 lbs.) 17.7 (60 lbs.)
Rio Grande	100	1.34	17.1
Herison Bearded	88	1.22	16.2
Pringle's Champion	90	1.30	15.8

The demand for the spring wheat experiments has been increasing during each of the past four years. In 1898, as in 1897, spring rye was included in the experiment with the varieties of spring wheat. We have, therefore, summarized the results of the three varieties of spring wheat, and the one variety of rye in the one table.

Conclusions.

1. Spring rye gave a larger yield of grain per acre than either of the varieties of spring wheat in the co-operative experiments throughout Ontario in 1897, and also in 1898.

2. The Herison Bearded variety of spring wheat gave the largest average yield of grain per acre in twenty-nine co-operative experiments in 1893, nineteen in 1894, thirteen in 1895, and eighteen in 1896; and gave the second largest average yield of grain per acre in thirty-one co-operative experiments in 1897, and sixty-eight in 1898.

3. The Rio Grande variety of spring wheat, which has a grain of rather coarse quality, gave the largest yield of three varieties of spring wheat in 1898.

4. Although the Herison Bearded did not make a record quite equal to that of the Rio Grande in 1898, it is, however, one of the best varieties of spring wheat tested at the Agricultural College for ten years in succession. It is a good yielder, weighs well, is liked by the millers, and gives general satisfaction.

No. 10. TESTING FOUR LEADING VARIETIES OF BARLEY.

(For "Instructions," see experiment No. 8.)

Varieties.	Comparative. value by experimenters.	Yield per acre.	
		Straw (tons).	Grain (bush.) 30 tests.
Mandscheuri	100	1.32	34.2
Oderbrucker	94	1.27	34.0
Kinna Kulla	57	1.22	26.9
White Hulless	53	1.20	23.1 (48) 18.5 (60)

Ninety-four varieties of barley have been tested in the experimental department at the Agricultural College within the last twelve years; and no less than sixteen varieties have been tested over Ontario in connection with the Experimental Union work since the spring of 1892. The varieties distributed in 1898 were the Mandscheuri, Oderbrucker, Kinna Kulla, White Hulless, and Black Hulless. It was, however the original intention not to send out the Black Hulless, but owing to the demand being greater than the supply, we were compelled to substitute the Black Hulless for the white variety for a few experiments. As there were so few, however, who carried on the experiment having the Black Hulless variety as one of the number, the results of that variety is not included in the summary here presented. As forty-eight pounds is the standard weight per measured bushel of barley in Ontario, and as Hulless barley usually weighs sixty pounds, the results for the White Hulless variety have been determined by using both weights per measured bushel as indicated in the foregoing table. The Mandscheuri and Oderbrucker are six-rowed varieties; the Kinna Kulla is a two-rowed; and the White is a hulless variety.

CONCLUSIONS.

1. The Mandscheuri variety of barley has given the largest average yield of grain per acre in the comparative test for each of the years 1892, 1893, 1894, 1895, 1896, 1897 and 1898.

2. The six-rowed varieties of barley have surpassed the two-rowed and the hulless varieties in yield per acre for seven years in succession.

3. The Mandscheuri variety of barley was the most popular of the four kinds of barley tested over Ontario in 1898.

4. Although the Oderbrucker variety comes next to the Mandscheuri in yield of grain per acre in the co-operative experiments over Ontario, and in the experiments at the College, still it will be seen that the Mandscheuri gave an average of only 1.5 of a bushel per acre more than the Oderbrucker in the co-operative experiments of 1898.

No. 11. TESTING FIVE LEADING VARIETIES OF OATS.

(For "Instructions" see experiment No. 8.)

Varieties.	Comparative value by experimenters.	Yield per Acre.	
		Straw (tons) 84 tests.	Grain (bus.) 106 tests.
Siberian	100	1.68	51.5
Bavarian	91	1.66	50.1
Oderbrucker	85	1.44	49.3
Joanette	66	1.57	47.6
Black Tartarian	71	1.68	45.9

Within the past twelve years two hundred and ten varieties of oats have been tested in the experimental department at the College. The greater number of these have been grown for at least five years in succession. There were 2,376,360 acres devoted to oats in Ontario in 1898. The reader will readily understand the importance of giving this crop close attention. Some of the foreign varieties which have been tested in the experi mental grounds at Guelph have done exceedingly well. They have also done well in the co-operative experiments throughout Ontario. Some of the imported varieties have taken the lead in every instance. Twelve different varieties have been distributed throughout the Province for the co-operative work within the past seven years.

Conclusions.

1. The Siberian variety of oats occupies first place in yield of grain per acre in the average results of one hundred and twenty-five experiments in 1892, one hundred and five experiments in 1893, one hundred and twenty-one experiments in 1894, seventy-eight experiments in 1895, and one hundred and six experiments in 1898, and it occupied second place in this respect in 1896 and in 1897.

2. The Joanette, which stands fourth in the list for 1898, occupies third place in yield per acre in each of the years 1897, 1895, 1894, 1893 and 1892, and fourth place in 1896.

3. The Oderbrucker variety, which gave the highest average yield per acre in 1896 and in 1897, and stands third in yield per acre in 1898, is somewhat weaker in the straw than the Siberian variety.

4. The Bavarian variety of oats, which stands second in yield per acre in the co-operative experiments in 1898, occupies the highest place in average yield per acre among all the Ontario varieties grown at the experimental farm for ten years in succession,

5. The Black Tartarian variety, which has been grown quite largely in some parts or Ontario for several years, occupies seventeenth place in yield per acre among the varieties grown at the College for ten years in succession, and occupies lowest place in yield pet acre among the five varieties of oats tested on one hundred and six farms throughou Ontario for 1898,

6. The Joanette variety of oats possesses the shortest straw of any of those used in the experiments of the present year, and is only suited for good rich land, and then should be sown very thinly and early in the season.

No. 12. Testing Four Leading Varieties of Peas.

(For "Instructions" see experiment No. 8).

Varieties.	Comparative value by experimenters.	Yield per Acre.	
		Straw (tons) 59 tests.	Grain (bus.) 70 tests.
Early Britain	100	1.14	23.3
Chancellor	100	1.15	22.3
Prussian Blue	89	1.29	21.8
Tall White Marrowfat	78	1.21	20.0

The Early Britain variety of peas was imported from England, and the Chancellor from the United States, by the Agricultural College, a few years ago. The Prussian Blue and the Tall White Marrowfat varieties have been grown in Ontario for several years

Conclusions.

1. The Early Britain has given the largest average yield of grain per acre in the co-operative experiments over Ontario for three years in succession.

2. The Prussian Blue variety kept the highest place in yield per acre in the average of the co-operative experiments in 1893 and in 1894; second place in 1895 and 1897; third place in 1898, and fourth place in 1896.

3. In each of the years that the Early Britain, Chancellor, and Prussian Blue varieties have been used for the co-operative experiments they rank in average yield of grain per acre in the order just named.

4. The Early Britain and the Chancellor varieties of peas were considered the best varieties to grow by the experimenters of 1898.

5. Of the four varieties of peas tested over Ontario in 1898 the Chancellor was the earliest and the Prussian Blue was the latest in reaching maturity.

No. 13.—Testing Three Varieties of Beans.

1. Prepare for sowing all the varieties of beans upon three uniform plots, of exactly the same shape and size.

2. Each plot may consist of (*a*) eight rows 16 feet 6 inches long; (*b*) four rows 33 feet long: (*c*) two rows 66 feet long.

3. The rows should be twenty-five inches apart.

4. Plant the beans six inches apart in the rows, thus using 264 beans of each variety.

5. When the young plants are about 4 inches tall, count the number on each plot, and if necessary pull a few plants in some of the plots in order to have exactly the same number of plants remaining of each variety.

6. The plants of each variety should be pulled and counted as soon as they ripen, and when dry threshed by flail immedeiately on being brought in from the heat of the sun, and the grain weighed.

Varieties.	Comparative value by Experimenters.	Comparative size of beans.	Yield of grain per acre, 13 tests—bus.
White Wonder	100	76	26.
California Pea Bean	65	100	19.2

Three varieties of beans were distributed for co-operative experiments in 1898. As the Marrowfat variety, however, was not up to the standard in the germination of seed and in vigor of growth of plants, the results of this variety are not presented in the table.

Conclusions.

1. The White Wonder variety of beans has given the largest average yield per acre among the varieties grown on the thirteen different farms throughout Ontario in 1898. It also occupies first place in average yield for two years in succession.

2. The individual beans of the White Wonder variety are only about two-thirds the size of those of the California Pea variety of beans.

No. 14.—Testing Five Leading Varieties of Carrots.

[The following instructions apply also to Experiments Nos. 15 and 16.]

1. Prepare for sowing all the varieties upon five uniform plots, of exactly the same shape and size.

2. Each plot may consist of (*a*) eight drills, 16 feet 4 inches long; or (*b*) four drills, 32 feet 8 inches long; or (*c*) two drills, 65 feet 4 inches long.

3. The drills should be twenty-five inches apart.

4. Sow all the seed of each variety as evenly as possible.

5. Thin out the young plants in the drills to an average of four inches apart, leaving 396 roots of each variety.

6. Again count the plants when about 8 inches tall, and, if necessary, remove a few of the plants from some plots in order that the number of roots on the different plots will be exactly the same.

Varieties.	Comparative value by Experimenters.	Yield per acre, tons—19 tests.
Pearce's Improved Half Long	100	30.4
Large White Vosges	83	28.7
Large White Belgian	69	27.6
Guerande	61	22.7
Danver's Orange	51	21.5

From among sixty varieties of carrots which have been tested at the Agricultural College within the last twelve years, five were selected for co-operative experiments throughout Ontario in 1898. Eight varieties have been used for the co-operative work within the past seven years.

CONCLUSIONS.

1. The Pearce's Improved Half Long White variety of carrots took the lead in point of yield in the co-operative experiments in 1896, in 1897 and in 1898; and is very similar to the Steele's Improved Short White variety, which took the lead in fifty per cent. of the experiments in 1892; in forty-two per cent. in 1893; in fifty-five per cent. in 1894, and sixty-three per cent in 1895.

2. The white fleshed varieties of carrots gave better yields of roots than the yellow fleshed varieties in 1893, 1894, 1895, 1896, and 1897.

3. The Guerande was the easiest, and the large White Belgian was the hardest variety to harvest owing to the roots of the latter being long, slender, and irregular.

4. The Pearce's Improved Half Long was decidedly the most popular variety of carrots with the experiments in 1898.

No. 15.—TESTING FOUR VARIETIES OF MANGELS AND ONE VARIETY OF SUGAR BEETS.

Varieties.	Comparative value by Experimenters.	Yield per acre, tons—32 tests.
Evans' Improved Mammoth Saw Log	87	35.1
Simmer's Improved Long Red	100	34.7
Danish Improved Sugar Beet	79	31.0
Carter's Yellow Intermediate	65	27.5
Carter's Yellow Globe	46	26.1

One variety of sugar beets was used in 1898 along with the four varieties of mangels for No. 15 experiment. One hundred and two varieties of mangels have been grown in the Experimental Department within the last twelve years, and the selection for co-operative experiments was carefully made from this list.

CONCLUSIONS.

1. The Evans' Improved Mammoth Saw Log variety of mangels has kept the highest average yield per acre among the varieties used in the co-operative experiments in each of the three years in which it has been used in these tests.

2. The two red varieties of mangels gave larger yields per acre than the intermediate or globe varieties of mangels, and than the variety of sugar beets used in this experiment.

3. The Danish Improved variety of sugar beets, which was used in the co-operative experiments in 1898 for the first time, occupies an intermediate place between the long red varieties of mangels, and the intermediate and globe varieties of mangels in average yield of roots per acre.

4. The sugar beets grow considerably under ground and require much more labor in harvesting than any of the varieties of mangels.

No. 16. Testing Two Varieties of Swedish and Two Varieties of Fall Turnips.

Varieties.	Comparative value by Experimenters.	Yield per acre (tons) 6 tests.
Purple Top Mammoth Fall	89	39.3
Jersey Navet Fall	67	38.0
Hartley's Bronze Top Swede	100	31.9
White Swede	78	29.5

No less than one hundred and seventy-nine varieties of Swede and fall turnips have been grown in the experimental department within the last twelve years; and as upwards of 150,000 acres are devoted to this crop annually, it is important that the best varieties be secured. Two varieties of fall turnips, and two varieties of Swede turnips were used for No. 16 experiment in 1898.

Conclusions.

1. The fall turnips gave larger yields of roots per acre than the Swede turnips in the co-operative tests in 1894, 1895, 1896, and 1898; while only one of the varieties occupied that place in 1897.

2. The Jersey Navet variety of fall turnips, which has done very well on former occasions, was the least appreciated by the experimenters among the varieties tested in 1898.

3. The Hartley's Bronze Top swede turnip was selected as the most valuable variety tested by the various experimenters in each of the years 1897 and 1898.

No. 17. Testing Six Leading Varieties of Corn.

1. Prepare for sowing all the varieties upon six uniform plots, each plot being exactly one rod square.

2. Mark out each plot into five rows both ways, allowing 3 feet 4 inches between the rows.

3. Plant each variety of corn upon its respective plot. Drop six kernels at each of the places where the lines touch, and thus make twenty-five hills of each variety.

4. When the corn is about 4 inches high, thin out to four plants per hill.

5. Cut each variety before frost, and at the time when its stage of growth corresponds to the roasting condition of field corn, or when the grain is partly glazed. Weigh the whole crop from each plot as soon as cut, and then husk, weigh, and count the ears, and examine the condition of the grain.

Varieties.	Kind of Corn.	Average condition of grain at time of cutting.	Height of Crop. (ins.)	Yield per acre. (tons.)	
				Ears, 40 tests.	Whole crop, 43 tests.
Mastodon Dent	Yellow Dent.	Dough (69).	98	3.1	14.6
Mammoth Cuban	Yellow Dent.	Dough (70).	96	2.7	12.8
Wisconsin's Earliest W. Dent	White Dent.	Firm Dough (84)	85	3.1	11.6
Salzer's North Dakota	White Flint.	Ripe (95).	73	2.9	10.8
Early Butler	Yellow Dent.	Firm Dough (87)	82	2.7	10.2
Kendel's Early Giant	Sweet.	Ripe (100).	51	2.1	6.3

Within the last twelve years two hundred and nineteen varieties of corn have been tested in the Experimental department. Of this number sixty-four varieties have been grown in the experimental grounds for five years in succession. The varieties sent out in 1897, included some of the best of the large, medium, and small varieties of corn, in order that each experimenter could determine which variety would give the best results in his own particular locality and on his own particular soil.

Conclusions.

1. In the co-operative experiments over Ontario in 1898, the Mastadon Dent appeared to be well suited to the warm soils in Southern Ontario; the Mammoth Cuban to Central and Southern Ontario; the Wisconsin's Earliest White Dent to Central Ontario; and the Salzer's North Dakota to Northern Ontario.

2. The individual experiments show that no one variety of corn is well suited to all parts of Ontario.

3. The variety of corn which will produce the largest total yield per acre, and the largest yield of grain per acre among the varieties that will mature in any locality, is one of the best corns for that locality.

4. The Early Butler variety, which has been grown considerably in some parts of Ontario, did not make as good a record as either the Wisconsin's Earliest White Dent or the Salzer's North Dakota variety in the co-operative experiments for 1898.

5. The Wisconsin's Earliest White Dent stood third in average yield of total crop per acre in 1898, and it was one of the first in yield of ears per acre; it also stands first in yield of ears per acre among sixty-four varieties grown for five years in succession in the Experimental department at the College.

No. 18. Testing Six Leading Varieties of Potatoes.

1. Prepare for planting all the potatoes received upon uniform plots of equal size.
2. One row sixty-six feet long is required for each variety. If the rows are placed side by side, a distance of thirty inches should be allowed between the rows.
3. First count the potatoes, and then cut them in such a way that there will be exactly sixty-six piece of each variety.
4. Plant the pieces one foot apart in the row.
5. Count the number of hills of potatoes before digging the crop.

Varieties.	Days from seeding to maturity.	Table quality.	Percentage of crop marketable.	Yield per acre (bushel) 33 tests.
American Wonder	124	80	81	191
Empire State	113	97	83	190
Tonhocks	101	100	73	173
Great Divide	109	82	71	161
Burpee's Extra Early	94	100	70	150
Stray Beauty	83	57	66	124

There were 169,946 acres devoted to potatoes in Ontario in 1898. This area is greater than that devoted to any of the root crops. No less than two hundred and thirty-six varieties of potatoes have been grown in the experimental department since 1886. From this number a very excellent selection could be made for co-operative experiments throughout Ontario. Five pounds of each of these varieties were sent out in the spring of the present year; and successful reports were received from thirty-six farmers.

Conclusions.

1. The Empire State variety occupied first place in yield of potatoes per acre in the co-operative experiments over Ontario in 1894, 1895, and 1896; second place in 1898; and third place in 1897. It has also given the highest average yield of potatoes per acre among thirty-nine varieties grown at the Agricultural College for eight years in succession.

2. Of the six varieties of potatoes used for the co-operative experiments for 1898, the American Wonder proved to be the latest, and the Stray Beauty the earliest; there being a difference of forty-one days between the time required for these two varieties to reach maturity.

3. In table quality, the Tonhocks, Burpee's Extra Early, and Empire State proved to be the best varieties, and the Stray Beauty decidely the poorest.

4. The Empire State has the largest and the Stray Beauty the smallest per centage of marketable potatoes in the crop produced on the farms on which these tests were made in 1898.

5. There is a difference of 67 bushels per acre in average yield of potatoes between the best and the poorest yielding varieties.

No. 19.—Testing Three Leading Varieties of Winter Wheat.

1. Select a portion of uniform soil and mark off three plots, each 16½ feet square. Allow a path three feet wide between each two consecutive plots. Should an extra variety be sown, the extra plot should be made similar to each of the other three plots.

2. Drive stakes at the four corners of each plot.

3. Sow the respective varieties upon the different plots. It is an advantage to run a strong cord around each plot and sow inside the line.

4. After the grain is up three or four inches, again run the cord around each plot and cut off any plants that are outside of the line.

5. In harvesting the plots, watch carefully the requirements of the blank form on this page.

6. The crops should be cut as soon as they ripen, and, when dry, weighed and threshed by flail immediately on being brought in from the heat of the sun.

Varieties.	Yield per acre—191 tests.	
	Straw (tons).	Grain (bush).
Dawson's Golden Chaff	1.8	30.6
Imperial Amber	1.9	29.3
Early Genesee Giant	1.7	28.2
New Columbia	1.6	27.5
Early Red Clawson	1.7	26.9
Pride of Genesee	1.5	25.5
Poole	1.5	24.6

The results of the winter wheat experiments were sent to three hundred and fifty-five of the newspapers of Ontario in the autumn of 1898 between the time of harvesting and seeding. The seven varieties of winter wheat, which were sent out in the autumn of 1897, were divided into three sets—the Dawson's Golden Chaff being used in each set. By having one variety included in each set, a basis of comparison was formed by which all the varieties could be compared with one another. The grain was sown at the rate of one and one-third bushels per acre.

Conclusions.

1. In the average yield of winter wheat per acre, the Dawson's Golden Chaff stood highest among eleven varieties tested over Ontario in the year 1893, among nine varieties in each of the years 1894, 1895, and 1896, and among seven varieties in each of the years 1897 and 1898.

2. Three of the varieties of winter wheat have been tested over Ontario for five years in succession with the following average yields of grain per acre:—Dawson's Golden Chaff, 32.0 bushels; Early Genesee Giant, 28.9 bushels; and Early Red Clawson. 28.7 bushels.

3. Dawson's Golden Chaff was the most popular variety with the experimenters in each of the past five years.

4. In the co-operative experiments for 1898, the Dawson's Golden Chaff and the Early Genesee Giant came through the winter the best, and the New Columbia the poorest.

5. The Early Genesee Giant, Dawson's Golden Chaff and New Columbia possessed the strongest straw, and the Poole and Imperial Amber the weakest straw in 1898.

6. In the co-operative experiments of each of the past five years, the Dawson's Golden Chaff was one of the least, and the Early Genesee Giant one of the most, affected by rust.

7. In 1898, all varieties were practically free from smut, which is nearly always the case when no smut is sown with the wheat.

8. The Pride of Genesee and the Imperial Amber produced the longest, and the New Columbia the shortest straw.

9. The New Columbia, Early Red Clawson, and Dawson's Golden Chaff were the first, and the Early Genesee Giant and Pride of Genesee were the last, to mature.

10. The Dawson's Golden Chaff and New Columbia produced the plumpest, and the Poole the most shrunken grain.

During the presentation of this report, the speaker was asked a great many questions, and the discussion was lively and interesting throughout.

CO-OPERATIVE EXPERIMENTS IN DAIRYING.

PRESENTED BY PROF. H. H. DEAN, DIRECTOR OF THE COMMITTEE.

The work done during the year consisted of two kinds,—

1. Reports from Cheese and Butter Makers.

2. Co-operative Experiments in Curing Cheese.

Blank forms similar to those used last year were sent to about 40 cheese and butter makers in different parts of Ontario. We received answers from 18 cheese makers and 9 butter makers. The names of the makers who were kind enough to fill out these blanks were as follows:

BUTTER MAKERS WHO SENT IN REPORTS:

W. J. Armstrong, Unionville.
Fred. Dean, St. Marys Creamery Co. Ltd.
J. M. McPhail, Milton, Creamery Co.
John Ballantyne, Beaverton. (Eden Creamery.)
Jas. Thomas, Gamebridge Dairying Co.
John Thompson, Barrie.
R. Young, Stouffville.
C. E. Betts, Renfrew.
David Randall, Ayton. (Creamery.)

CHEESE MAKERS WHO SENT IN REPORTS:

Jas. Poole, Waba.
Arnold Aldrich, Cheapside.
Thos. E. Nimmo, Royal Oak, (Huron.)
W. S. Stocks, Conn.
R. T. Stillman, Flackstock.
Frank Boyes, Putnam., (Burnside.)
O. J. B. Yearsley, Little Britain.
William Waddell, Shakespeare.
G. E. Goodhand, Milverton.
S. P. Brown, Birnam, (Maple Grove.)
W. J. Atkinson, Kintore.
W. D. Angus, Atwood, (Elma)
D. A. James, Nilestown. (Thames
J. G. Paterson, Molesworth.
A. Chalmers, Monkton.
F. A. Leak, Blytheswood.
E. Agur, Brownsville.
S. R. Payne, Warsaw.

SUMMARY OF ANSWERS FROM BUTTER MAKERS.

Q. What are the chief faults to be found with the milk or cream delivered at your creamery ?

A. Over ripe, dirty, lack of aeration, cream not cooled from skimming stations. In cream gathering creameries, fermented cream, causing a cheesy flavor in the butter during hot weather.

Q. At what temperature do you separate milk ?

A. 75° to 100°.

Q. How do you heat milk ?

A. Tempering vat, live steam, warm in vat and finish in pan.

Q. How do you cool your cream ?

A. In vat, cone-shaped cooler, pan and ice water, ice water in vat.

Q. What percentage of fat do you find in skim milk ?

A. Trace, .05, .2, .1, .01, .02 to .08, .04 per cent.

Q. What per cent of fat in butter milk ?

A. Trace to .4.

Q. Do you test skim milk and butter milk daily ?

A. Only one does so. Others test from twice a week to once a month.

Q. How do you ripen your cream ?

A. Cool to ripening temperature (65° to 70°), and when the acid develops the cream is cooled to churning temperature. One man reports cooling to 50°, then warming to 65°, until it thickens, and then cooling again to churning temperature, 58°.

Q. What percentage of starter do you use ?

A. Five use no starter. Others use from 7 to 30 per cent.

Q, What is your test to know when cream is ripe enough for churning ?

A. Appearance, experience, judgment, taste and smell.

Q. At what temperature do you churn ?

A 50° to 60°.

Q. How long do you take for churning ?

A. 30 to 60 minutes.

Q. Do you wash your butter ?

A. Some wash once and some wash twice.

Q. Do you work butter once or twice ?

A. Separator creameries work once, and cream gathering twice.

Q What kind of package do you prefer ?

A. Most makers prefer the 56 pound square box, lined with paraffine wax. One cream gathering creamery uses the 112 pound firkin, made air and water tight.

Q. At what temperature is butter held in storage ?

A. 32° to 50°.

Q. What price is charged for making butter ?

A. 3c. to 4½c. per pound.

Q. What price is charged for hauling the milk ?

A. From 5c. to 10c. per 100 pounds.

Q. What price was patrons paid per pound of butter?

A. 13c. to 17c.

Q. What improvements would you suggest?

A. Inspection of creameries, interchange of ideas, co-operation in hauling the milk, better care of the milk, coolers at skimming stations, regular shipments to British markets, mechanical refrigeration, and education of patrons. One maker suggests divorcing the man and wife in some cases, and then furnish the better one with a progressive help-mate. Another, ironically, suggests the "blowing" process of making butter as a remedy for the ills of the creameryman.

One maker in a cream gathering creamery says in a letter which accompanied his report: "I have no end of trouble with the patrons, at least with some of them, regarding the test of their cream. Some can make from 10 to 30 pounds more butter than I can from their cream, and they accuse me of stealing it. I have found that the actual butter churned corresponds with what the test calls for within two to three per cent—sometimes short and sometimes long".

A maker in a separator creamery adds this to his report: "Some farmers think anything is good enough for the creamery. If the milk is sent home, in three or four hours that farmer will come to the creamery with *blood* in his eye, and want to know why the milk was returned. If the butter makers of Canada were to send all milk home which is not in condition to make fine butter, three-quarters of the creameries would be closed for want of clean milk."

Summary of Answers from Cheesemakers.

Q. What are the chief faults with the milk?

A. Gas, lack of straining, bad flavor, cowy and rooty flavors, over-ripe milk, careless patrons, dirty milkers, Monday's milk over-ripe.

Q. What is the best method of straining and aerating milk?

A. Strain through several thicknesses of cloth. Aerate by means of dipping, or with an aerator. Keep milk in small quantities.

Q. What system of dividing proceeds have you adopted?

A. "Pooling," fat, % fat + 2.

Q. How often do you test milk?

A. Once to twice per month, where the pay is determined by the test.

Q. What is the range of fat in the milk where you pay by test?

A. 2.8 to 4.6 per cent.

Q. Do you favour the use of a "starter;" if so, how made, and how much?

A. Some use it, and some do not. Some pasteurize, and some use the best milk delivered. The quantity varies from 4 to 5 lbs. per 1,000 lbs. of milk.

Q. What per cent. fat do you find in the whey?

A. Five make no test. Others from a "trace" to .03 per cent.

Q. Do you date or brand your cheese?

A. Some do not, and others date and mark the word "Canada" on cheese.

Q. What temperature do you aim to keep curing-room?

A. Some report that they cannot control the temperature. The others vary from 60° to 70°.

Q. What amount of moisture do you have in curing-room?

A. Majority do not test. The rest report 50 to 80 per cent.

Q How long are cheese held before shipping?

A. From eight days to six weeks, and one reports two to three months.

Q What was the highest, lowest, and average price for cheese during the season

A. $6\frac{7}{8}$c. to 9c. (1897—$7\frac{1}{4}$c. to 10c.)

Q. What price per pound of cheese is charged for making?

A. .9 to $2\frac{1}{8}$c. per pound of cheese.

Q. What price per 100 pounds of cheese is paid to the maker?

A. 54 to 90c.

Q. What price per 100 pounds of milk for hauling?

A. Two to ten cents.

Q. Has the season been successful?

A. Majority say "Yes." Some complain of low price of cheese. Others report that it has been fairly good, and others say it was a poor year.

Q. What improvements would you suggest?

A. More cows on less area of land; better feed; better care of milk; better cows; better factories; better drainage, and cleaner surroundings of factories; cheese shipped oftener; abolish cheese boards, which are a bill of expense to factorymen, and buy cheese at the factories, sales made binding subject to the decision of a board of arbitrators regarding the quality of the cheese; stop returning whey in cans; use of ice in curing rooms; pay by the test.

Co-operative Experiments.

The same inducements in the way of book premiums were held out to makers, as last year. We also endeavoured to secure the co-operation of the Kingston and Strathroy Dairy School Stations in this work.

When we consider the requisites for experimental dairy work, viz., training in exactness and carefulness, a liking for the work, proper utensils and conveniences, time at one's disposal, and little or no money at stake, we can understand the difficulty of securing the co-operation of ordinary cheese and butter makers. In the doing of the work itself the experimenter should bear in mind that all other conditions except those bearing directly on the point to be investigated should be the same, as far as possible. Looking at the question in its broadest phases, we may expect dairy experimental work to be done in but three places in the Province of Ontario—at the Guelph Station, at Kingston, and at Strathroy.

The only results we have to report this year are those made in our own dairy, and those conducted by Mr. Ruddick, at Kingston, which relate to the effects of temperature in curing cheese. Blank forms for recording results, together with instructions for making a hygrometer, were sent to each maker.

The main points brought out in these experiments are:

1. The shrinkage of the cheese is about one per cent. less when kept at a temperature of 60° to 65°, than in similar cheese cured at 70° to 80°.

2. The quality of the cheese was very much improved by curing at the lower temperature—60° to 65°.

The tables give the details of the experiments made in the College dairy, together with the results of curing cheese brought from two factories in the neighbourhood, and also details of Mr. Ruddick's experiments.

RESULTS OF EXPERIMENTS CONDUCTED BY MR. RUDDICK.

—	Rooms. A.	Rooms. B.	Rooms. C.
Size of room	780 c. ft.	780 c. ft.	780 c. ft.
Method of controlling temperature	Ice.	Sub-earth duct.	No control.
Amount of ice used	100 to 150 lbs. per day.	....	....
Method of controlling moisture	Wet sheet.	Sub-earth duct.	Lime.
Averave temperature	65°	68°	80°
Average relative humidity	86 per cent.	81 per cent.	68 per cent.
Average shrinkage of cheese	2.59 per cent.	2.59 per cent.	3.53 per cent.
Quality of cheese—points scored	98	97	90
Duration of test	18 days.	18 days.	18 days.

SUMMARY OF CHEESE CURING EXPERIMENTS—FOUR MONTHS. CHEESE MADE IN COLLEGE DAIRY.

Number of experiments, 18.	Room No. 1. B.	Room No. 2. A.	Room No. 3. C.
Size of room, cubic feet	1,844	863	863
Method of controlling temperature	Sub-earth duct.	Ice and duct.	No control.
" " moisture	"	"	"
Highest temperature outside 96°	....	....	....
Lowest " " 11°	....	....	....
Average " " 59.7°	....	....	....
Highest temperature in room	75°	67°	86°
Lowest " "	55°	53°	57°
Average " "	66.15°	59 69°	68 64°
Highest per cent. of moisture in room	95	97	91
Lowest " " "	70	43	46
Average " " "	84.63	81.71	72.16
Average per cent. of shrinkage in cheese in one month	3.85	3.40	4.31
Average flavor	29.72	30.44	28.53
" closeness	18.16	18.72	18.17
" color	14.50	14.50	14.29
" texture	15.66	17.05	15.00
" total (first score)	88.04	90.71	85.99
Average total of all scorings—College cheese	87.95	91.42	83.71
" " —Rockwood cheese	88.50	90.44	85.11
" " —Freelton cheese	91.44	93.77	86.77
Average per cent. of shrinkage in cheese in four weeks :			
Rockwood factory	3.23	2.86	4.21
Freelton factory	3.05	2.72	4.06

DIRECTIONS FOR MAKING HYGROMETER TO DETERMINE MOISTURE IN CHEESE CURING ROOMS.

Take two dairy thermometers which read alike, or nearly so, between 50° and 75°. Double about twelve inches of lamp wicking, and fasten the two ends about the end of one of the thermometers, by tying it above and below the bulb with a piece of string. Hang the two thermometers side by side, near the centre of the room. Into a cup put *clean* rain water and place it on a shelf above level with, and to one side of the thermometer having the wick attached, then place the wick in the water. Renew the water from time to time. Take the readings once or twice a day, and determine the percentage of moisture in the air of the room by the following table :

TABLE SHOWING THE PER CENT. MOISTURE IN THE AIR OF CURING ROOMS.—(*King*)

Dry bulb.	Wet bulb.	Per cent. of moisture.
40	32	37
	33	44
	34	52
	35	59
	36	68
	37	76
	38	84
	39	92
41	32	31
	33	38
	34	46
	35	53
	36	60
	37	68
	38	76
	39	84
	40	92
42	33	33
	34	40
	35	47
	36	54
	37	61
	38	69
	39	77
	40	84
	41	92
43	33	28
	34	34
	35	41
	36	48
	37	55
	38	62
	39	70
	40	77
	41	85
	42	92
44	34	29
	35	36
	36	43
	37	49
	38	56
	39	63
	40	70
	41	78
	42	85
	43	92
45	35	31
	36	37
	37	44
	38	50
	39	57
	40	64
	41	71
	42	78
	43	85
	44	92
46	35	26
	36	32
	37	38
	38	45
	39	51
	40	58
	41	65
	42	72
	43	79
	44	85
	45	93
47	36	28
	37	34
	38	40
	39	46
	40	52
	41	59
	42	66
	43	72
	44	79
	45	86
	46	93
48	37	29
	38	35
	39	41
	40	47
	41	53
	42	60
	43	66
	44	73
	45	79
	46	86
	47	93
49	38	30
	39	36
	40	42
	41	48
	42	54
	43	60
	44	67
	45	73
	46	80
	47	86
	48	93
50	39	32
	40	37
	41	43
	42	49
	43	55
	44	61
	45	67
	46	74
	47	80
	48	87
	49	93
51	40	33
	41	39
	42	45
	43	50
	44	56
	45	62
	46	68
	47	74
	48	81
	49	87
	50	93
52	41	35
	42	40
	43	46
	44	51
	45	57
	46	63
	47	69
	48	75
	49	81
	50	87
	51	94
53	41	31
	42	36
	43	41
	44	47
	45	52
	46	58
	47	63
	48	69
	49	75
	50	81
	51	87
	52	94
54	42	32
	43	37
	44	42
	45	48
	46	53
	47	59
	48	64
	49	70
	50	76
	51	82
	52	88
	53	94
55	43	33
	44	38
	45	43
	46	49
	47	54
	48	59
	49	65
	50	70
	51	76
	52	82
	53	88
	54	94
56	44	34
	45	39
	46	44
	47	50
	48	55
	49	60
	50	65
	51	71
	52	77
	53	83
	54	88
	55	94
57	45	36
	46	40
	47	45
	48	50
	49	55
	50	61
	51	66
	52	71
	53	77
	54	83
	55	88
	56	94
58	46	37
	47	42
	48	46
	49	51
	50	56
	51	61
	52	67
	53	72
	54	78
	55	83
	56	89
	57	94
59	47	38
	48	43
	49	47
	50	52
	51	57
	52	62
	53	67
	54	72
	55	78
	56	83
	57	89
	58	94
60	48	39
	49	44
	50	48
	51	53
	52	58
	53	63
	54	68
	55	73
	56	78
	57	84
	58	89
	59	94
61	49	40
	50	44
	51	49
	52	54
	53	58
	54	63
	55	68
	56	73
	57	78
	58	84
	59	89
	60	94
62	50	41
	51	45
	52	50
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	56	69
	57	74
	58	79
	59	84
	60	89
	61	95
63	51	42
	52	46
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	55	60
	56	64
	57	69
	58	74
	59	79
	60	84
	61	89
	62	95
64	52	43
	53	47
	54	51
	55	56
	56	60
	57	65
	58	70
	59	74
	60	79
	61	85
	62	90
	63	95
65	53	44
	54	48
	55	52
	56	56
	57	61
	58	65
	59	70
	60	75
	61	80
	62	85
	63	90
	64	95
66	53	40
	54	45
	55	49
	56	53
	57	57
	58	61
	59	66
	60	71
	61	75
	62	80
	63	85
	64	90
	65	95
67	54	41
	55	45
	56	49
	57	53
	58	58
	59	62
	60	66
	61	71
	62	76
	63	80
	64	85
	65	90
	66	95
68	55	42
	56	46
	57	50
	58	54
	59	58
	60	63
	61	67
	62	71
	63	76
	64	81
	65	85
	66	90
	67	95
69	56	43
	57	47
	58	51
	59	55
	60	59
	61	63
	62	67
	63	72
	64	76
	65	81
	66	86
	67	90
	68	95
70	57	44
	58	48
	59	52
	60	55
	61	60
	62	64
	63	68
	64	72
	65	77
	66	81
	67	86
	68	90
	69	95
71	58	45
	59	48
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72	59	45
	60	46
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	68	82
	69	86
	70	91
	71	95
73	60	46
	61	50
	62	53
	63	57
	64	61
	65	65
	66	69
	67	73
	68	78
	69	82
	70	86
	71	91
	72	95
74	61	47
	62	50
	63	54
	64	58
	65	62
	66	66
	67	70
	68	74
	69	78
	70	82
	71	86
	72	91
	73	95
75	62	47
	63	51
	64	55
	65	58
	66	62
	67	66
	68	70
	69	74
	70	78
	71	82
	72	87
	73	91
	74	95
76	63	48
	64	52
	65	55
	66	59
	67	63
	68	66
	69	70
	70	74
	71	78
	72	82
	73	87
	74	91
	75	95
77	64	49
	65	52
	66	56
	67	60
	68	63
	69	67
	70	71
	71	74
	72	78
	73	83
	74	87
	75	91
	76	95
78	65	49
	66	53
	67	56
	68	60
	69	63
	70	67
	71	71
	72	75
	73	79
	74	83
	75	87
	76	91
79	66	50
	67	53
	68	57
	69	60
	70	64
	71	68
	72	71
	73	75
	74	79
	75	83
	76	87
	77	91
80	66	47
	67	51
	68	54
	69	57
	70	61
	71	64
	72	68
	73	72
	74	75
	75	79
	76	83
	77	87
	78	92

DIRECTIONS. Notice that the table is in three column sections. Find air temperature in first column, then find wet bulb temperature in second column, same division. In third column opposite this is per cent moisture.

Example. Air temperature is 50°, in the first column; wet bulb is 44° in the second column, same division. Opposite 44° is 61, which is the per cent. of moisture, or the relative humidity in the air.

ADDRESS.

BY PROF. JAS. ROBERTSON, DOMINION AGRICULTURAL AND DAIRY COMMISSIONER, OTTAWA, ONT.

It is a pleasant thing for me to come back to Guelph and meet so many fellow-workers who are doing their best to fit themselves to help the people of Canada to make a good living, or doing their best to find out how others who are living on farms get the best results for their labor. I come back to Guelph not merely with pleasure, because I have a good deal of pride in this Ontario Agricultural College, but I have still more pride in the friendship of the men who have made the College what it has been and now is. Any institution, after all, depends for its true success, not upon its organization or its constitution, but upon the character, ability and spirit of the men who administer its affairs; and Guelph has been particularly fortunate in the quality of the men who have been in charge of the departments since it was first started. I mean some of those good men who have spent their own and themselves in most unselfish and kindly ways for the people of this Province. Some have gone to other spheres of usefulness, and some have ended their truly righteous labors and gone to their last reward Then, connected with the College is this Experimental Union, which is doing for the people of Ontario perhaps a large part of its most valuable work in finding out how the men who live on their farms can make the best use of their soil, their labor and their opportunities. There are many men in Canada who are doing excellent work, and people say it is hardly fair for a man to pick out names, but I say this for the encouragement of the students here, perhaps in their first years, that there are very few men to whom the privilege is given to serve their day and their fellow citizens as Mr. Zavitz has done in his capacity in this College. There are men whose names sometimes secure quick recognition, and others who do work that lasts for all time, by which their fellows profit, and whose names are seldom mentioned. As far as Mr. Zavitz name is known it is most deeply and highly respected, and the work which he has done will wear and last even after a long life in his case may be ended. I get a good deal of help for my own work from the work done here and by the Experimental Union, and the very short time I shall take shall be to lay before you in brief a new department which the Dominion Department of Agriculture proposes to inaugurate to carry on a little further the work this Experimental Union does. It will not be very long. The Department of Agriculture of the Dominion of Canada does not have charge of educational work; that belongs to the Province. It does a good deal of illustration work, which so far the Provinces have not done as fully as they might have done and shall yet do. The Department of Agriculture conducts dairy stations for illustration purposes; it has inaugurated cold storage for the transport of food in a safe and rapid way; it maintains experimental farms, gives help to the agricultural societies all through the northwest, and it gives the quarantine service to the Dominion. While it does some experimental work, some of us think it might do still more and still better illustration work. I would like your attention just for a moment along that line. Every experiment has two possible uses or purposes. These valuable experiments, planned with skill and carried out with thoroughness and care, are a means of finding out that which we do not know before. Their most valuable quality is that of research, to find out what nobody knew before, and find out a principle any man may afterwards apply in his own practical work. And so an experiment station is a place for finding out things, a research station for carrying on investigations. But every experiment has also those other uses; that is, of showing what we know can be done in the most economical way, with the best outcome for labor and material used. It is the possibility of illustrating the principles we may discover. Is the Dominion of Canada being served in the illustration sense as fully and thoroughly as in the investigation sense? I think not. There are vast areas of Canada where the farmers read the results of investigations, but they have no mental genius for sifting out of a printed statement what they can apply to their own fields and stables, I think in that sense we can do a lot of good work in Canada, by just showing how these illustration stations would help farmers to put into practice the best methods. An experiment to find out something may be very costly, and still be very cheap to the country. As far as I can learn when Edison was trying to find out how to make a telephone he spent more than the cost of the whole system of the city of Guelph and county of Wellington to find out whether a telephone could be used and how it could be used. Now you could not have a company spend that much on every telephone; it wouldn't pay, So after you have found out by investigation how it may be done you have to reduce that to a cheap economical proposition, giving the best results. An experimental farm may costs thousands a year; it pays if you find out things. But after it has found out things what use is the knowledge? "Knowledge puffeth up." But if the man can have the knowledge so that he can take it into himself, and then put it into his life, knowledge builds up, it edifieth a man who knows of it and does it. When the experimental station finds out something, how shall the man be helped to use it? Put it in a report? The last report was somewhere over 300 pages, and you don't know how I thanked the Lord when I had read the last page. We printed a large number of copies of it; I think it will do some good, but a man whose life consists largely in handling things, of handling material things, of doing manual labor, of making bargains that concern material objects, has not any genius, as a rule, for taking it out of the abstract and putting it into himself. So we need to have the information given in some other way. How shall we give it? First of all by his seeing it in actual existence—object lessons; and then not only seeing it, but by seeing it in such a way that he will understand it. Let me give an illustration. Mr. Sangster, who has done very excellent work in the county of Glengarry, says one kind of barley has been of very great value to the farmers of that county. I warrant there are not four men in this room, with all the advantages you have had, and with your minds quick to take in a statement, who, if you did not know the kind of barley he named three minutes ago, can give me or tell your neighbor tomorrow the name of that variety or what it was like. Most of you are like myself—you have forgotten it by this time, unless you know that variety by having seen it once or twice. If you ever saw four plots of barley growing side by side, one-quarter of an acre each, and one stood up strong, good long heads, dark colored leaves, and you learn the name of that, you would have the name in your mind for all time, and the man who saw that kind would want it next year even if he did not know its name. And so we want all over Canada illustration stations where these things will be seen—not only experimental plots where things are found out, but with the specific object and purpose of illustrating what we already know. The object should have a good deal of simplicity and directness, and this will be the plan we propose: To have between 10 and 20 acres of land, no less nor more, beside a public road where people who pass will see, near the market centre or some other centre where people go; where people will see, and those who do not want to see will see. The man who wants to learn will learn; the man we need to instruct is the man who does not know his ignorance, they are the men who need to be helped. Near a market town and near a school house. "Oh," some one says, "the boys are very apt to break things and spoil things." It is a good deal better to have some of the grain spoiled than the boy spoiled. Near a school house; that is simple, is it not? There are lots of men who belong to this Experimental Union who would jump at the chance of taking up the work if some one would compensate them for the time and material. There should never be more than two things tried at one time. The human mind cannot take in the whole theory of creation at one sitting. I have listened to some young speakers who tried to account for the universe in half an hours' talk, but when a man gets grey he is quite content to regulate one little life rather than try to regulate the universe. A few things will be tried at a time; the illustration of varieties of not all kinds of grain, but only two kinds of grain at one station. Say, barley and wheat at one place; four kinds of the best wheat you know of. The people driving to market will see it, the people going to church will see it. And what a lot more religion we would have of the true reverential sort if people got into the habit of talking of what the Lord is doing instead of talking society gossip. Then, two kinds of grain, quarter acre plots, where the thing will be seen. Then, illustration of cultivation. Of course, around Guelph here one sees an illustration on every farm, but there are places where there are not good farmers. Four-quarter acre plots of turnips; a quarter properly fertilized and properly cultivated, one properly fertilized and not cultivated, one properly cultivated and not fertilized, and one left to take care of itself, as most plots in Canada are. It took a Province I know of fifteen years to learn how to grow turnips. Down in Prince Edward Island we started an illustration station of cheese factories, a more complex, a more difficult kind of business, established in three years, and it took the same people, they say themselves, fifteen years to learn how to grow turnips. What does that mean? It means that the improvement of live stock in Canada rests on growing turnips. Do you think I am making an extreme statement? Go back to the time of Cruikshank, and you will find the improvement in stock and growing of turnips took place at one time. It is essential, and you cannot have it without that. The people of the whole county seeing this once or twice a year would do the right thing next year, and if one man began to do it his neighbor would do it. You simply complete for the good of the people the most excellent work this Experimental Union begins. I have spoken longer than I intended when I stood up, but I thought I would make clear to the members of the Experimental Union the plan of this work. Then you will have the Dominion Department of Agriculture, which has a certain definite place, to promote the development of the whole country, look after the transportation and markets, co-operate with the Provincial authorities, and to make the most of this important calling in our country, for after all the prosperity of Canada from its so-called national growth to the stability and kindness and comfort of single homes, these things, from the circumference to the very core of our national being, rest upon and rise from the men who live on them, making the most of their soil, the most of their climate, the most of their seeds, and the most of themselves.

INFLUENCE OF FEED ON QUANTITY AND QUALITY OF MILK.

By Prof. F. C. Curtiss, Director Agricultural Station, Ames, Iowa.

Perhaps on no subject in the range of dairy husbandry is there a wider diversity of opinion than on the one assigned for this discussion. It is as old as the practice of dairying, and yet of such far reaching significance as to enter into the calculation of causes and conditions governing every finished product from the dairy or creamery. It is an old and commonly accepted saying that cows milk by the mouth, and that the dairyman can get nothing out of a cow but what is put in by the feed basket. In contrast with this we have the skepticism of the scientist or investigator who believes nothing not susceptible of clear and convincing proof, not only by abstract analysis but by material demonstration. Science and practice have been widely at variance concerning the influence of feed on the quantity and quality of milk. The doctrine that blood is only feed, is arrayed against the doctrine that breed is everything and feed nothing, in determining the quality of milk. These views are radically opposite, and either one carried to its logical conclusion would practically eliminate principles and practices that have long been regarded as unalterable. There are, however, many doctrines resting only on empirical practice that are unable to stand before the search light of truth. Thus it is that the scientist has this question settled one way and the practical feeder another.

At the outset it may be stated that it is universally conceded that feed exercises a marked influence in determining the quantity of milk yield from dairy cows ; so much so that the yield of a dairy herd is in many cases directly proportional to the nutritive value of the ration given. The dairy functions of the cow are never developed to their maximum capacity except by liberal and intelligent feeding. To be sure it requires something more than liberal feeding to make a good dairy cow in all cases, but of one thing the dairyman may rest assured, viz, that no really good dairy cow was ever produced without it. The good dairy cow does not come by chance or accident. She grows, but not spontaneously. She begins milking at about two years of age, and when surrounded by favorable conditions continues to develop and grow in milk producting capacity until the age of seven. It then takes seven years of constant, careful work after birth to make a dairy cow what she ought to be, and many of our best cows represent at least a hundred years of intelligent selection and breeding before birth. During all this time feed exercises a dominant influence in the development of dairy function and increasing milk giving capacity. The quantity of milk, then, is directly dependent upon two principal factors—feed and hereditary training or force. Feed is simply the raw material from which the cow as a delicate organization or machine makes the first product of the dairy, milk and other things being equal, the results are always in favor of the cow capable of utilizing the largest amount of this raw material. The importance then of liberal feeding, and the cow having large digestive capacity, is readily apparent.

The second phase of the question under consideration relates to whether or not the cow is able to furnish a uniform product under all conditions, independent of the kind of raw material or feed used. For several centuries this question was answered negatively by almost universal consent. It was considered settled. But the invention of Dr. Babcock, giving to the dairy world a simple and accurate means of measuring the fat content of milk, shed new light on this problem, and we have another illustration of the saying that great questions are never settled until they are settled right. The reading of the Babcock test did not reveal the variation in quality of milk due to feed that had been supposed to exist, and a great many careful and practical investigators have been studying this subject during recent years. The authorities are not yet agreed on the influence of feed in this respect. The investigations that have been conducted in the United States have generally indicated that feed has comparatively little influence in determining the quality of milk, while many practical dairymen yet believe the opposite. Some of the British authorities hold very positive views on this subject. I quote the following sentence from a writer in a recent number of a British agricultural journal, relating to the work of an American experiment station :

"It is impossible to too strongly denounce the false teaching of those ignorant American would-be scientists and their followers in this kingdom."

The false teaching referred to was the conclusion reached at one of our stations to the effect that feed exercised no perceptible influence in modifying the composition of milk. The writer then proceeded to quote from the report of that station, and from the report of an experiment by Mr. J. Speir, of England, in parallel columns. The sentences quoted are as follows :

"So far, however, no method of feeding has yet been devised that so far improves the quality of milk as to produce more butter at one time than at an other."—American Experiment Report.

"On pasture, 100 pounds of milk produced 3.77 pounds of butter ; on decorticated cotton cake feeding, 100 pounds of milk produced 5.26 pounds of butter."—English Report.

A superficial glance at these statements indicates a marked discrepancy in the results of the two investigations under consideration, and if the latter were accepted as conclusive, the American investigators alluded to, and a number of others as well, would unquestionably have to plead guilty to ignorance. Mr. Speir's report was published in the Journal of the Royal Agricultural Society in 1896. The experiment covered a vast amount of research, carefully and conscientiously reported by Mr. Speir, but there were a number of factors entering into the experiment tending to modify the results in such a way as to make them not directly comparable. The experiment started out with only four cows, and all of them were changed between the grass and the cotton-seed feeding periods so that these periods were really nine months apart, and conducted with different sets of cows. When the variation due to these influences is accounted for, the contrast in the results is much less striking than the above comparison indicates. There was, however, a less marked variation in the composition of the milk that was attributed to the influence of feed. Mr. Speir summarized the results in the following words:

"There are at least two foods, viz, young fresh grass and grains that have the power of lowering the percentage of fat in milk, and two others, viz., vetches and decorticated cotton-seed cake that have a tendency to increase it."

These findings harmonize with the conclusions of England's most eminent investigators, Lawes and Gilbert, who report from their Rothamsted experiments, in the Journal of the Royal Agricultural Society, 1895, that:

"The yield of milk was in much greater degree increased by grazing than by any other change in the food, and that roots came next in order. Also that grazing considerably reduced the percentage composition of the milk, though owing to the greatly increased quantity yielded, the amount of constitients removed in the milk whilst grazing may nevertheless be greater per head than under any other conditions."

The experiment and observation of practical dairymen are quite generally in accord with the foregoing results, though on careful analysis, the distinctions not infrequently vanish. In the Iowa Experiment Station herd in 1897, the record of seventeen cows was taken, extending over a period of eight months, from February to September inclusive. The seventeen cows used were in perfect health and good condition. The list comprised four Jerseys, four Short Horns, seven Holsteins. and two Red Polls, all pure breds. Each cow's milk was weighed and sampled at every milking, and a composite sample tested at the end of every week. The average number of pounds of fat per 100 pounds of milk in February on dry feed and five pounds of roots per head daily, was 4.21; in May it fell to 4., in June to 3.01, and in September it rose to 4.27. The advance in the period of lactation would account for the highest percentage of fat in September over the other months, but the decline from February to May and June are probably due to the influence of the succulent ration furnished by pasture grass. No account was taken in this experiment of solids, other than fat. The four Jersey cows produced slightly more butter fat per 100 pounds of milk in May than in February, and only .12 of a pound less in June, though the other cows in the test fell off considerably. In an experiment conducted at the Iowa Station in 1891, in which sugar meal, a by-product of a glucose factory, was fed against corn and cob meal, the former feed resulted in increasing not only the percentage of fat, but the proportion of fat to other solids as well. This, and an experiment by Gustave Kuhn at Mockern, in addition to those already noted, are about the only ones indicating any material influence of the composition of milk due to feed. Kuhn used palm-nut meal in nine trials, and in every case the percentage of fat in proportion to other solids was slightly increased.

At the Vermont Station, and at the Copenhagan Station, where experiments have been conducted comparing feed with pasture, no appreciable effect has been found due to pasture, and at the Pennsylvania Station no difference was detected in the composition of milk due to feeding green and dry grasses. At the Vermont Station the results were summarized as follows:

"The evidence appears overwhelming that cows on early pasture (May and June), not only make more, but richer milk than during the last months of their barn life."

Professor Henry, in his excellent book on "Feeds and Feeding," concludes a review of this subject as follows;

"The extensive Danish investigations conclusively show that the dairy farmer can not hope to measurably increase the percentage of fat in his milk by any practicable system of feeding. The dairyman who wishes to improve the quality of his milk must look to breed rather than feed."

Professor Henry also states that it is remarkable that dairymen have so generally held an erroneous opinion regarding the ability of feed to permanently affect the value of milk, and expresses the opinion that they have been led to this belief because any marked improvement of the cow is always accompanied by a larger flow of milk, and consequently by a larger total amount of fat. The preponderance of evidence seems to indicate that no marked and permanent change in the composition of milk can be attributed to the influence of feed. It should be clearly understood, however, that the acceptance of this view does not imply excuse for failure to furnish the dairy cow a liberal and nutritous ration, and all other conditions essential to good returns. Let it be kept constantly in mind that a good cow always responds to good treatment, and renders proportional returns and profit. The effect of good feeding cannot be measured by the results of a comparatively short trial with a limited number of cows, but it is only when such feeding enters into the perpetual environment of the cow that it exercises a permanent and lasting influence. The history of our domestic animals abounds in practical lessons and demonstrations to that effect. In western Germany and Holland for instance, the moist atmosphere, the low lying soil, with its rank vegetation, and succulent feeds, have combined to produce a cow yielding a large quantity of comparatively watery milk; while the scanty vegetation and rich feeds of the Channel Islands have developed a breed prized for its rich milk. These breeds are simply what their environment and breeding have made them. It would be impossible to reverse the conditions and maintain either without modification. Both breeds are subject to material variation when transferred to the Mississippi Valley. There are many similar illustrations pointing conclusively to the fact that ultimately feed does affect the quality of milk.

Aside from this, there are other ways in which the quality of milk is influenced by feed. It is well known that many feeds impart a characteristic flavor to milk, and that this influence generally affects the products made from milk in even a more marked degree than the milk itself. The new pasture exercises a marked influence in this respect, and the "grassy flavor" is very pronounced early in the season. Potatoes, turnips, cabbage, and rape if fed in large quantities will impair the flavor of butter. Gluten and linseed meals, when used exclusively, tend to make butter soft, while cotton-seed meal has the opposite effect, and all three of these feeds are detrimental to the quality of butter when used to excess. In the experiment reported by J. Speir in the Journal of the Royal Agricultural Society, the melting point of butter varied from 95 degrees to 106 degrees in changing from a ration containing seven pounds of linseed meal, to one containing the same amount of cotton-seed meal. Bright, well cured clover hay is known to have a particularly favorable effect in promoting good flavor of butter during the winter months. Feeds partially decomposed, or badly tainted in any way, will cause tainted milk.

It will then be seen that feed is in various ways an extremely important factor that must be reckoned with in its effect on both the quantity and quality of dairy products, though the immediate modification in quality that may be attributed to feed is comparatively slight.

Prof. Robertson: May I make just one observation. I have been very much interested with the report Prof. Dean has made to-day. I would supplement that report with this further report from the market end of the business. When in Great Britain this last summer, and also in the summer of 1897, I found that home-made English and Scotch cheese were selling for nearly 50 per cent. more money than Canadian cheese in the same warehouse, at the same time. The milk from which the cheese in Britain was made was certainly of no richer or better flavour originally than that from the Canadian cows, but the difference in the flavour of the two kinds of cheese was so marked that the British consumer would pay nearly 4½ cents per pound more than for our very highly-boasted-of cheese. The difference, I think, arose almost entirely from the climate of Britain. The climate there allows the maker to cure his cheese at from 60 to 65 degrees. We must begin a radical improvement in the curing-rooms of the cheese factories of Canada. It is on another department's programme for next year to do a good deal of work in that line, having succeeded very well in getting the butter factories to improve their storage rooms. I think we could make in Canada in June and July just as fine cheese as they do in Britain, if we could keep the cheese continually below 65°, and unless we do that we will certainly be second, and perhaps third, in the markets of Great Britain and Europe. I know that the pressure of business on the programme makes us diffident of entering on a discussion, but there are a great many points which could be discussed with profit to the Union, and also to the dairymen and cattle feeders of Ontario.

I was especially pleased with the careful compilation of results which Prof. Curtiss' paper contained, and we in Canada have reason to be quite guarded in accepting conclusions with regard to any experiment of which the summary appears in a newspaper, because very often the one who makes the summary is not conversant with the particular matter under discussion in all particulars. But we can see in Canada, from the conclusions arrived at by at least a few experimental stations in the United States, that they have the greatest respect with regard to their correctness. Wisconsin, a good many years ago, acquired an excellent reputation in that respect, and now during the last eight or ten years the Experimental Station at Iowa has been taking a most creditable place in this respect, both in the United States and Canada, and also I hear it spoken well of in Great Britain; and no small portion of the excellent reputation which that institution has won has been due to the carefulness of the experiments undertaken under Prof. Curtiss' care. Not the least factor in promoting the good relationship, which we are quick to recognize, existing between the two English-speaking nations, has come from the kindly spirit which has been in existence for many years among the leaders in agricultural work in the two parts of the Empire. I think the visits of Governor Hoard and John Gould to this part of the Dominion have had a good deal to do with it. I think also on the other side that the visits of some of our people there have made them think more kindly and highly of us, and from these small grains of sands may have come in no small measure this pearl of great price, which is the union of these two peoples for the advancement of civilization and the good of mankind.

Mr. S. P. Brown: I would like to ask one question with reference to the moisture of our curing-rooms. I find this summer that one of the great troubles all through our section of the country was that we have had too much moisture, and our cheese has given a great deal of trouble from mould. My own cheese this past season have been sometimes unsightly on account of the mould, and how to dry the curing-room properly is one thing that I would like to find out.

Prof. Dean: The question asked by Mr. Brown is one which has given makers a great deal of trouble. The moulding of the cheese is not exactly the result of the moisture in the room, but the moisture makes the conditions favorable for the growth of the mould. We have experimented with it this season. It has been claimed that a solution of formalin will cure the mould on the cheese. Mr. Ross has been making some experiments with a number of solutions, and I do not know whether he has got the data in sufficient shape to make an exact report or not. That is one of the difficulties in cheese, and I don't know any practical way to dry the room except by building a fire. We have tried lime in the room, and found that it affected the moisture very little indeed, and while it is possible to get the room too dry there is the opposite difficulty of having too much moisture and causing mould on the cheese. In regard to Prof. Curtiss' paper, I would like to have seen the question discussed more fully. There were some gentlemen here a while ago who have attacked me very severely on the position I have taken on that question. One man said he would not believe that you couldn't make the milk richer by feeding, if ten professors said so. He was a Scotchman, and he wouldn't accept any common, ordinary Canadian professor's teaching on that point, and I would like him to tackle Prof. Curtiss. I am very often met with that question. These are things which dairymen are constantly bringing to the attention of people who say it is practically impossible to feed the fat into the milk. I think that all the careful investigation along that line leads us to believe that the food has little influence on the percentage of fat in milk. I have noticed with our own cows, from which we take a sample of milk night and morning, that with some cows the percentage of fat goes up, and with others it goes down. If we turn the cows out to water, or they get into a new clover field or something of that kind, the fat goes up with some, and down with others. I tell you I think it is a difficult matter to lay down any hard-and-fast rules as to what the cow will give with regard to the percentage of fat in milk. So, with all these experiments, we have to take into account the peculiarities of that particular cow, and it is only by summarizing the results of these experiments that we are able to arrive at some rule, but, as I said, it is very hard to lay down a hard and fast rule on that point.

Mr. DARLING: There is one point that has not been touched upon, or if it has I have missed it, and that is the temperature of milk at certain times when it is handled. I keep a few Jersey cows, and sell milk to patrons a good deal. One of my customers said at one time that they would have to take less milk; they were getting too much cream. I said it would be easy to remedy that,—I would put a little water in. The weather came in warm, and I was called to the telephone and asked what was the matter with the milk, as there was not as much cream as before. After what transpired a few days before, it naturally put me on my mettle. However, I turned to my wife and asked her if she was cooling Mr. So-ond so's milk with the rest when she sent it out, and she said yes. I told her I wished she would not do so. She said she cooled all the milk alike, and I said to keep theirs out. She kept their milk aside, and sent it to them without cooling, and the trouble disappeared. In a great many instances I believe persons are dissatisfied with the results simply because the milk is cooled a little too much when handled.

Mr. S. P. BROWN: There is another point I think will relieve the trouble that is claimed by so many farmers, whom we have no reason to doubt are thoroughly practical in every respect so far as they are able to carry out their work. That is in reference to the effect of the food on the quality of the milk. We all know, who have had experience in feeding dairy cows and handling the milk and so on, that the quality of the food does affect the quality of the milk in so far as it affects the churnability of the milk and the separation of the fat from the milk. We all know that if cows are running in the barnyard and getting a great deal more north wind than they are meal, the butter fat will not separate very well, whatever may be the cause. There may be 5 per cent. of butter fat, or there may be 2 per cent., nevertheless it is very difficult to get it out in the first place. Then, after it is out in the form of cream, it is almost an impossibility to churn that cream. That, in my opinion, is the whole score of the claim on the part of the farmers that the food does affect the quality of the milk, and I think that is the only reason, because they have no means of knowing whether they get $\frac{1}{2}$, $\frac{1}{4}$ or $\frac{3}{4}$ of the fat out of the milk in the first place; and then to make it still worse they do not know whether they get $\frac{1}{2}$ out of the cream.

Mr. JEFFS: I do not know whether I caught the idea that the Jersey cattle from their continued habitation of the Jersey Island and the peculiarity of the food there, would give richer milk than cattle from other countries. If I am right in catching that idea, would it not indicate that the food would affect the volume of milk? I have attended Farmers' Institutes for a good while, and I find that point very often referred to. There is this about it, if a cow is in normal condition then I do not think your extra quantity of food will affect the milk; but if she is in very poor trim and running at the straw stack and getting more north wind than meal, then does Prof. Curtiss not believe that an improvement in rations would improve the milk?

Prof. CURTISS: Answering the latter part of the question first, I will say that in the case the gentleman speaks of, where the cow is exposed to the inclement weather and on scant ration, and then changed and put on good ration, that it will affect the composition of the milk, but it will change it in the opposite way from what you expect; that is, you will have less butter fat than you will have when the cow is exposed. I think that variation, however, will not be due so much to food as to the climatic condition, and I believe a great many of the variations we find in the composition of milk in our dairy herds are more largely due to other conditions than to food. Frequently there will be changes that cannot be accounted for in any milk. It is an exceedingly complicated matter when we come to study dairy records, and while we cannot account for many of them, there will be a great many that can be attributed to the atmospheric conditions. As a rule when cows are turned out in that way, and exposed and subjected to very scant ration, they will not give much milk, but the probability is that that milk will be comparatively rich. Some cows are practically uniform under all conditions in their composition of milk, others will be extremely susceptible to changes. Answering your other question as to environment of the cow modifying the milk produced, I will say that I believe that those conditions do eventually control the product. I think the matter of environment is a great feature in moulding animal life, and I think the environment the Jersey cow has been subjected to for centuries is accountable for the characteristics of the Jersey, just as the environment of the Holstein is accountable for the Holstein breed. We find both of these breeds are subject to modification when imported to our country. The Holstein generally give richer under our conditions than in their own country, and the Jerseys generally give more milk under our conditions, though, perhaps, not always.

Mr. Brown : I think a person would hardly be safe to take that practice to build up a good herd of cows from a very poor herd. I think if we were to undertake to build up our dairy herds which now perhaps will only test in the neighborhood of 3 per cent., or perhaps some individuals of them higher, by taking the offspring from such individuals and attempt to improve our herds simply by feeding that offspring without further selection, it seems to me it would be very difficult and almost impossible task.

Prof. Curtiss : It is not safe any more to take anything for granted ; that is, the dairyman cannot be safe in following the methods suggested by these gentlemen, nor can he be safe in taking offspring of the best individual names we can find and rely upon both good feeding and good blood to give satisfactory results. I know from observation that there is quite a large percentage of failures in animal production. I know that men who have large, carefully selected, well fed herds, and the offspring carefully fed and handled from birth to the time when they are ready to begin milking, will find a good many animals that are unprofitable producers. So that we are not safe in relying upon good breeding. The only way we can be sure of this thing is to determine the actual and the individual merits of the cow or animal we are using, and we must do that in every case if we would build up a good herd. There will be a large percentage that will need to be culled out, no matter how carefully we breed or feed.

Mr. Frith : Still, do you not think that, allowing the conditions as you have them, feeding for the specific purpose of improving the increase of butter fat in the posterity would have a good deal to do with the butter fat ?

Prof. Curtiss : Yes.

Mr. Frith : It is pretty generally understood that in feeding a cow that is now at work you cannot increase the butter fat, still if you feed that cow her posterity will be more likely to bring forth increased butter fat.

Prof. Curtiss : That may be true, but you will observe the opposite facts. I think the cumulative effect of this will be to bring about a richer product. I do not wish to discourage the value of good blood from what I have said, because I believe most thoroughly in, and our work in many lines have demonstrated the superiority of, good breeding ; but I simply wish to urge that we must determine the actual and individual merits, and satisfy ourselves without taking these things for granted, because sometimes notwithstanding the fact that we have an animal well fed, and bring the offspring up in the same way, you will find a marked decline. Sometimes you will find when there is a marked decline in quality there will be an increase in quantity to make up for it. Then, you may find that some of the offspring further along will still more improve. For instance, we have one cow in our herd that is one of the most uniform milkers I have ever seen. She averaged for several years 7 per cent butter fat the year round, and under nearly all conditions she varies only a trifle. Notwithstanding the fact that she has always been fed well, always used the best males in breeding, and always fed them with good food, and brought them up under proper dairying conditions, we have not yet a single heifer come from her giving as rich milk, some of them $1\frac{1}{2}$ or 2 per cent below.

Mr. Frith : The cause might be attributed to something foreign to the feed.

Prof. Curtiss : Yes; but that is one of the illustrations of the fact that good breed ing and good feeding have not produced any increase from that cow.

TREASURER'S REPORT, 1898

Receipts.	$ c.	Expenditure.	$ c.
Balance from 1897	302 18	Agricultural experiments	777 57
Membership fees	80 00	Horticultural experiments	168 80
Government grant	1,200 00	Dairy experiments	11 30
		Soil physics experiments	48 20
		Botanical experiments	28 35
		Apicultural experiments	9 70
		Part expenses annual meeting, 1897	63 35
		Part expenses annual meeting, 1898	74 25
		Expenses of Executive	2 75
		Salary of Editor and Secretary	105 00
		Balance on hand	292 91
	$1,582 18		$1,582 18

We, the undersigned Auditors of the Ontario Agricultural and Experimental Union, beg leave to say that we have examined the accounts of the Treasurer, and find them to be correct.

ALLEN SHANTZ,
THOS. J. HURLEY,
Auditors.

O. A. C., Dec. 8th, 1898.

CO-OPERATIVE EXPERIMENTS IN SOIL MOISTURE.

By J. B. Reynolds, B.A., Agricultural College, Guelph, Ont.

This year being the first for experimenters along this line, there were only three experimenters—Mr. E. Beam, of Black Creek, Mr. G. W. Morgan, of Kerwood, and Mr. H. R. Ross, of Gilead; and the experiments were conducted for only one month. At its inception, the work was attended with some difficulty. Samples of the soil under experiment had to be sent at stated intervals to the physical laboratory. To make the work at all practicable, implements had to be improvised by means of which a small and yet a representative sample could be obtained. The quantity sent had to be small, else the expense of shipping would have been too great. Then the method of shipping required to be such that no moisture could escape during transit. After some time spent in trying different methods, the following plan was finally adopted, and the method has proved quite satisfactory. The apparatus consists of a brass tube one foot long, with an inside thread cut at one end. Into this end fits an iron shank, about three feet long, having a similar outside thread cut at one end, and with a large eye at the other, into which a wooden handle fits. The other extremity of the brass tube is fitted with short curved steel knives, which serve the purpose of cutting out a tube of soil. The sample is taken by a combination of boring and downward pressure, and the tube of soil passes up the brass tube until the latter is filled. Then the filled tube is unscrewed from the shank, slipped into a tin case, previously labelled, and the tin case is then corked tightly and put into a wooden box. The end of the box slides in and out of a snugly-fitting groove, and when the box is thus closed, there is little chance for the moisture to escape from the soil within.

After the first tube had been removed from the shank, a second is screwed on, and a second boring is made just below the former, and after that a third. It has been our practice so far to take three depths—two a week; and as the wooden box will contain just six tubes, each box represents one week's work. When filled, the box is shipped to the laboratory for the determination of the moisture-content. Each experimenter was kept supplied with one set of empty tubes, so that no time was lost.

TABLE OF RESULTS IN MOISTURE DETERMINATIONS.

Locality	Hastings Co.			Middlesex Co.			Welland Co.		
Soil	Clay Loam.			Light Sandy Loam.			Heavy Clay.		
Crop	Turnips.			Barley.			Winter Wheat.		
Yield per acre	485 bushels.			35 bushels.			25 bushels.		
Moisture	1	2	3	1	2	3	1	2	3
Average	21.4	22.7	23.5	9.2	8.0	8.6	19.9	18.5	18.0
Highest	24.6	24.7	25.7	16.7	13.5	22.5	22.5	20.2	19.6
Lowest	18.0	18.8	21.2	2.9	2.2	5.6	18.4	17.3	17.4
Dates	June 18....July 27			June 20....July 20			July 17....July 18		

The meaning and value of the results are pretty well shown in the tables above. One very important fact proven here is, that soils differ widely in the availability of their moisture content. The absolute amount of water in two soils may differ greatly, while the amount of water in each available for plants may be more nearly equal. The moisture in the sandy soil in the experiment fell as low as 2·9 per cent for the surface layer, and yet the grain did not wilt, and there was a fair crop. From experiments we have made on the wilting point of plants, we have proven that if the moisture of the clay soils had fallen to 10 per cent., the crops would have perished.

These soil moisture experiments are a valuable supplement to the field experiments which determine the yield of grain only. In the experiments with turnips, Mr. Ross reported that he practiced surface cultivation continuously, and the high percentage of moisture, as shown by the table, is the consequence. Our experiments therefore, illustrates the efficiency of surface cultivation. If he had depended upon the yield to prove that, it would have negatived this conclusion, as there was only half a crop. The moisture was there, but the yield does not show it. Why? First, because the soil was rather too heavy for turnips; secondly, a bad attack of lice interfered with the growth of the crop. Hence, from causes not coming within the scope of the experiment, there was a poor yield. Yet our results show clearly the effect of mulching in conserving moisture.

The work this season was necessarily defective, for two reasons: 1. It was continued through the season, the allowance for shipping having been exhausted; 2. Weather observations were almost entirely lacking, as we were not able to furnish instruments to the experimenters. Next year we hope to improve in both directions. As we have the apparatus ready, we shall be in a position to begin the first of the season. We also hope to be able to supply instruments, rain gauges at least. In addition to the experimenters of last year, a number of others have volunteered to assist in the experiments for next year.

Mr. BROWN: What reason would you assign for the difference in the amount of moisture at three feet deep in case of the turnip crop and the others? The moisture seems to increase at each increasing depth under examination of the turnip crop, while in the case of the others it seems to decrease.

Mr. REYNOLDS: Various conditions enter into anything of that sort. I suppose it is due largely to the difference in the soil. It is not due to the surface cultivation only, because I find from many results that surface cultivation increases capillary action and reduces the amount of moisture below. It must be due to the different kind of soil.

Mr. HARCOURT: There might be something due to the surface feeding of the crop.

Mr. H. R. ROSS: Would drainage make any difference in that respect?

Mr. REYNOLDS: No; because there is no free water there. A great many people have the opinion with regard to drainage that the drain takes away too much moisture, while as a matter of fact it can never take away any moisture that is at all useful, and it can never take away capillary moisture, although the presence of the drain may improve or change the condition of the soil to increase or decrease the amount of moisture kept in it.

Dr. MILLS: Suppose your drain was in the third foot down, might it not remove the supply that would be brought up to the upper foot by capillary action?

Mr. REYNOLDS: Yes; by taking away free water.

Mr. BROWN: I would not think drainage ought to effect the moisture necessary for the crop. I would think the tendency in well-drained land would be to increase the percentage of the kind of moisture we are looking for.

Mr. MILLS: How?

Mr. BROWN: It opens the soil and gives the air a chance to permeate; makes it more like a sponge. The more lively the soil can be kept the more moisture it will retain.

Dr. MILLS: The air keeps it in a condition, then, to hold moisture?

Mr. BROWN: Yes.

Dr. MILLS: Is it not a fact that clay soil is not a good soil for turnips? Is not a pretty strong soil containing a good deal of potash considered a good soil for turnips?

Mr. REYNOLDS: I cannot answer that from a chemical standpoint, but from a practical standpoint I have observed that people who have clay land do not attempt to raise turnips; that they have pronounced it a failure—that is, a pretty heavy clay soil.

Mr. HARCOURT: Clay soil is usually richer in potash than sandy soil, but it is phosphoric acid the turnips want.

Dr. MILLS: Isn't there more of that in clays and clay loams than sandy soil!

Mr. HARCOURT: Very often there is a large percentage, but it is not available.

Dr. MILLS: I would like to hear some men of experience speak, because my observ ation has led me to the conclusion that a good clay loam, well drained, is a good soil for turnips.

Mr. E. WILSON: Our experience is that we do not use our clay soil for turnips.

Dr. MILLS: Heavy clay or clay loam?

Mr. WILSON: Heavy clay. Sandy loam had best results.

Mr. HUTTON: I have had a little experience in turnip growing. My fields are a variety of soils as a rule; that is, in some parts they are what you would call clay, almost gravelly soil, and you might get a sandy loam, and you could get a streak of clay loam. The turnips are quite as good in our clays as in any of the other soils; in fact I think we get the heaviest turnips from our clays. I know a party in the township of Fitzroy, where the soil is clay, and they raise magnificent turnips. I have known them to have turnips that would weigh anywhere from 20 to 25 pounds, and I call that a good turnip. I think there must be some other conditions that enter into the situation to effect the turnips.

Dr. MILLS: Where I was brought up, south of Bondhead, the soil is generally rich clay loam with some open clay subsoil, and with proper cultivation and care there was no difficulty in growing good turnips; but unfortunately the people in that locality got into the habit of growing grain over and above everything else, and selling it, because they did it successfully. I think the time has come now when they have to grow turnips and keep more stock than they did when I was there many years since. I don't think it is due to anything in the soil. I would not be prepared to accept the inference that that soil was not adapted to raising both first-class grain crops and turnips.

Mr. REYNOLDS: I want to repeat what I said just now. In the classification of this soil, in the district from which that clay loam comes, it would be called a heavy clay. We call it a clay loam for the reason that we get all sorts of soils here for analysis and classification, and if we called that a heavy clay we have no name at all for much heavier soils which we get here, I mean of closer composition. And, therefore, I think we lower the classification by as much as two grades on that account. Roughly speaking, in any district, a soil may be called a heavy clay without any particular reference to other soils; in another district it may be heavier. In Peel county there is a very close heavy red clay. Now if you call that clay, very many soils that are commonly called clay must be classified a grade or two lower, and therefore I think we disagree rather upon the terms than upon the facts of the texture of certain kinds of soil. That soil, I am sure, is classified two grades lower than would ordinarily be done with farmers. I would like to take this opportunity of thanking those who conducted the experiments. I refer to Mr. Ross, Mr. Beam, and Mr. Morgan. They helped me very materially in the promptness and accuracy of their work.

SOME ADVANCES THAT HAVE BEEN MADE IN THE AGRICULTURE OF MY LOCALITY WITHIN THE LAST FEW YEARS.

Short Addresses by a Number of Ex-Students of the College.

C. M. Macfie, Appin, Middlesex Co. As progress is the order of the day in agriculture, as in other vocations of life, it is only in place for Middlesex, always in the van of progress, to be able to report advancement in almost every line of agriculture during the past decade; and while it is not within the scope of a five-minute paper to notice every detail of progress, yet a short statement of the advance made along the most prominent lines will indicate the real condition to-day existent in my locality. The primary work of every agriculturalist being the cultivation of the soil, it is evident that they who report progress in other branches of farm work must also report progress in this, and we can testify with pleasure to marked improvements in soil cultivation. While fall wheat is one of our staple cereal crops, yet the old method of cultivation and preparation for a good crop (the bare fallow) is, except on heavy clay, almost a thing of the past. Our farmers recognize the necessity of obtaining more than one crop in two years from their soil, and where possible, have relegated this seemingly necessary, but wasteful method, to the history of agriculture in Middlesex. Then the acreage of corn in this locality has more than doubled, and of root crops has increased eighty per cent.; and these increases certainly force the conclusion that nearly twice the acreage is under thorough cultivation as in ten years ago, for there is no cultivation as thorough as that which a hoed crop necessitates. With regard to fall cultivation, it is more thorough, and more common to-day than it was rare some years ago.

Regarding field crops, there is little to say, save that the same improvement is noticeable here in keeping with improved cultivation. It is not long since all the grain products of the farm were directly sold on the market, and hay and straw formed the chief fodder for the live stock. To-day almost all the coarse grains are consumed on the farm with corn fodder and roots, as well as much mill feed which adds not a little to the fertility of the soil.

The improvement in live stock should be the most noticeable in all departments of farm management, and in this department we are glad to be able to report some advancement. The decline in the horse market forced a benefit on the Canadian farmers in almost completely driving out the scrub stallion, and Middlesex farmers to-day, breed, if not from special purpose mares, from special purpose horses, and this cannot fail to have a beneficial influence in the production of better horses. In cattle breeding, we can report also the use of fewer grade bulls. Ten years have witnessed a wonderful change in the quality of our cattle, and if the high prices which have prevailed for "stockers" during the past two years do not lead to carelessness in breeding, we can look for continued improvement. Breeding for the dairy, in many cases has been along special lines, and while there are too many cows below the "Ontario Standard" for milk and butter production, yet there are fewer "boarders" than formerly. The dairy herds might still be further weeded to the benefit of the dairyman, for there are yet too many poor cows; and although the price of dairy produce has been discouraging during the past two years, this should be an incentive to closer selection for dairy herds. Cattle, too, are better fed than ten years ago. Then, I knew of no silo in my own and three surrounding townships; to-day there are between thirty and forty in a radius of eight miles of my home, and this system of storing fodder may be said to be only in its infancy here. It certainly shows an attempt on the part of our farmers, in every possible way, to improve the winter feeding of their cattle; the most important operation on the Ontario farm. Then our sheep are becoming more numerous, better cared for, and better bred. In hog raising a complete revolution has been made; and if our farmers are not just breeding what the packer demands to produce first-class bacon, it is because the difference in the cost of the production of the bacon hog and the hog produced is not covered by the market price. If the proper discrimination were made by the drovers in our district, I have no hesitation in saying that the packers would get nothing but first-class marketable hogs from our farmers within nine months. But the line of improvement, which, more than others is indicative of advancement, is the permanent improvement of our farms; and Middlesex is not behind in this respect. The farms in this county are being better fenced, and drained than ever before. Farm buildings are being improved to keep pace with the times. Better farm houses, more home-like, convenient, and comfortable, are being constructed. Better roads are assisting in the improvement of the social relations of the farmers; and farm life is gaining its attractions to a greater degree than it ever before possessed them. Regarding our out buildings and their improvements, there has recently been marked progress. Among my neighbors during 1898, there have been built and remodelled some dozen barns in which commodious and convenient stables have been placed. The work is of a permanent character, nearly all having foundations, and floors of concrete. One gentleman told me, in conversation this fall, that he had put foundations beneath, and floors, in fourteen buildings, besides cellars and piggeries, and he was only one of six men in the employ of Isaac Usher & Sons, Queenstown, in this locality. This is only an instance of the advance being made in permanent farm improvements during the past year; and if we may judge the county of Middlesex from this, it certainly must still be going forward.

We hear still of the "hard times" of the farmers. It is true they may come. Doubtless many at times feel under a brief financial pressure, but all just as surely share in the triumph which shall crown our noble calling, when, by all it is acknowledged to hold the position which it rightfully should hold in the eyes of all Canadians.

F. W. Heacock, North York: I have noticed that in our immediate district there has been great increase, as in all other parts of the Province, in the area of corn grown this last nine years, since I have been away from the College. That has taken the greatest lead of any improvement there is in farm crops—the raising of corn and the doing away with summer fallows. There was a great deal of summer fallowing in our district at one time; but that has fallen away, and corn has taken the place of it. We have one man up there right in our district, Hon. William Mulock, who raised this year 35 acres of corn and 35 acres of turnips. He put in, I think, over 500 tons of ensilage this year. That farm is doing a great deal for our neighborhood. It is what we call a model farm; and it is really a model farm, because when he bought it some ten or fifteen years ago it was completely covered with mustard, and he is running the mustard out by the use of hoed crops, and doing it very successfully. A great many thought it was an impossibility to get rid of mustard when it got into the grain. We have no mustard where I am—that is up Yonge St. Mr. Mulock is giving us an object lesson there by showing that with good farming he can eradicate the weeds. There is a great deal of private dairying going on. We have got many successful dairies, and one of the most successful dairies is in the town of Newmarket; we have three or four right around us. which have not been so successful, all being joint stock companies. In root culture, there has been quite an advance; and there has been a great advance in the remodelling of barns during the last five years. It is quite an old settlement, and the barns were what they used to call the old Dutch style, low, flat barns with lintels on each side. There was too much roof for the amount of room they had inside, and the stable was mostly above ground. In the last ten years there has been a great revolution in stabling. All the stall stables put in at the present time, or nearly all, have cement floors. Some are hardly satisfied with the Queenston cement. I have been recommending it, and have used some of it myself; I think it is quite eqaal to the Portland cement, though there are some who claim it will not answer the purpose as well. A neighbour of mine put in a cement stable floor and it is very permanent. He put in part of Queenston cement and part of Portland cement. A few in our neighborhood have been putting in stone pavement. We have two men there who do this work, and the stone pavement has made very good floors so far, but it is not as smooth, and I don't think it is going to be as lasting as a cement floor. I built a barn for myself two years ago, 50x70, with a stone wall underneath. I put water into my stable; which was the first in the neighborhood where the water was run right into the stable. It is quite a job to get water there. Our land is rolling, and it is hard to get a good building spot with water close to the barn. I ran water in from the well and have it in my stable all the time, and the last two years I know of seven different farmers within two miles of me who have run water from the pumps to the stables. They find it a very convenient thing, and they find their stock improved by not turning them out in cold weather as they used to do. In the handling of cattle there has been quite a change as in other places over the Province. The subject of deborning cattle was much talked of a few years ago. Now, nearly any person who undertakes to handle any number of cattle dehorns them. It was preached against very strongly, but we have found that no matter whether it is cows or beef cattle they are all better dehorned. I do not really approve of Mr. Mulock's way of feeding; he runs his whole 60 head all together. But, of course, he has lots of money to experiment with, which we farmers have not, and we have got to do the thing that profits us most. Two years ago he made a very fine profit out of his cattle, but we found that by having a less number running loose with access to water supply and feed as they have here, we got better results. Mr. Mulock, eight years ago, offered a prize of $200 to be divided in the planting of orchards. Each competitor was compelled to plant out 50 trees of the best winter varieties, and the first year I think we had somewhere about 25 competitors. The first prize given was $50, and the rest was divided as the judges thought fit. He has given four different lots of prizes. The trees had to be two years old before the prizes were given. I think I would be safe in saying that that has given such an inducement to the farmers of North York to plant out trees that there has not been less than 8,000 trees planted out in that county in eight years. The last year there was one man planted 10 acres. Four years ago a man planted 5 acres, and the same man who planted 10 acres this year is going to plant 17 acres next year. The cultivation of apples is going ahead in North York. We can grow as good a quality of apple there as they can in Ontario county. It is a splendid climate for winter apples. We do not go in for fall apples. There has been some increase in small fruits. I know of several farmers who have put in from 4 to 10 acres of small fruits, but we are quite a piece from Toronto, and that is our only available market; and we have to compete with the men from Niagara district, and it does not pay us as well as the shipping of apples. The last two or three years the buyers have come into our part of the country and want our apples, and the people who planted out orchards begin to find out that when the shippers want winter apples they come there to get them. I think in another ten years we will have as fine an apple country as there is in Ontario.

I. I. Devitt, Halton Co.: Your President has well said that our country is the garden of the Province. I have only lived there two years, but there are several parties having very good fruit right in that vicinity. Fruit, of course, is the main product. Most of the fruit-growers have small farms. They have not made as much use of the Experimental Union as they might have done. We have a man there by the name of

Fisher who has in the neighborhood of 80 acres of fruit. Very few people have more than five or six acres. Strawberries have been a very good crop in the past season, but the prices were very low, and the people who set out large crops in the spring began to plow them up towards the end of the season for fear they wouldn't be a profitable crop next year. The season was very dry and a good many plants died. Red currants were a pretty good crop in that country, and demand a very good price. They used to get from 70 cents to $1.00 for a 12-quart basket of currants, whereas now 35 or 40 cents is what is sometimes obtained. The crops this year and last year were very encouraging.

S. P. BROWN: I must acknowledge that I have been privileged to see several parts of the Province, and the advancement that is being made to some extent in some of them. I will speak of the advancement in farming where I am now residing in the county of Lambton, probably about the centre of a circle that would strike Thedford and Forrest on the main line and Watford on the western division of the Grand Trunk, about 30 miles from Sarnia. In that locality the chief advancement in the last year is the improvement in the outbuildings of the farms. Last year there were a great many farm buildings, barns chiefly, raised and foundations put under them, in order to permit of the fixing up of the stables for the greater comfort of the stock. I do not know whether any inducement was held forth for such an improvement from the encouragement which I gave in reference to the dairy business or not. When I started there I advocated winter dairying very strongly. I have sometimes thought I imposed my ideas a little too strongly, but perhaps not. Whatever may have been the cause, however, they have taken those steps, and the people are beginning to see that it is one of the necessary steps in the advancement of their business. They are beginning to see, too, that it is not all profit in buying high-priced steers and stockers of various kinds for feeding for the British market. Two years ago a great many of them were discouraged, and they felt a good deal at that time in reference to feeding cattle as they do this fall with reference to the cheese business. Prices were rather low then, and they got discouraged. Last year the prices were high, and the farmers were raised away up on that point. The advancement in feeding the crops raised on the farm in place of selling them off the farm is one of the marks of improvement. I think that within the last three years there have been seven or eight small-sized silos started, and that has claimed the attention of the people. There were two or three round silos put up this year and filled, and wherever they have started in that line of action they are very well satisfied, and I am in hopes that in a few years the corn crop there will have made great strides in the amount of acreage, as it has in many other parts. Three years ago it was not an uncommon thing to see a 100 acre farm without a spear of corn for the farm stock. They raised about enough corn for the table and that was all they calculated on, except a very few who raised it for the fattening of their pork in the fall. Now there is hardly a farm without at least 3 acres of corn.

D. P. L. CAMPBELL, Vankleek Hill, Prescott Co.: Perhaps one of the most important advances of late years is the increased acreage devoted to corn-growing for fodder and for siloing. It is also noticeable that it is planted much thinner than formerly. A number of years ago it was customary to sow four bushels of seed per acre when the crop was intended for fodder. Now the majority use about one-half a bushel or less per acre. Formerly it was customary to plant the corn when the basswood leaves would be the size of chipmunks' ears, then leave it until the weeds would be ankle high before getting the cultivator going, thus making hand-hoeing a long and hard job. Now, with the introduction of weeders, the weeds are not allowed to start at all, and hand-hoeing is rendered unnecessary. At one time the larger varieties were grown, now varieties which will reach maturity in ordinary seasons are more largely grown. All this means that the silo is becoming as necessary on a well regulated farm as a cook stove and a grandpa are in a well-ordered family. The round form of silo is also growing in favor.

Another important feature is that better attention is being paid to the the feeding of the stock, especially dairy animals; also a considerable amount of summer feeding is done. A few years ago, if a man would be observed feeding good hay to his cows, many would look with pitying astonishment at the poor fellow, as much as to say that such a creature is hardly safe to be running at large in a civilized country. During these days the horses were fed all the hay, and the most of the grain; and the cows had the advantage of the sheltering side of a straw stack during the day, and sometimes for the night too. In fact, I heard of one man who claimed to have fed his cows on snow and east wind. As it came near spring, the cows were "on the lift," and it was necessary to lift the animals each morning. This was most easily performed by a number of neighboring farmers making a daily round to "lift." On such occasions a good stout tail was a decided advantage and convenience. Now, however, the advanced idea is to give horses an economical ration adapted to their requirements, and the milk cow a comfortable stable and a well balanced ration of food. With this treatment she will milk during the entire year, except a month or two before parturition. A few years ago a very economical stockman declared that it did not pay to feed cows so that they would give milk during the winter. This is beyond my depths for if it does not pay to feed so as to get milk then how can it pay to feed and get nothing? Winter dairying is becoming quite an important art and a good source of revenue. As a natural result better stock is kept, and more attention is given to improving the different classes of farm animals. Less grain is being sold, and more fed on the farm, and the finished articles, such as cheese, butter, beef, mutton, pork, and fowl marketed instead. This system permits of a better chance for keeping up the fertility of the soil. The manure is also handled to better advantage. Formerly many allowed it to remain in the yards to leach into the roadside or adjacent lot, thus causing the farmer's loss to be two fold; first the loss of the manurial value, and second a loss of a year's time in getting returns. Many of our farmers now haul and spread the manure directly on the soil as soon as it is made.

J. B. Spencer: Middlesex county, has been referred to at very good length, which county I suppose I should represent. I do not know that I can add very much to what Mr. Macfie gave you in his paper. It is a fact that too many farmers are too slow to take advantage of improvements that they can see benefiting others. Still the trend is, I think, towards more advanced agriculture. There is a great deal more attention being paid to producing products of a strictly higher quality, in order that they will bring the best price. It is simply the result of having been driven to that by the sort of times we have had during the last few years. There is one branch that has not been referred to that I think has made a great advance; that is, poultry-raising. I find in a number of districts of the country a number of worthy gentlemen who are going into that line quite extensively. I might mention the name of W. E. H. Massey, of the Massey Farm in Toronto. I was at his farm a few days ago, and he had in course of construction poultry buildings, one of which was to accommodate 500 laying hens, in which he proposed to produce fresh eggs he could guarantee. I also understand that one of my neighbors, Mr. Graham, has gone quite extensively into the trade of fresh egg production in supplying eggs he can guarantee to markets like Montreal and the Eastern States, and finds it very advantageous. A reference has been made to the better stabling of stock, and the better condition of farm buildings. There is one line in that which has not been referred to, and that is better provision of light and ventilation. We find we get a good number of inquiries about farm buildings, and that is one thing they are paying special attention to. There are a good many of the opinion that the cause of so much tuberculosis, and the like, will in a very short time be much reduced on account of the better sanitary condition of the stock, which, of course, is a reasonable deduction.

H. A. McCullough, South Simcoe: The lines of improvement in Simcoe county appear to be much the same as those in other counties, especially in the line of stock feeding and improvement in buildings and barns. A member of a door and sash firm in Barrie told me that he turned out more sash for the basements of barns than he had in ten years. Along with this I might mention the silos. There have been few in that part previous to this last year, but several have gone up this last season.

G. H. Hutton, Glengarry Co.: In our immediate section the dairying industry has been specially developed by Mr. M. K. Everts, who took the dairy course some few years since. He is a very energetic man and has several large factories. The factory nearest my home has put into the hands of the patrons, I think 300 in number, $35,000 during the last year. In the last few years the breeding of a better class of horses has been gone into extensively. Since the reduction in price the horses have gone very much down, and they are a very poor class, but they have introduced several very improved sires and the class will be improved. Then, perhaps, another feature of improvement is the interest which is being shown in the advisability of having better roads

REPORT ON ECONOMIC BOTANY.

Mr. F. C. HARRISON, director of the Committee on Economic Botany, presented the report of the Committee on Economic Botany, which dealt with the characteristics and the distribution of about thirty of the noxious weeds of Ontario. As this material is being prepared in bulletin form, however, the report is not here presented. He said :

We have collected sufficient weed seeds of the 35 specimens, I suppose, to fill between 300 and 400 bottles, and it is our hope that these may be taken or may be given out, if not to the rural schools, to some of the high schools, one probably in each county, which would look after the agricultural teaching. The collection and presentation of the weeds themselves would take one man pretty nearly all his time doing nothing else but collecting them. These plants, to get the natural way of growing, and also the color, require considerable time to cut and press them, and unless this is done the specimens are of little value. I think if a small sum were granted for employing somebody to do this collecting, and then distribute from here or from the union, maybe a start could be made. We hope that the work will be taken up by the department at some other point.

Mr. LOCHHEAD : There is one point I would like to emphasize here ; Mr. Harrison has stated it would be a good plan to send out samples perhaps to some of the High Schools. I think, after my experience in High School work, that too little attention is given to the studying of weeds. Very few even of the best students in botany in High Schools can identify weed seeds. They may be able to identify weeds, but to identify the seeds they have had no experience in that line. I think if it is within our power here, and I think very likely it is, to memorialize or send a requisition to the Minister of Education from this meeting asking that more attention to that part of the work at High Schools be devoted to the study of weeds, more particularly to the recognition of weed seeds, this should be done. In spite of what criticism has been made of High Schools, a great many of the students go back to the farm—and they go back without any knowledge of weed seeds whatever after studying botany maybe for two or three years. I think if the Department of Education would insist that a knowledge of weed seeds would be a requisite for the passing of certain examinations that would be a great advance, a great thing for agriculture, and be just as good along the line of education. So I think if it is the will of the meeting that something of that kind be done, it might have some effect. Of course the curriculum is made out for five years to some extent, but the five years will soon be up, and if we can influence the men who are going to form the new curriculum it is time we set about it.

Dr. MILLS : I presume Mr. Lochhead can draw a suitable resolution himself on that subject, and I have no doubt it would have an effect, coming from this meeting. I think the time has come when we cannot speak too plainly to arouse the people of this Province to the alarming spread of noxious weeds. I have been here nineteen years, and when I came first you could ride from here to Toronto and back day after day and never see any striking scene of noxious weeds, excepting Canadian thistles, on each side of the road. Now, field after field is yellow with wild mustard and other troublesome weeds, and they have come up here actually to the very College door. The fields south of us and all around us are yellow, and they tell me that between here and the city you can get between 80 and 90 species of weeds; and I must say to the young men who are taking farms now, whether it is due to the negligence of their fathers or what, that they are entering on their work under very trying conditions. I would rather take the woods and cut down the timber, and burn it and start fresh, than undertake some of these fields overrun with noxious weeds. I feel, as President of the College, I cannot rub it too much into these young men to take off their coats and clean their farms or give them up. There are more spreading year after year, and the sight is a constant theme of comment amongst visitors. It seems that the explanation is in buying seed. If that is so, what can be done to remedy that? It is a fact that our farmers will not purchase the best seed. The best seed is as a general rule the cleanest, and the best seed is exported to Germany and other European countries, and our farmers will buy less satisfactory seed because it is cheaper. Let us rouse our boys up to this. I had a request from one of our students to know whether I would recommend him for a certain place. I could not recommend him because I heard the crops growing on his farm were not clean, as they should be. There were foul weeds amongst his grain, and especially an intermixture of seed—even had he taken the pains to clean out foreign varieties of seed. It created a bad impression right around where he lived. I wrote him very plainly about it. I said, in effect: "If you want a position you have got to free yourself from that right away; you are watched from the day you leave here, and if you have dirty farms you can whistle." Of course we might talk till midnight about the different methods of handling digerent weeds. I don't know that it is necessary to say much on that. The young man who has made up his mind to have his farm clean will find a way. By reading, thinking and listening he will find some way, but he will not be satisfied to continue work on a dirty farm. I have told you before what a man who was speaking at a Farmers Institute in York county said about a man with a dirty farm. He always came to certain conclusions regarding him: "You may make up your mind to this, that he is either farming too much land, or he doesn't understand his business, or he is lazy. Long experience has forced me to that conclusion." And it is true. If I have the pleasure of visiting any of your farms I hope I will find no dirty ones.

Resolution.

Moved by Wm Lochhead, seconded by F. C. Harrison: "In view of the abnormal spread of weeds throughout Ontario, the members of the Ontario Agricultural and Experimental Union request that the study of weeds and weed seeds form an important part of the course in botany in High Schools, and in nature study in rural schools, in order that boys and girls be enabled to recognize the noxious weeds when they see them." Carried unanimously.

AGRICULTURE AS A BRANCH OF PUBLIC INSTRUCTION.

By Prof. C. F. Curtiss, Director of the Agricultтral Experiment Station, Ames, Iowa.

I assure you that it is a pleasure to me to be able to attend this, the annual meeting of your Experimental Union. I have always had a high appreciation of the work of this College, and have been interested in observing its progress. We have in our agricultural faculty four men from Ontario, and three of them were students of this College.

There is no tax collected for public purposes that the average citizen pays so willingly as that which goes to the support of our schools. The free school is firmly rooted in English and American soil. We pride ourselves on our general intelligence and the efficiency of our educational system. It is even contended by some that we educate too much. During a recent state teachers' convention in one of the states, the high schools were severely criticized by one of the speakers before the directors' section for "teaching fads" at public expense; and a short time previous one of the prominent educators of Iowa expressed alarm at the indications of an "educated proletariat" in our midst.

Notwithstanding our extensive educational system and immense expenditure, I do not share in the apprehension lest we educate too much. Horace Mann's ringing declaration, "We must educate the people," is as true to-day as when uttered fifty years ago. If we are to have an education proletariat it will not be because of educating too much, but rather of educating unwisely. It is well to reflect on what we are getting for the vast expenditure in our public schools. By far the greater part of it goes to maintain the city high schools in educating about thirty per cent. of the school population living in the cities, while the balance, a paltry sum in comparison with the work, is devoted to the country schools in educating the remaining seventy per cent of the school population living in the rural districts. With all our progress and development of the modern school system we are teaching practically everything except agriculture, the business in which three-fifths of our entire population is directly engaged, and upon which nine-tenths of all our people are directly or indirectly dependent for a profitable avocation. We take pride in our modern methods and advanced system of instruction, but what are we doing for the great army of boys and girls constituting the overwhelming majority who never receive the advantages of any instruction except that given in the country school house. Dr. Hugh Watson, (Ian Maclaren) said to a Boston audience, during his visit to America: "If you wish to understand humanity, you must leave the city and go into the country."

It is a matter of record that less than five per cent. of the rural school population ever enjoys the privilege of any high school, and that less than three per cent. of those attending the high schools ever engage in agricultural work. The academy which is designed to afford a higher grade of training and form a connecting link between the common schools and the colleges, trains even less for the farm, or for any industrial calling. To quote from the words of Ulysses to Laertes, "Great, O Father, is thy skill, great thy toil; on every plant and tree thy care is shown; nothing neglected but thyself alone." I am not deploring the fact that the high school, the academy, and the college students do not all return to the farm. It would be sufficient cause for very grave apprehension if they did. No great city has ever yet been able to sustain itself without a constant stream of invigorating blood and brain from the country, and the most enlightened urban population that is known to modern civilization would rapidly degenerate without this reviving and strength-giving influence. The infusion of improved blood from the country is necessary to the very existence and perpetuity of our great business and mercantile enterprises, and even to restock the professions. I only deplore the absence of equally efficient training for those who remain on the farm, to labor in a calling that means more to our national and human welfare than all others combined.

"Do the opportunities for the graduates of an agricultural college warrant the outlay incurred in taking a four years' course?" was recently asked of me by a man who was preparing a commencement address for an eastern college. I unhesitatingly replied "Yes." The positions open to graduates in this field of work compare favorably with those of other colleges. It is not to be expected, however, that a young man just out of college will begin at the top in any profession.

Not long since, the late Henry W. Sage was interviewed by a student at Cornell University. "What are you going to do?" asked Mr. Sage, "when you complete your college course?" "I expect to engage in journalism," he replied. "That is why I am here. I want to get a little experience so that I will not have to begin on seven dollars a week." "Young man," said Mr. Sage, "you begin on seven dollars a week, or two dollars; you will never amount to anything unless you take what you can get and make the most of it." A prominent lawyer, who is now one of the ablest judges of his State, told me recently that he sat in his office for four years before he had clientage enough to pay his board and office expenses. Yet he said he blamed no one, because business men were not willing to trust their business in the hands of inexperienced lawyers. A number of the graduates from the agricultural course in the Iowa Agricultural College have taken positions immediately after graduation paying from $50 to $100 per month.

The time has passed when every educated man must either teach, preach or go into the professions. It is apparent that not all can become lawyers, doctors and preachers. Statistics show that the average minister makes but little over $600 a year, and the average lawyer only about $800. The average salary paid the 28,000 school teachers of Iowa is just about one-half as much as that paid to the butter-makers who take a six months' course in butter-making at the Iowa Dairy School, and those who take a four years' course there are able to rank much higher. While the ministers and lawyers are struggling for their beggarly $600 and $800 salaries, we are confronted with the fact the chief cooks of some of the first-class hotels are being paid as high as $10,000 a year, and the shrewd, well-informed cattle buyer for the great packing concerns commands as high as $15,000 per year. It is strikingly apparent that the urgent demand of to-day is for men who are educated to do something. These are extreme cases, but skilled men of lower rank in the same and other occupations draw proportional salaries. The Iowa Agricultural College lately had application from two wealthy agricultural States of the east for skilled men to give instruction in newly-organized schools at good salaries. We were at that time unable to supply the demand; but if the call had been for lawyers or doctors of equal proficiency in their line, I will venture the assertion that there are a dozen schools in our State that could have furnished a car-load each ready to work at a dollar a day. I do not wish to be understood as in any manner casting the slightest reflection on the avocations of law or medicine, or any other profession. They are all useful and highly essential to an advanced civilization, but the difficulty lies in the fact that there are two doctors for every patient and about five lawyers for every client. We have educated to much for the professions and not enough for the sober, serious work of doing and creating that which contributes most to the national welfare and human happiness. Our greatest danger toward an educated proletariat lies in an educated class with nothing to do—in educated Greek scholars and Latin students who are hungry, and without bread—who have classical culture, without qualification for anything that the world wants and will pay for. Booker Washington has well said, "An educated man standing on the streets with his hands in his pockets is of no more value to the world than an ignorant man doing the same thing.

It has become recognized that there is just as much advantage in thorough training for agriculture and the industries as for the professions, and just as good opportunity for the culture and discipline of a master mind. The various branches of technology require the highest mental acquirements, and the direction and management of vast agricultural, commercial and industrial enterprises often necessitates a higher development of the intellectual faculties than ever comes from poring over text-books.

Agriculture stood still a thousand years until the investigations of science were brought to bear upon it. Horace Mann has tersely said:—"The plowman that turns the clod may be a Cincinnatus or a Washington, or he may be a brother to the clod he turns. It is in every way creditable to handle the yard-stick and to measure tape; the only discredit consists in having a soul whose range of thought is as short as the yard-stick and as narrow as the tape."

The requirements for successful agriculture were never as exacting as to-day. As long as we had our vast extent of cheap lands the problem of production was easy; and comparative close proximity to the great market centres of the world insured certain profit from simple methods. But all this is rapidly changing. Not long since I stood on the banks of the St. Lawrence and was informed by residents there that the products of their farms were transported from the nearest shipping point to the coast and thence across the ocean and laid down in Liverpool for less than it costs the farmers of Ireland and Scotland to put the products of their farms on the same market. The wonderful development and extension of cheap transportation lines is rapidly bringing the remote parts of the globe in touch with the common market centres of the world. These conditions compel us to recognize the Australian, the New Zealander and the South American, with their vast areas of cheap lands, as our neighbours and competitors in business.

The field of agriculture is demanding the application of all the resources that agricultural science and a well trained mind can command. But the formidable obstacle in the way of suitable preparation for advanced agriculture is found in the limited provision for its study as a branch of instruction. The agricultural colleges are to-day doing an excellent work, but they are utterly inaccessible to the great body of farmers. The college can never reach the masses. The farmers are peculiarly dependent on common schools, and there, unquestionably, is where agricultural instruction should begin. But some will say what right has agriculture in the public school? This suggests another question. What right has any study in the public school? I answer, to serve the purpose of an education. In other words, to properly train and develop the immature mind, and to fit the youth for the discharge of life's duties and the enjoyment of its privileges.

The leading educators of the world are substantially agreed that the value of any study is governed by its adaptation to meet one or more of three requirements. These are, first, *mental discipline*, or that which trains the intellect in the faculties of perception, judgment, logic, and reason; second, *æsthetic culture*, or that which trains what are termed the finer sensibilities of humanity in the discernment of beauty in all of its infinite manifestations, whether it be in nature, poetry, oratory, music, sculpture or painting, or in the divine attributes of moral excellence and grandeur of character; third, the *practical* or *utilitarian* value, or that which contributes to the world's store of useful knowledge, and becomes immediately available as mental capital. We may differ largely about the relative importance of these purposes, but taken together they constitute a comprehensive definition of the functions of an education.

We need not take the time to look minutely into the adaptation of agriculture to meet these requirements, for this audience will at once recognize that the practical and utilitarian benefits resulting from the study of agriculture most certainly entitle it to a place in the curriculum of the country school. Too frequently, however, this is regarded as the only justification for pursuing a study. The materialistic value of things in the field of agriculture is by no means its only significance. No subject brings the student into closer relation with nature and its Divine author. One of our great educators has said: "In literature we study the work of man; in nature we study the handiwork of God." Nature is the source of all our impressions of beauty, and surely the æsthetic faculties are abundantly provided for in the study of agriculture. It is also evident that a comprehensive study of agriculture, including the application of the related sciences, affords a disciplinary training corresponding to the study of the pure science itself, and the problems involved constitute ample material for the exercise and development of a keen intellect. It will be seen then that agriculture, in addition to its utilitarian value, meets all the other essential requirements of the educational standard. There are those who would exclude from the curriculum designed to furnish an education every subject that has any economic bearing whatever, on the ground that it savors too much of plebeianism to harmonize with the classical standard of culture; but fortunately this progressive age has but little toleration for that doctrine.

Admitting the adaptability of agriculture, then, as a branch of public instruction, let us consider how it shall be taught. There are many obstacles in the way of successful agricultural instruction, chief of which is the scarcity of suitable instructors. The instruction must necessarily be quite elementary at first. The initial lessons should deal plainly and in a simple manner with the essential principles rather than strive at any intricate technical training.

Teachers must be educated as well as pupils. Wherever the work has been taken up the inefficiency of the average teacher has been found to be the chief hindrance. In European countries, where agricultural instruction is firmly established, two general systems are in vogue. Germany has over one hundred agricultural schools and colleges. All of these are equipped with model farms and facilities for practical illustration. France has fewer colleges, but generously supports five or six leading technical schools that are eminently adapted to give instruction in all special lines of agriculture, and in addition each of the eighty-six departments has a professor of agriculture in charge of the agricultural instruction and investigation conducted in his department. Besides the instruction given in the colleges, a law was enacted in 1879 requiring every normal college to provide instruction in agriculture for teachers; and further, that within three years every primary school should make agriculture a compulsory subject in its course of instruction. Prior to this time France had been endeavouring to teach agriculture in her public schools with very unsatisfactory results. The successful inauguration of the work began with the training of the teachers. A similar course may eventually be necessary here, but if sufficient interest in this subject can be awakened, and the work once permanently established in our country schools, no matter how simple and elementary the instruction is at the beginning, the problem of qualification of teachers will work out its own solution. Most of the text books that have been designed for this purpose thus far have been too technical. The subject must be treated in a simple and interesting manner. Professor W. M. Hayes, of the Minnesota Agricultural College, is at work on an agricultural reader designed to give the first lessons of public school agriculture in narrative form. This would need to be supplanted with a more extended treatise on special subjects. The object method will need to be used largely. Many of the country schools of France have gardens and agricultural museums.

The purpose at the outset should be to lead out the observation and reasoning faculties of the pupil by training him to apply them to the field of agriculture. and in so doing become familiar with the laws of nature and scientific principles which govern animal and plant life and the cultivation of the soil.

During the past year 1,600 farmers, 10,000 teachers, and 25,000 pupils have been reached in the State of New York with pamphlets on nature study. This is the beginning of elementary study of agriculture in the public schools of that State, and it is awakening a new interest. The chemistry and botany that the country school pupil is in need of is the chemistry and botany of the field, and the laws of mechanics taught should be those applied to agricultural machinery and the problems of the farm. The purpose is not so much to teach how to plow and how to dig a ditch and lay a drain, as to impart a knowledge of why these operations are performed at all, and to impress the eternal principles and scientific laws that everywhere prevail in the broad field of agriculture. Professor Huxley stated in one of his public lectures that he was able to give a fair amount of exact information about a bean plant and the manner and condition of its growth, but that he knew he would be laughed at by the entire community if he were to attempt to raise a crop of beans; and yet he said that the man who raised beans might be very greatly benefitted by the scientific knowledge of the bean plant that he possessed.

Men raised clover, peas, and beans for ages without ever realizing half the significance of these crops in the economy of agriculture and rotation of the farm, until Hellriegel discovered the scientific function of the little nodules on their roots.

The agricultural colleges have sometimes been quite severely critized for not making their graduates skilled operators in the details of farm work. I am heartily in accord with the view that a college farm should be a model in every respect; that every piece of work should be performed in the most practical and perfect manner; that every animal produced should characterize all of the work pertaining to the farm and college; but I question the wisdom of making this sort of training compulsory, either in elementary schools or higher colleges. It is much more desirable, for instance, that the agricultural student understand the scientific nature and economic importance of the clover tubercle, and the nitrogen gathering and storing properties of this plant than that he be taught to pitch the product skillfully when it is made into hay—though it will always be necessary perhaps for some one to pitch hay.

The knowledge of how to do a thing comes from doing. The practice of agriculture must come from practice. The president of one of the principal western lines of railroad said, during a recent visit to the Iowa Agricultural College, that their road had tried the experiment of making a comparatively inexperienced college graduate master mechanic in the central shops of the road. The lack of practical training was at first quite apparent in the young man's work, and some of the officers pronounced him a failure and were ready to dismiss him ; but at the end of the first eighteen months he had the rolling stock in better shape than ever before in the history of the road and he also was able to maintain it at less expense. Agriculture is not the only field in which skilled application comes from experience. All professional men are under the necessity of learning how to practice. Chauncey Depew relates that he received $1.50 for trying his first case in court, and that he has since received $150,000 for rendering a similarly easy service.

The agricultural instruction of some sections of Europe, particularly Germany, is largely given through an intermediate class of schools, or more properly agricultural academies. This plan of agricultural education is entirely wanting in America. The old New England academy has been pushing its way westward, where it is frequently dignified by the name of college, and it has taken quite an important part in the general system of education. While it has the advantage of being more accessible to the rural population than any other school beyond the common branches, it lays no claim whatever to giving rural instruction. It educates away from the farm and leads up to the classical college and university. The plan of establishing agricultural academies in this country has been quite favorably considered. President Stickney, of the Great Western railroad, has given the subject careful attention and states that in his judgment the conditions demand such a school. He is also of the opinion that they may be made successful as a financial enterprise.

Agricultural instruction in public schools would not only be of material advantage there, but it would also contribute to the success of secondary schools or academies, and both together would sustain and strengthen the colleges and higher schools of agriculture.

It is plainly manifest that exact agricultural information is fast becoming a necessity ; that empirical knowledge is no longer a safe guide ; and that instruction pertaining to this subject, in order to be of greatest service and of most thorough and material benefit, must reach the masses by beginning at the common schools.

REPORT ON APICULTURAL EXPERIMENTS.

R. F. Holtermann, director of Apicultural experiments, gave the following report :

In carrying on apicultural experiments we have many difficulties to contend with. Comparatively few experiments of an official nature have been carried on. In carrying on experiments with living things, the variations in the individuals alone may account for a wide difference in results. This holds good in experiments with bees, and, in addition, when comparing the results from one colony and another, we not only have to take into consideration the individual wants of the bees but the results in many ways are affected by the number of bees in the colony. Difficulties such as these limit the scope of our co-operative experimental work. The Experimental Union, as far as I know, was the first public body that took in hand experiments in connection with the variations in thickness of comb foundation. Without going into details, I may say that the results of our co-operative experiments went to show that the amount of base left in the comb was generally in proportion to the thickness of the base of the comb foundation ; that the beekeeper could not depend upon the bees to do this work of thinning, and that for comb honey, to avoid heavy comb, it was desirable to use a comb foundation with a liquid base. Since these experiments have been conducted, the Michigan Agricultural College, Michigan Experimental Apiary, Dominion Experimental Farm, and the Ontario Experimental Apiary have carried on experiments with comb foundation, and thus far no evidence has been brought forward to shake the results of the work of the Union.

Next, the Union undertook a series of co-operative experiments with five-banded Italian bees. In certain quarters these bees have received the highest praise, and they were attracting a good deal of attention. Queens of this variety were supplied to some of the best bee-keepers in the Province. We were somewhat disappointed at the small proportion of complete returns received. However, the Experimental Union experiments went to show that these bees were not desirable for honey-gathering purposes.

Since the result of the work has been published there has been ample testimony to bear the Union out in these results, and there are few who venture to recommend the five-banded Italians as honey-gatherers. Thus far our work appears to have been well done. For several years I have been trying to interest bee-keepers in the specific gravity of honey, The nectar is gathered from blossoms brought to the hive, and gradually ripened and thickened by the bees in the hive. Owing to bad teaching and a desire to increase the returns from the apiary in the production of extracted honey, bee-keepers have occasionally taken honey from the hive before it was sufficiently ripe, and therefore of inferior quality. In the discussion which has taken place from time to time it was thought desirable to educate the producer to take only ripened honey, and on the other hand draw the attention of the consumer to the fact that if such honey is put upon the market it will be thin, inferior in quality and lacking in flavor. It was also proposed to take advantage of a Dominion statute which allows the Inland Revenue Department, through the Government in Council, to pass an ordinance limiting the percentage of water in honey.

Your committee collected samples from many portions of the Dominion—in all 43 samples were secured. Unfortunately ten samples, including all the poorest grades, were lost between Brantford and the College laboratory. This makes the results somewhat one-sided; however, we trust another year to carry on the work and arrive at something definite. I may say that there was a distinct relationship between specific gravity and flavor and aroma of honey. From whatever source, the higher the specific gravity the better the honey. Of course, greater or less specific gravity does not destroy the aroma of the honey peculiar to the variety.

Specific Gravity of Honey. The following are the results, as given by Mr. Harcourt, at the Ontario College laboratory:

Label No.	Name.	Province.	Specific gravity at 15.5° C.
1	W. McLaughlin	Ontario	1.4212
2	A. Bridge	"	1.4211
3	"	"	1.4211
4	"	"	1.4235
5	R. F. Whitesides	"	1.4138
6	"	"	1.4269
7	Colpitts Bros	New Brunswick	1.3913
8	"	"	1.4144
9	Marrison	Ontario	1.4235
10	R. A. Marrison	"	1.4206
11	"	"	1.4235
12	"	"	1.4220
13	James Armstrong	"	1.4140
14	Allen Kendall	"	1.4177
15	"	"	1.4211
16	Percy H. Selwyn	"	1.4292
17	W. J. Henry	British Columbia	1.4083
18	I. Avinpolt	Ontario	1.4181
19	Alex. Black	"	1.3991
20	W. McLaughlin	"	1.4267
21	"	"	1.4156
22	S. Wood	"	1.4142
23	"	"	1.4181
24	Mrs. Whitney	Prince Edward Island	1.3946
25	"	" "	1.4138
26	E. Goodacre	Quebec	1.4108
27	"	"	1.4040
28	M. Beaupræ	"	1.4069
29	"	"	1.4099
30	P. L. Pivisen	"	1.4187
31	"	"	1.4197
33	Goold, Shapley & Muir Co	Ontario	1.422

COOKING AS AN ART.

Mrs. S. T. Rorer, Principal Philadephia Cooking School.

Mr. Chairman, Ladies and Gentlemen,—With your permission I shall change my subject for the morning and go over carefully that which I intended to give you last night. The subject being rather technical, the hour late, I felt I might then burden you. In a kindergarden way, go with me over "body building," taking into consideration the best material for both mental and physical structure.

The average farmer spends much time in learning how to grow crops, how to raise animals, how to keep them, and how to get the very best from them. He keeps them lean as long as he wants them so; when he is ready to sell he quickly fattens them. The human animal is not so very different from the one going on "all fours," and it is always a matter of great surprise to me why so much time is spent on the commercial side of this question, and so little on the side of health and comfort of the family. Sometimes these same men keep the animals in good condition while the family is allowed to fall ill, from neglect, and without a twinge of conscience, a physician is called in to correct their own shortcomings. If half as much attention was bestowed to the health, care and general living of the family in the house as to that portion which resides in the barn, the doctor's buggy would be seldom at the door. Sickness is certainly caused by disobedience to the laws of nature. We are governed by our appetites. The first palate, that of the mouth, is our average guide; the second, the stomach, when greatly abused, creates a little uneasiness; but, unless it does, we take for granted that we are suffering no discomfort from that which we have eaten, not taking into consideration that nature after repeated offenses ceases to be tolerant. One frequently hears of a mother or a father living to be ninety, who boasts of disregarding every law of hygiene, having eaten that which suited best or was most convenient. Forget her for moment, and look at her progeny, you find them weaker—sometimes mentally, at others physically; just one step lower down in the scale of health and vitality. Her grandchildren, if there be any, are puny indeed; a fourth generation rarely follows, unless there happens to stray into this family, by marriage, some individual who has observed natural laws and put them into practice. Watch the change. You find a sturdy, healthy offspring, from the father who can scarcely congratulate himself on a single well day. Such children however, must always watch for the "shallow places." The great insane hospitals, as we now call them, are filled with the children of unthinking people. In Pennsylvania (a great State), it is the pride of our legislators that we have the largest of the kind in the country. We have one near my summer neighborhood which holds a thousand souls, while three others of the same sort close by hold from one to two thousand. It happened to be my privilege to visit these institutions and to look carefully over the food. While there, I investigated many individual cases, that I might make for myself a thorough report of the cause of this great affliction. To my surprise, it was found that two-thirds of the inmates were of country birth, and nine-tenths of these had broken down from preventable causes, while the remaining one-tenth came to their condition from shock or accident. The nine-tenths are there because they have never been taught to care for the body as the great casement of both mind and soul. The farmer feeds the buttermilk to his hogs and the butter to his children The hogs look it, and so do the children. He sells his eggs, and feeds his children on pototoes. He gives the corn—good, wholesome food—to his hog until it is too fat to stand; then calls you out to look at this "beautiful" animal whose ankles and feet can no longer bear its weight; it is panting from fat pressure—in fact, an object of misery. This he kills and feeds to his children. Why not give the children the corn in the first place, rather than convert it into fat of this diseased form? Buttermilk contains an admirable form of nitrogen, tissue-building food, and this along with an occasional egg—even at a high price—might prevent a breakdown.

In our educational institutions it is high time that all teachers were imbued with the idea that each has a responsibility to one's self; that our bodies are given to us to religiously care for, and unless we do this in the best manner we certainly must pay God's penalty. In the education of woman many things have been taught to make her exceedingly attractive, such as playing the piano, painting, etc., these are all well enough, they teach her to use her hands; but let her also learn to use them in things for practical every-day life, such things as affect us vitally. Domestic economy is not a single subject, but a collection of many of our most interesting studies. In large cities, the masses must watch health most carefully. The lack of fresh air, and as a rule, good water, make it doubly necessary. But watch the brawny, muscular fellow picking up that trunk, placing it on his shoulder and carrying it for several blocks without the least sign of fatigue, it is a toy in his hand—why? Nitrogeon foods are handy and he uses them freely. Stop off at a small place where nitrogenous foods are scarce with your heavy trunk, and watch *that* man carry your trunk accross the platform; several times he tries before he succeeds in lifting it to his shoulder; why? Because his tissues are worn out, and have not been repaired, nor has he used the proper sort of force and fuel foods—the first, no doubt, uses beef and porridge—or pork and beans; the second, pork and potatoes, or white bread and butter. In most countries, the ordinary day laborer should combine at each meal, proportions of one-fourth nitrogenous food to three-fourths carbonaceous or heat foods; the carbonaceous division may be divided again so that, in the winter, it will be composed more largely of fatty foods, and in the summer starches, such as potatoes, rice, with a small amount of sugar. If he is rich, he will get his nitrogen from the red meats, beef or mutton; if his purse, however, is of smaller size, he can get it equally well from whole wheat bread and old peas and beans. If the latter be cooked carefully and in a toothsome manner, they are by no means inferior foods. The man who depends upon tenderloin steak does not find his muscles in any better condition than the brawny workman of the north who uses oat meal and beans. The exercise of the latter increases his circulation, thereby he takes in more oxygen, and is able to digest with greater ease these rather complicated foods. It may be remembered that last night I canvassed the audience, and found that even here, among college people, few of the housewives knew the composition of potatoes which they probably see and eat three times a day. If one does not know the composition of material, and its nature, how can they cook it well; and we do feel sometimes that the cooking of the potatoes is a lost art. Potatoes, by the way, are heat and force food, lacking nitrogen. In Ireland, where they are the chief diet, they are balanced by buttermilk. One quart of buttermilk with ten pounds of potatoes, three pounds for breakfast, four for dinner and three for supper is the usual allowance for a laboring man who lives solely upon these simple foods.

Going back for a moment to the combinations of foods, if we consider many tables throughout the country, we find pork and potatoes almost daily upon them. This pork is largely fat, heat and force food; potatoes the same; consequently, this class of people lack repair food for the tissues of the body; and it will be remembered that the mental condition of the people in the various insane hospitals frequently follow a great physical breakdown from this cause. To make it still plainer, we will compare the human being to a house. When you are building a house, you put in sufficient lumber, bricks and mortar to make the structure perfect. Then, next, you furnish proper heating apparatus; and for this you must have constant fuel. But the framework of the house needs occasional repair, and for this you select materials suited to those from which the house was originally built. If a post is rotted, for instance, and it is not given immediate attention, the whole structure begins to totter and settle on the weak side. Now, it is exactly the same with the human being. If any of the tissues of the body lack the necessary repair material, the whole frame becomes shattered, and it is frequently impossible to return it to its normal condition. The nitrogenous foods, as meats, eggs, milk, old peas and beans are repair foods—while fats, starches and sugar are heat and force foods. The first corresponds to the structure material of the house, the second to the fuel for heating. We do not need to run nitrogen-mad, as the average dietician of to-day is doing, but we must have sufficient to give us an evenly-balanced dietary. Dr. Fothergill once said to the class at Guy's: "There is not one grain of common sense in eating potatoes and fat pork; but there is a deal of uncommon sense in eating beans and pork." Nor should the dietary be alike for every man; the student would certainly be most unwise to live after the same manner and eat the same food with the laborer; and with four men, all sitting at the same table, having different occupations, it is not necessary that each one of the four shall have a separate meal cooked, but it is necessary to have sufficient variety from which each one can select that best suited to his requirements.

Regarding the quantity of food, much may be said; this impression I would like to give, that the minimum amount to sustain life, in work or idleness as the case may be, is desirable. The average person eats twice as much as is necessary for his well being, and each ounce of food consumed more than is needed for the body's requirements is one ounce of food to be gotten rid of. Thus the economy is worn out, not by actual service, but by doing an unnecessary amount of overwork. In cold climates fat is the best of the heat foods. The Esquimos feed upon blubber. Going to the South, we find the natives preferring rice, sweet fruits, as bananas containing inuline rather than starch, dates and figs rich in nature's sugar. The so-called savage knows by instinct what to eat and how to eat it: the consequence is, their bodies are in tolerably healthy good conditions. Civilize them and they immediately fall ill—not on account of the civilization, but from the uncivilized food used by most civilized people.

Cane sugar may be taken alone without serious injury. Mix it with an acid fruit and subject it to heat, and examine the mixture, and you will not find cane sugar as a result, but in its place two new sugars created from the action of the heat and acid, which are much more liable to fermentation than cane sugar alone. The fruit being attractive, we are enticed to eat more of it than is good for us: fermentation is the result, and this not only destroys the power of the acting digestive secretions upon the fruit and sugar, but frequently contaminates all other foods within range, thus converting the stomach into a fermenting vat rather than a place where food should be properly digested. I am fully of the opinion that all food products now used by man are comparatively wholesome, if not destroyed in combination with other foods or in the cooking; for instance, a person may digest easily meat and potatoes; add a cup of coffee sweetened with sugar and diluted with milk, and a dish of stewed fruit, and fermentation will be immediate. Sour eructations and probably flatulency will follow. Any of these foods might have been taken alone, or in proper combination, without injurious effects. Nature teaches what to eat, but her rules have so long been violated by artificial living that even those with clear, bright-seeing eyes and of thoughtful mind cannot recognize what nature is, so artificial are we. Foods are made tempting, highly seasoned and spiced, to please the palate, producing gluttons, or a set of people who live to eat rather than eating scientifically to live. These gluttons, strange to say, eat, but really never live, as to live is to be healthy and happy. Our fancies are too often taken into account. He eats what he likes, studies what he chooses, and lives as he can For instance, he would like to be a stenographer, whether or not he has adaptation for that profession; and many a good blacksmith has been spoiled by being a poor stenographer. Others feel that teaching is a nice, easy, comfortable way of earning one's living; they have no special adaptation in that direction, but they take to teaching. Independent thought in all such cases is lost, the humdrum every day book learning does not produce the highest type of educators. In my own school days, for instance, (if you will pardon a personal allusion), people at Aurora were interested in astronomy and algebra. I, joining with my friends, went into both of these studies with more than average enthusiasm. No one suggested chemistry or hygiene; and, upon leaving school, my algebra was of little use in my kitchen. My astronomy I found most entertaining and elevating; but I was sadly at a loss to know how to boil a potato, to broil a beefsteak, or to make a respectable loaf of bread. Of course, sickness and sorrow always comes to homes of this sort, and I did not escape the penalty of punishment. 'Tis true that a woman's life is made up of many small and irritating duties; not of necessity, but from lack of training, we have made them so. She must be seamstress, laundress, child's nurse, cook and chambermaid. All these professions, separate and individual as they are, cannot be done well by one person. If she loves to sew, she neglects the cooking; if she likes to cook, she neglects the sewing; and I am fully of the mind that laundry work should be a separate profession from either. There was a time when a woman, too old and decrepit to wash, iron, or scrub, took up the profession of nursing. Results corresponded to her ability. Who would in these days go back to the Sarah Gamp in preference to the trained, skilled, intelligent hand of the modern nurse? And the time cannot be far distant when cooking will assume the same dignity and standing as nursing. Women of higher mental calibre will find it entertaining, instructive and lucrative, and naturally drift into its walks. Laundry work will be done at the village laundry under a skilled and trained laundress; clothing will come back like new, the color not faded but restored, materials not worn out, and flannels not three sizes smaller. I find all housekeepers interested in these subjects. Our shortcomings do not exist from lack of interest. It was announced, during my stay in Hamilton, that I would talk at Stoney Creek on scientific laundering, on Saturday morning at ten o'clock; a busy morning for a housewife to leave her home; but, on arriving at the little room in which the Institute holds its meetings, I found two hundred and fifty energetic, thrifty-looking women awaiting me. They were all housekeepers, many of them having families; and not a single one knew anything about the chemistry of the soap that they used three, four and five times a day. It was soap, and that was the end of it. Washing powders were washing powders; they had no more idea of its composition, than they had of the composition of sugar. They had never examined the fibre of muslin or wool under a microscope; consequently, knew nothing about its shrinking capacity or its construction. Now, why should these women do good laundry work? In looking back over the foundation education in our women, we feel that many years of our lives have been lost, especially if our allotment is only three score years and ten. We are now, many of us, beginning to study at forty, and our minds are not capable of absorbing and holding new facts as they were perhaps twenty years ago. The consequence is that while now we are trying to do our best to build both body and soul, we find ourselves, at fifty, not in the prime of life as we should be, but just a little on the other side. What matters it whether our grandmothers put potatoes on to boil in cold or hot water, if it was not the proper thing to do? Let us examine, experiment, watch carefully, and find out for ourselves whether results are better if potatoes are put on in cold or hot water, with or without salt Our palates are not to answer these questions, but our common sense judgment and results.

It is the constant working out of new problems like these that keeps up our progress. Forty years ago an agricultural college, such as I am now within, would have been the laughing stock of the whole country. Imagine one of the old time farmers, who thought the only thing that ever could be in the line of farming was a simple rotation of crops. The constant growing of corn in the State of Illinois, from the same soil and even without fertilization, would have startled him. Look over the country; study the training tables carefully under the care of our various colleges, and watch the muscles of the teams. Do you think for a moment that Cornell won the race against Harvard because her men were better trained? No. They probably were more sensibly fed: their physiques were better without a doubt, even if their structures were smaller. A little change in the diet of an athlete will produce most marked results. His assignments will be carried out with less fatigue, less strain on the body, and less serious after results than the man who simply loads himself with nitrogen, wins, and takes the after consequences. In nature's arrangement, which, of course, is the perfect idea, there is a storehouse in the body for fuel, a safe guard against freezing or rapid starvation. The results of both are much the same—the reducing of the temperature of the body below the point necessary to sustain life. In the summer, growing around us, we find large quantities of green and succulent vegetables. Upon examination, we find these vegetables to contain salts and acids necessary for our comfort and the cooling of the blood. In the winter we have an entirely different supply, and still even educated people will can tomatoes, peas and succulent vegetables growing in the summer and eat them in the winter, as though nature had made a mistake, which they must correct; a very expensive way too of living, not only from a money standpoint, but the standpoint of physical economy. Such people are obliged to wear sealskin sacques and heavy fur coats: they are constantly reducing the temperature of the body, and so must wear a non-conducting material to keep the little warmth they have, within. Those who *buy* canned goods are unthinking indeed. Take, for instance, a can of peas; analysis shows it to contain, we will say, a little mineral matter, about a teaspoonful of sugar and a pint of water, for which you pay eighteen to twenty cents; at the rate of about five dollars a pound for poor nourishment.

We have dwelt upon the necessity for a carefully regulated dietary; of equal importance is the care of the body. The excretory organs must always be kept clear. The skin, being one of the most important of these, makes a daily bath of cold or warm water, according to the constitution, an absolute necessity. There is little danger of taking cold if the skin is kept in good healthy condition, all excretory organs open and clear, with a properly arranged dietary. The weather may be what it pleases, and the changes severe, you are prepared for it.

Cooking should, without doubt, be taught in every city and country school. Friday afternoon, in my young days, used to be given to sewing. Why not give it now to cooking? The children taught, going to their homes, must throw an influence over the household not attainable from other studies, During the early part of my life. which was devoted to missionary work in the slums of New York and Philadelphia, I found one woman—a woman with four children eating a pan of uncooked beans. In one of the daily papers there had been an article recommending beans as highly nutritious for the poor, a given quantity containing more nitrogen than could be procured for perhaps ten times the money, in beef. In speaking of the cooking of beans the article stated that they must be well soaked over night to be digestible. This poor soul, never having seen a bean cooked, simply soaked them over night and ate them. It happened to be my pleasure to start in that neighborhood a cooking school, and I am sure that my friends in Philadelphia will tell you that this school had the most elevating effect upon the neighborhood of all the work that had heretofore been done. Those women commenced to think, and, to-day, many of them are married, have good comfortable homes, earned and paid for by themselves. Cooking, I am thankful to say, is obligatory in the public schools of Boston, New York, Philadelphia and Washington. It is also taught in the high schools of many of the larger cities; but there is an aversion to this on account of the small percentage of children attending such schools: for instance, Philadelphia, a city of a million and a half inhabitants, finds one high school building for girls and one for boys, all that are necessary for pupils applying. This is supplemented, for boys, by the manual training school; for the girls, by the normal school. The children of the poor cannot find the time required for this higher education; consequently, it was found that cooking would do a greater good and have a farther reaching influence if taught in the lower grades, to girls from twelve to fifteen years of age.

It might be interesting for you to know that many of these children taught both sewing and cooking in the public schools are enabled at home to bring about rapid cures in cases of sickness by the daintily and scientifically prepared food. I have one case in mind where a small child, only twelve years of age, prepared all the beef tea and food for her father in a case of typhoid, and was given credit by the doctor of helping to bring about a better cure. Another child has been given all the mending, and her darning is so well done that it can scarcely be told from the ordinary first weaving of the material. These things are steps in the right direction.

Statistics show that one-half of all the children born die before they reach the twenty-first year; one-third of these before they reach the twelfth month, nine out of every ten from preventable causes. This mortality is by no means necessary, and upon examination we find, in almost every instance, improper food the cause. One of our fallacies—if, for any reason, the child is deprived of its natural food—it's mother's milk—they immediately give it cow's milk. Now, the milk of the cow, being intended for the calf, necessarily is not fitted for the human being; the former reaches maturity in two, three, or, at the outside, four years, the human being at sixteen, seventeen or perhaps twenty-one. Examine the milk of the cow and you will find all the necessary elements for the rapid growth of the calf. Examine the milk of the mother and you will find the necessary elements for the slower development of the infant. My good friend, Dr. Wiley remarks, "This lack of wisdom can easily be proven by a visit to the grave yards." These are things that must be taught in our common schools.

I will say a word about the size and arrangement of the common kitchen. The lack of money in no way interferes with the skill and knowledge of the housewife. Let the kitchen be small with stove, sink and table in close proximity. A cabinet table, of course, is a convenience as it holds all the necessary utensils and materials for the day's work, thus saving the running backwards and forwards from the closets, and perhaps a storeroom on the second or third floor. If one-half of the kitchen table is covered with zinc it saves scrubbing, and allows one to stand a hot pot down without injury to the table. The large half-sitting-room kitchens are an abomination—things must be kept in another room out of sight. At the beginning of a meal miles are walked in collecting the necessary things before the actual preparation is begun. Far better for the housewife to have a room especially for cooking, all conveniences at hand, the meal quickly gotten and cleared away, that she may take her exercise or walking in the fresh open air. The furnishing of such a kitchen would not cost, exclusive of stove, over thirty dollars, as a good cabinet table in these days can be purchased for five or four and a half dollars. A good cooking school kitchen, where from twenty to twenty-five girls can be taken in class, should not cost over two hundred dollars; in fact, exclusive of the tables and stove, fifty dollars would cover all necessary utensils. Economy in furnishing is as necessary as economy in the use of materials.

Pres. MILLS: Q. Just one moment, please; we don't often get you up here, and we would like to have a few questions answered. First of all, won't you say just one word about cooking cabbage without an odor, and the cooking of some of the plainer foods.

A. In the first place you all know, without my telling you, that cabbage is more digestable raw than cooked. The why is easily explained, if one knows the chemical condition of the cabbage. The calcium oxolate is soluble in water; if the cabbage is boiled carelessly or rapidly, this secretion is dissolved in the water, thus the cabbage is rendered less digestable from the fact that you have taken from it one of your aids to its digestion; and, in this rapid boiling also, you dissolve a volatile sulphurised oil, the odor of which is not agreeable and is thrown throughout the house in the evaporation of the steam. To prevent this, then, throw the cabbage into boiling water to which you have added a little salt. This will coagulate the outside; then push the kettle back where it cannot again possibly boil, until the cabbage is tender and white. The water may be kept at a temperature of 200° (Fahr.) and the kettle uncovered.

Pres. MILLS: Q. Why?

A. The air falling directly upon the water in the uncovered kettle prevents the danger of boiling and enables the cook to watch it more easily.

Pres. MILLS: Q. Do you use boiling water to cook all vegetables in?

A. Yes. Old potatoes, however, sprout at the expense of the starch nearest the surface of the potato. If they are soaked in cold water, and put to boil in cold water they will frequently become more mealy than when put into hot water. This is the only exception of which I can now think. Green and top ground vegetables retain their color and flavor better if cooked in salted water; while the white and underground vegetables, rich as they usually are in woody and amylaceous fibre, are better cooked in unsalted water; the fibre is less toughened.

Pres. MILLS: Q. Tell us how to cook porridge. And do you consider it a good food?

A. This depends entirely upon the cooking. The Scotchman builds his muscle and brain on well-made porridge; while the Japanese athlete finds the rice of his country quite as well adapted to his needs. Oatmeal, sold under the name of Scotch or Irish or steel-cut oats, requires long, slow cooking, and is much better if cooked in a double boiler—

that is, an upper boiler sunken down into an under one containing hot water; as a chemist would express it, in a water bath. This prevents scorching and removes the necessity of stirring. Four or five hours is not any too long, and where one has a hard coal fire it may be put over at night and cooked until morning. Five tablespoonfuls of such oat meal will thicken one quart of water to the proper consistency. The water first used may be boiling, the oat meal thoroughly mixed with it, the kettle covered and left to cook.

Pres. Mills: Q. How would you cook potatoes? In the jackets or not?

A. If cooked in the jackets they certainly have better flavor; without the jackets, the potash salts, soluble in water, are lost. This may, in some cases, be an advantage. Drop them into boiling water; keep them at boiling point uutil you can readily pierce them with a fork; if the centre seems to be just a little hard and the outside done, check the boiling by adding a cup of cold water; and bring again quickly to a boil; when done, drain, sprinkle with salt and shake over a fire until dry and mealy.

Mrs. Panton: Q. Do you prefer to cook meat in a pot or oven?

A. As far as the heat is concerned, there is little difference; but we are accustomed to the roasted scorched taste produced by the dry heat of the oven. Most people consider roasted more savory than that cooked in a pot. Stewed meats, or meats cooked in water just below the boiling point, however, lose less in weight and are much more easily digested.

Pres. Mills: Q. Do you put sugar on porridge?

A. No; sugar, here is liable to produce the fermentation spoken of in some of the previous remarks. Porridge alone is an admirable food, and it may be taken with milk; but not with sugar and milk. Simple foods are more easily digested than when made complex by the addition of other materials.

Q. Do you believe a straight line of foods will answer for all people in all conditions?

A. No; certainly not. The rations of the United States army may be exceedingly good in our climate, but certainly did not prove so in Cuba. Fat pork is not the proper food for summer, and people living on such diet in a hot climate must necessarily fall ill.

Mrs. Mills: Q Give a recipe for a good cup of tea?

A. Tea, of course, should be made without boiling. The boiling develops or draws out the tannin. The tea pot should be scalded. Allow a teaspoonful of tea to a half pint of water; put the tea in the pot; take the water at the first boil, pour it over the tea, cover the pot with a cosy; allow it to stand for five minutes; stir and use.

Pres. Mills: Q. Just wait a moment; I am not through with the porridge. Must the meal be fine or coarse?

A. If you use the Scotch oats, you know it is medium; the grains are slightly cracked, but it is not rolled or crushed; ordinary rolled oat meal will cook in, perhaps one hour.

Miss Rose: Q. Will you give a day's rations for a school child who has his dinner at noon?

A. A bowl of porridge with sub-acid fruit forms an excellent breakfast The cereal may be changed; one morning it may be wheat, another oats, another some wheat preparation, another corn meal mush. Water should be the beverage. The noonday meal should consist of a clear soup, a meat, as beef, mutton or chicken, whichever is most convenient, with two vegetables, one starchy and one green, such as beef, potatoes and stewed cabbage, or mutton, rice and spinach, or chicken, stewed maccaroni and cauliflower, or green peas or beans, and a simple dessert such as rice pudding, an occasional gelatin pudding, cup custard or fruit. The night meal may consist of two soft boiled eggs and well toasted bread, or a dish of milk toast, or a little minced meat and a baked potato, or the hard boiled yoke of an egg grated over milk toast, or two tablespoonfuls of cheese added to hot milk poured over toasted bread. Avoid, of course, excessive sweets, hot breads and fried foods.

Q. What about pie?

A. Well, it is better to eat the fruit in another way.

Q. Why?

A. Because acid fruits cooked with sugar change both the character of the fruit and the sugar. Even if we use cane sugar it is split into dextrose and lavulose by the acid and heat—two new sugars prone to fermentation. The fat and the flour are exceedingly nutritious, each one separate, but when the grains of starch are enveloped with the grease it prevents the direct contact of the starch with the mucous secretions of the mouth and hinders their digestion, so that, besides giving a great deal of extra work, good food is converted into bad.

A Voice. "Oh, my, but pies are good."

A. "It would be an unwise man indeed who would eat pie." (Laughter and applause.) "It is not the articles used in pastry that are injurious, but it is the combination, especially as the fat is a covering to the starch.

Pres. Mills. Q. How would you modify milk for infants?

A. Heat two quarts of milk to 100 (Fahr), add two dissolved junket tablets, allow the milk to stand until thoroughly congealed, then stir it with an egg-beater; drain and throw away the curd, or use it for something else, saving the whey. To this add one pint of water, six teaspoonfuls of sugar of milk, eight tablespoonfuls or five ounces of cream and the whites of four eggs, mix together, whey, water, cream and sugar of milk. Take a small quantity of the mixture and put it in a fruit jar, add the whites of the eggs to it, screw on the top of the jar, and shake the mixture until the whole is thoroughly blended then return it to the mass and put at once in a cool place. This will be given as ordinary milk. A child cannot digest starchy materials until after the first teeth appear.

I certainly thank you very much for this opportunity of addressing you upon so important a subject, and my prayer is that your next step in advance in this College shall be that of Domestic Science for women. (Applause, loud and continued.)

At the conclusion of the address a vote of thanks was, on motion of Dr. Mills and Mr. C. A. Zavitz, tendered the lecturer for her able and instructive address.

THIRTIETH ANNUAL REPORT

OF THE

FRUIT-GROWERS' ASSOCIATION

OF

ONTARIO.

1898

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To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to submit for your approval the Thirtieth Annual Report of the Fruit Growers' Association of Ontario. The discussions therein contained are upon matters of great importance to the Fruit Growers of our Province, such as the best export markets and the best and most economical methods of transportation.

I am, Sir,

Your obedient servant,

L. WOOLVERTON,
Secretary.

GRIMSBY, January, 1899.

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

OFFICERS FOR 1899.

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Vice-President.—W. M. ORR, Fruitland.

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FRUIT GROWERS' ASSOCIATION OF ONTARIO.

The annual meeting was held in Court House, St. Catharines, on December 1st and 2nd, 1898.

The President, Mr. W. E. Wellington, took the chair, after which the following committees were duly appointed :

Fruit Exhibit : Messrs A. H. Pettit, A. M. Smith and Edward Morris.

Resolutions : Messrs. M. Burrell and Thos. Beall.

New Fruits : Profs. H. L. Hutt, W. T. Macoun, the President and the Secretary.

Nominations : Messrs. Alex. McNeill and T. H. Race (by the President), and Messrs. Murray Pettit, R. B. Whyte and G. C. Caston (by the Association).

FRAUDS IN FRUITS AT FAIRS.

By A. M. Smith, St. Catharines.

It has always been the mission and aim of this Association to advance the interests of fruit growing and to encourage any object or project calculated to benefit the fruit grower; and the work that it has done in the past gives ample evidence that its mission has not been in vain. When we compare fruit growing of to-day with what it was forty years ago in this Canada of ours, and see what rapid advancement it has made, and realize that it has largely been accomplished by the efforts of this Association in introducing varieties adapted to our country, and new methods of cultivation, fertilization and combatting insect enemies and diseases affecting fruit, and devising better methods of packing, transporting and marketing, we can but wonder it has done so much ; indeed we almost wonder if it can do any more, until we take up the programme before us to-day and see on it such questions as "How can we prevent fraudulent packing ?" "How can we punish the dishonest packer ?" and the subject assigned to me : "Frauds in Fruits at Fairs." All this suggests that there is a moral side to this business that has not been sufficiently cultivated, and which needs attention. I believe it is just as much the duty of this Association to introduce good *morals* among fruit growers and assist in their cultivation as it is to develop good *fruit*, and it is as much their duty to point out and warn the public of the evils of fraud and deception in packing, marketing and exhibiting fruit and trying to prevent it as it is to warn the public of the danger from insect pests and fungoid diseases and how to exterminate them. If we could devise some effectual means of exterminating these evils we would confer a greater good upon the public at large as well as on fruit growers, than we have by any act in the past. I shall not attempt to answer the questions regarding dishonest packing, but would simply remark that a man who would show fruit at a fair as his own that his neigh or grew, would be able, perhaps, to throw some light on the question if so disposed, or at least be well acquainted with the business.

Although the Fruit Growers' Association of Ontario does not give prizes at horticultural exhibitions and fairs, it always takes a deep interest in them, believing if they are rightly conducted they are a great means of educating the people in fruit growing and they have taken great pains in formulating and publishing tables giving the relative value of fruits for the guidance of judges at fairs ; and they have often recommended to directors of fairs suitable persons to act as judges, and it is with chagrin they see anything on the part of either directors, judges, or exhibitors that indicates unfairness to any one, or fraud in any individual for the sake of gain. But that there is fraud, if not perjury, at many, if not all of our fairs in connection with fruit exhibits, I think no one who is familiar with fruit exhibits will deny. There is a certain class of exhibitors whom you might term professionals, who grow very little, if any, fruit themselves, but who buy, beg or *borrow*—to use a mild expression—all the best samples the country affords, and go from one fair to another showing them as their own production, and raking in the prizes—sometimes they go singly, and sometimes they club together and divide the spoils. I have even heard of their getting themselves put on as judges when, from some cause the appointed judge was absent, and judging fruit they were interested in themselves. I think it is one of the rules of all Agricultural Societies that the grain, vegetables and fruit must be grown by the exhibitor, and he must swear or certify to that effect when making his entries. Now, if a neighbor of mine shows fruit grown on my trees, no matter how he comes by it, and signs a certificate that it is his own growing, what would you call it? I know many men do this who would not like to be called dishonest or guilty of fraud, and they argue that they are not defrauding the Society, as they would have to pay the prizes to someone in any case; but they do not stop to think they are defrauding their neighbor and obtaining money under false pretences. I fear that, in many cases, directors wink at this kind of work and think it helps the show to get out these fine displays. I think they make a mistake even in this regard, for this practice has become so prevalent that many honest fruit growers will not bring out their fruit to compete against these professional prize takers, and thus many of our best fruits are kept back from exhibition. If directors of fairs are going to allow this sort of thing, let them amend their rules so as not to make men swear falsely and encourage them in dishonesty. I have noticed, with pain, that many of our young men are getting into this business. They are naturally anxious to attend fairs, and here is an opening to pay their way, have a good time and make a little money out of it besides, so they fall into the temptation.

I do not know what means to recommend to exterminate this evil, but I think this Association should at least enter its protest against such a state of affairs, and the officers of all agricultural societies should so amend and enforce their rules that these frauds may be suppressed.

Mr. BURRELL, (St. Catharines): I always understood it was a rule at fairs that visitors should exhibit what they grow themselves. I understand, however, that at Toronto Fair you have not to sign a declaration of that kind. It is very hard to refuse a neighbor who comes in for some specimens as he is making up a variety. It is difficult when there is a rule that exhibitors must sign a declaration that the fruit is their own growing.

Mr. SMITH: Of course there are certain collections open to the general public; but if there is not such a rule as that, and you do not have to sign a document of that kind, I would like to know it.

THE PRESIDENT: Being a Director, and also Chairman of the Fruit Committee of the Toronto Fair, I would say that the rules and regulations are that all exhibits must be the *bona fide* produce of or grown by the exhibitor. We do not go the length of asking every man to make a declaration to that effect, but if we are shown on complaint of an exhibitor, or anyone in fact, that fruit so exhibited at the Exhibition was not grown by the exhibitor, that fruit would be ruled out and not be passed upon. It is just the same way in the naming of varieties. The rule is very strict in that respect, and it lies in the hands of the judges to throw out any exhibit, no matter how meritorious it may be, if there is one wrongly named plate in the collection, for instance. It seems sometimes a little hard. The idea is to have all fruit exhibited true to name, because we wish as far as it is possible to make the exhibition an educator in the fruit interests, and we think that centered there in Toronto where the large exhibits are made everything should be correct; and the judges who are present in the room know that I have always, hard as the case made be, insisted that the rule be strictly adhered to in that regard. Of course if it were thought necessary, or in the interest of the fruit growers, that a declaration should accompany every exhibit we would take measures to carry that out.

Mr. ORR, (Fruitland): I think the object of giving awards for fruit exhibits is to encourage growers to grow the very best fruit that they can grow. As far as Toronto Fair is concerned, I think the fruit exhibited should be strictly the produce of the party exhibiting. Probably that does not apply to counties, at the Toronto and London Fairs where we have people from all parts of the world, many from neighboring States, I think we ought to have the very best possible exhibit irrespective of who is the grower. Whether it would be desirable to have another class for exhibits of that kind I don't know, but I don't think we should hamper having the very best possible exhibit gathered from where you will, where so many people see the exhibit and see the products of our country.

Mr. BURRELL: I think Mr. Orr's objection is well taken. I only spoke because I think that if there is a stipulation of that kind, whether it is expressed in the way of requiring a declaration on the part of the exhibitor or not, it should be made more emphatic, because if a man is going to show what he does not grow when there is a rule against it, then he may just as well perjure himself right out by making a declaration, and that will keep any man who feels a little dubious about doing it; but I would have it right open or else have him sign a declaration and I would make it clear. The thing should be stated either one way or the other. I think Mr. Orr's views are correct as far as Toronto is concerned.

THE PRESIDENT: I may point out that it does not prevent us from having an exhibit that will really show what can be done in Canada no matter where the fruit is grown, because there is a class at present open to Societies. It is a class we have been trying to encourage of late years. That of course enables them to gather the best specimens of fruit in their district, and consequently in that exhibit you have the best the land produces, while in the other class where there is individual competition you have what I think is only fair, the actual growth by the exhibitor. Of course I am your representative there, and if this meeting wishes that that clause should be done away with I could take means to have it done, but with the open classes that there are at present I don't think it would be advisable.

Mr. BURRELL: The only open classes now are for Societies?

THE PRESIDENT: That is all.

Mr. BURRELL: That has only led to two Societies, Oakville and Burlington, exhibiting, and that is over an immense range of fruits that no one man is likely to touch; and it is in the small selections where this thing is done. I think it should be thrown open—either no declaration at all wanted, or a declaration wanted, so as to leave no half way. Have no clause at all, or else have a clause expressly stating, and have a man sign it when he makes his entry.

A. McNEILL, (Walkerville): Would that it were possible to get back to the good old classic times when they used to compete for the glory of the thing. I would like to see the rules framed so as to throw more on the honor of the person exhibiting, and that lees stress should be placed on the money question. It is not desirable even for the purpose of securing a good exhibit of fruit that this class of men should be encouraged.

We as Canadians have a reputation which I think without undue modesty we can claim, of being honest, and as far as the regulations can be framed to put down that kind of thing and secure honesty in that respect the better. I think the Toronto people have done well in putting a premium upon the exhibits of fruit from Horticultural Societies, and more stress should be laid upon that. Horticultural Societies should look to the educational value of these collections, and look upon it as part of their legitimate work to make the exhibits and to make them educative. Less stress should be laid upon the money side and more upon the credit of having a good exhibit for the individuals and the societies and the country in they which live.

Mr. ORR: When we get rich and can do as they did in the classic land, where the members of Parliament served without money, and it was all honor, and they could afford to live for honor, all right; but I am satisfied it would very seriously interfere with our exhibits at the fairs if the prizes were done away with. I know men that go out in their orchard, and up and down the country gathering fruits that no society would do, and I know these men get together splendid exhibits that are a credit to our country, and I do think it would be well to have a class just for that kind of thing.

Mr. A. M. SMITH : You will often see men going through the country begging or borrowing or buying fruit—and they have the excuse, that they are gathering for certain societies—that there is a class, as there is in Toronto, open to the general public or any association or society. They go through the country and gather up this selection of fruit, and a very close observer will often find some of that fruit on a plate of private individuals, shown as their own producing. I know what I am taking about, because I have seen some of my own fruit shown in that way, that I had taken pains to fix so that I could identify it.

Mr. CASTON (Craighurst) : Mr. Smith's paper was aimed at what may be called the professional exhibitor, and we have a number of them. At the Industrial this fall one of the experimenters told me that a party there wanted to purchase the best selection of the fruit and offered him a pretty good figure for it, and he asked me what I thought about it, and I said "The best thing is to sit on him and sit on him heavy too." He was one of these professionals. They follow up the fairs as long as they last during the fall. It is a money business with them. If, as Mr. McNeill suggested, we do away with the money prizes and have people exhibit for the honor of the thing in the shape of medals or diplomas, there would not be that inducement to these professionals, as there would be no money in it for them. On the other hand, as Mr. Orr suggests, we would not have as many exhibitors if the money prizes were withdrawn. It is rather a troublesome question to deal with, and I hardly know how we are going to get at that class to stamp them out.

Mr. ROBT. THOMPSON (St. Catharines) : I don't think we can stamp them out. As far as making a declaration is concerned, the rules of all societies at present are that any person, any other exhibitor, can make a protest against one of these professional men. How often is it done? When it is done, in 99 cases out of a 100 these professionals will take that declaration and swear that the article is their own growth and produced on their own place. If this declaration were made compulsory when they are making the entry, Mr. Burrell would have some good fruit and of course he would exhibit as his own. The professional will do the same thing. They have done it in the past and will do it in the future. I am sorry we cannot confine it to the growers, but with my experience of fairs I know that it is impossible to do it, and, as Mr. Orr says, it would work detrimental to our fruit exhibit. I believe that all the large exhibits should be thrown open and that clause done away with, because I am satisfied it will never be observed.

Mr. BURRELL : I am inclined to think those ideas are right as far as the Provincial show goes. I believe we can shut out all those men in the different localities, because they are known and it is known what they grow, but at Toronto you will never shut down on them altogether, and I would say either push it so as to make it very stringent or else let it go. I would ask Mr. Smith his views on ringing grapes. Everyone in Toronto who is a judge of grapes must know that the majority of the prizes in Toronto go to the grapes that are ringed. We all know the process. Is that to be upheld? Lots of the prizes this year were to be given for grapes that any man knows had been ringed. That is certainly a very unfair thing to the man that shows the grape in its natural state.

THE PRESIDENT : If the meeting feel that that should be looked after it would be a very easy matter to stop it by giving the judges power and authority to throw out all ringed grapes, which would soon bring that to an end. It is simply a question now whether you think they should be thrown out.

Mr. BURRELL : Many men do not ring their graspes because they do not think it is a fair way of competing, and at the same time they know they will not get the prize unless they do ring them. Everybody should understand that they will be allowed to ring them. One judge told a competitor who was complaining that he did not get a prize, "You ought to ring them."

Mr. CASTON: Do you think that the judges can always determine?

Mr. BURRELL: I do not say you always can. but there are many cases where there is absolutely no doubt about it.

Mr. CASTON: I should think it would be very difficult for a judge to decide.

Mr. BURRELL: Sometimes it is very difficult, but it is sometimes very easy.

Mr. HUGGARD (Whitby): If we were to adopt the system Mr. Burrell advocates, the best in fruits would not be exhibited at all. That is, giving none of the prizes to grapes that were ringed. It would apply equally to all manner of cattle, and horses, and stock; the better you feed it and the better you doctor it up, it would make it win a prize all the sooner. I don't see any reason why, if a man goes to the trouble to ring his grape vines and produce a few clusters of extra good grapes, it would not be equivalent to another man who would pick most of the pears off his pear tree and bring in a few choice ones of very extra ones. You would have to prevent the one just as much as the other. My notion is to let everybody bring the best that they can possibly produce; but have a specific rule and see that it is carried out, that in the case of any one begging, borrowing, or stealing fruit that is not his own, the prizes should be withheld. The majority of the exhibitors send in their exhibits for the money value that is in the prize. Our township people go there for the purpose of getting money out of the exhibitions, and if they are awarded the prize and don't get it, no matter how trifling it is, you will hear a great deal of squealing against the association or society. I think the best way that an association can do is to encourage growing grapes of the largest possible kind, whether ringed or otherwise, and the best of every kind of fruit that we are capable of producing, and if a rule which is severe enough now is applied to these professionals who collect fruit through the districts and exhibit it as their own, they will soon drop out.

R. B. WHYTE (Ottawa): It seems to be a question whether the ringed grapes are the best. I think it is generally understood that they are bad in flavor, and would never be bought by anybody in competition with other grapes; therefore ringed grapes should be prohibited. They are large and watery and of poor flavour. In our Horticultural Society we had a little trouble with exhibitors by requiring every member in making his entry to sign a declaration that all articles exhibited by him were of his own growth. We have not had a bit of trouble this year. I cannot see any object in having an exhibition at all if it is not the production of the individual grower. I do not think we can take a better way of having a small exhibition than by allowing people to go about and collect what they do not grow. There are some fruit men along the St. Lawrence that gather up wherever they can. Our Horticultural Committee are trying to stop that, but the fact in the past has been that the local fruit growers did not gather in competition because they had no chance with those men that gather wherever they can. It deterred so many people from exhibiting that it had the effect of making a smaller exhibition than we otherwise would have.

A. H. PETTIT (Grimsby): I think every exhibitor in a local show should sign a certificate that his fruits are his own product. I think it is very unfair to individual growers who want to make an exhibit of their own products at the fair to come in competition with those who come from all over the country; but I do think it is quite necessary to have in our exhibitions, particularly in Toronto, a sort of go-as-you-please class, where a man can collect the products of the whole country if he wants to and show them; but I would put that exhibit in this way, that everything should be very correctly named. We don't want a lot of fruits in this class exhibited to the public given fictitious or other incorrect names. Why? Because that is exhibited as an educator of the people; it is there for that purpose; it is to show the resources of our country and the variety of fruit we can successfully cultivate, and I think it is a good thing to have it, for the reason that you get a big exhibit of this great Dominion of ours at that exhibition, and I think that is what we want, but the individual who is showing his own product wants to be protected by this form of declaration that they are his own product. As to the grape question, I have been a judge on several occasions, and I say that if you passed a rule that ringed grapes are to be ruled out, there should be a very plain card placed on every one of those plates, and the judge should write on that card in plain language that they are ringed grapes; for if the public passing by the tables and seeing the work that you have left behind you, all the finest plates upon the table ruled out, want to know what is the matter? They will tell you at once you do not understand your business. The plates look a great deal better than those you have given the prizes to. Now, here you are educating the people. Let us do it properly if you are going to do it; let ringed grapes be plainly marked so that people can see why judges rule them out. In an exhibition to show what we can produce in this country I don't know that you should rule out ringed grapes any more than you would an animal that was overly fat. You see lots of animals shown at these exhibitions that we know are too fat for breeding purposes, and your ringed grapes come the same way—they are a little too large in size to have that quality and flavor that is so desirable. If we look at the exhibitions as an educational institution, let us encourage them along the educational lines as much as we can, and give a go-as-you-please class for Societies, requiring that every fruit in it be correctly named. Then if we protect the individual grower that has to come in competition with this class of exhibitors I think you will come pretty nearly to the right thing.

M. Pettit (Winona); I have judged grapes for the last fifteen or twenty years, and I defy any man to say in every instance whether grapes have been ringed or not. If a vine has been ringed very early the grape will appear very bloated and the flavor insipid, but if you ring it later on you will increase the size and color and no judge can tell whether it has been ringed or not, there are so many degrees of it, depending on the time and the season at which the vine has been ringed. The prize list says "the best." My experience in judging and working with other judges is that those very large overgrown grapes do not always get the prize. For my own part I very often go for throwing them out where there are better flavored and nice even grapes in the same class, and I have just made it stand that way. It works all right. We show people fine fruit, and if the judges do their duty they go there and show the people what good fruit is, and the kind of fruit that should be put upon the market and upon the tables should be well colored, well flavored fruit. (Applause.)

Mr. Burrell: I do not think it is quite fair to argue, as Mr. Huggard and Mr. Pettit did, that ringing was a sort of natural process. I don't care whether grapes are ringed or not in Toronto Fair as long as everybody is allowed to exhibit them; but the ringing of grapes is not an normal process like the thinning of fruit, or the fattening of cattle. If I were to use a comparison I would say, suppose an animal eats a bushel of grain and gets very fat, but it is going to die in twenty minutes, it would not be fair to exhibit it. It is not an normal or healthy process.

Mr. McNeill: Nor a commercial process.

Mr. Burrell: No. If they admit ringing, all right, but let everybody ring, because otherwise it is competing on an unfair basis.

The President: Unless you wish to take some definite action on the matter, which I should judge from the discussion could hardly be done, we will have to close the question here. Judges will have to take this matter into consideration, as they always do.

IS FRUIT GROWING CONDUCTIVE TO MORALITY?

By F. G. H. Pattison, Grimsby.

In introducing his paper the writer said: Before reading this paper, I would like to say I do not wish it to be taken too seriously. It has been my misfortune sometimes, notably at Kingston, to have my serious papers taken in a jocular strain. I don't wish that to be taken in an opposite way—that a paper that is intended to be taken in a slightly jocular strain should be regarded from a too serious standpoint. It is peculiarly fortunate to the interest of this paper that I am about to read that Mr. Smith has already directed your attention to frauds in fruit at fairs. In this short paper, it is my object to throw what I think is a new light upon the temptations and the difficulties surrounding the business of fruit growing, and one which the general public, and also fruit growers themselves, have entirely ignored up to the present time. My proposition is this: That there is an inherent original sin in fruit itself, which exposes those who plant it in the nursery, those who grow it in the orchard, and those who sell it on the market, to peculiar trials and temptations. On looking back to the earlier stages of the human race, we are told in the story of the Garden of Eden how the Devil, in the guise of a serpent, entered into, not a cabbage, nor a potato, but an apple; and since then, apparently, not only apples but all other fruits, although pleasant to the eye, and seductive to the palate, have retained that primeval devilishness. If this be *not* the case, how do we account for many well-known facts relating to the fruit business? For example, the way in which the large apples, peaches, strawberries, etc., find their way to the top of the basket, and the small, wormy, and bruised ones to the bottom. The outside public say that the growers put them there. I know this to be erroneous, because the growers have told me that they do not, and I will undertake to say that if one of the outside public were to ask any fruit grower in the whole Province if he put the large ones at the top and the little ones at the bottom of a basket or barrel, he would reject the idea with scorn. But the public say that the large apples, etc., *do* come to the top and the small etc., to the bottom. Are we then to consider the public as liars? By no means. This seemingly inconsistent state of affairs had long puzzled me, until I was led to make the following experiment. I collected a basket of fruit and put it by itself in the fruit house, carefully placing the small and poor specimens at the top, and the large fine ones at the bottom. It was then left by itself for two or three days, without being watched or interfered with. At the expiration of that time, upon examination, the large ones were all at the top and the little ones at the bottom. This experiment has been repeated several times, with a similar result. It is true that certain scoffers have suggested the children as the authors of this strange metamorphosis, failing them that it was owing to rats. But to both of these objections I think "rats" is the proper reply. I am forced, then, to the following conclusion, viz: That if fruit in a basket or other package be left to itself and remain quiescent for a considerable period, that the big ones will work themselves to the top, and the small, wormy ones to the bottom. Now to prevent this requires great watchfulness and care on the part of the grower, added to high moral principle, and the purchaser little knows what a struggle has been gone through, what a moral victory gained, when he remarks, on examination of a basket of fruit he has purchased from the store, "Why, I have actually got a basket that is good all through!" But this same character follows the fruit into the hands of the commission men and retail dealers How else do we account for the marvelous discrepancies between the actual sales and the growers' returns therefrom, of which great complaints are being continually made? No doubt the commission men are an honourable body, but, unless the moral qualities of people handling fruit are unusually strong, the innate devilishness of the fruit itself overcome them. For to the commission man the fruit devil whispers: "That was a splendid sale you made, but you need not return the full amount to the grower. Ten per cent. is but a beggarly amount to receive for a sale like that, owing to *your* energy and business capacity, besides he will be satisfied with much less." And too often this fruit-devil is listened to, the commissionman falls, and the grower suffers.

Look at the number of "wet," "slack" and "wasty" returns that come back from the old country. Think you that there is no fruit-devil at work there? I am afraid that the English commissionman too often, like his Canadian *confrere*, does not exhibit sufficient moral fibre to withstand his temptations. Even in the nursery row fruit trees exhibit their evil propensity, for which some blame the nurserymen, who are in the main a fine body of men of more lofty principle, who would scorn of themselves to do anything wrong, and yet, varieties first-class when planted, turn out but third class at bearing time, ironclads fail to resist the slightest frost, and prodigious bearers decline to bear anything. Plenty of other instances might be brought forward in support of my discovery; but why take up more of your time? The more you study the matter, the more you will see the truth of my discovery, and the more apparent it will be that high moral principle is the first requisite for the fruit business; and it is much to the credit of the noble body of men now engaged in the business that matters are not worse than they are, that occasionally the fruit at the bottom of a basket is not much worse than at the top, and that sometimes there are no wormy or bruised apples at the bottom of a barrel.

What, then, should be done to remedy this state of affairs? Firstly, gentlemen, let us be thankful that this discovery has been made; now that we know the real cause we can take measures for its prevention and cure. Secondly, a board should be appointed by the Government, selected from our highest and most moral citizens, to award certificates of moral character to anyone about to engage in handling fruit or fruit stock. Thirdly, no one should be allowed to engage in growing or selling fruit or fruit stock without such a certificate Fourthly, the writer should be president of the board at a handsome salary. Fifthly, no fruit package should be left alone for any considerable period. By the adoption of these measures we can, in time, attain to perfect honesty; and, instead of its being a matter of surprise for a private purchaser to receive an honest basket of fruit, it will be the most ordinary, every-day occurrence.

OBSERVATIONS ON RUSSIAN FRUITS AT THE CENTRAL EXPERIMENTAL FARM, 1898.

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

It is a great pleasure for me to be with you this morning. It is the first time that I have had the pleasure of attending a meeting of the Ontario Fruit Growers' Association. Knowing as I do full well the high esteem in which you held Mr. Craig, the late Horticulturist of the Farm, I feel that without your sympathy and co operation the work that I may do there will not be such as if I felt you were all my friends.

Before giving my observations on Russian fruits for 1898, let me relate the history of these fruits as grown at the Central Experimental Farm, Ottawa.

A large number of Russian fruits have now been tested for ten years at the Central Experimental Farm. In the year 1888 there were planted in the orchards 133 supposed varieties of apples, twenty-eight of pears, eight of plums, and thirty-eight of cherries. Since that time others have been added at intervals, and notwithstanding those that have been winter-killed, there are now about 160 supposed varieties of apples in the orchard, eighteen of pears, twenty-eight of cherries, and seven of plums. A few of the apple trees planted in 1888 fruited in 1890. The trees did well and made vigorous growth up to the year 1892, when blight appeared in the pear orchard and continued to spread throughout the summer and autumn, notwithstanding all efforts to hold it in check. All the Russian varieties of pears were affected, twenty-five trees being killed to the ground. The apples were also affected that year, though not so seriously. In 1893 the disease appeared earlier in the season and committed great ravages, both among the apples and the pears. Many apple trees were reduced to stubs, while the pears were still more badly injured than in 1892. This left these orchards in a very dilapidated condition. Some trees had died altogether, others were reduced to stumps, and again others which had large diseased limbs sawn off, had lost their symmetry. The trees were not so much affected in 1894 and 1895, but owing to the severity of the winter of 1895-6 a large number were root-killed; the last of the pear trees originally planted going at that time. Further injury from root-killing occured in the winter of 1896-7. During the past two seasons, most of the apples and pears which have been replaced, made good growth, and some of the apple trees which were badly affected by blight are regaining symmetrical proportions. Out of about 288 apple trees planted in 1888, there are now 149 trees living, 139 having died, of which 104 died in the spring of 1896, twenty-seven in the spring of 1897, and eight this year.

The cherries did well at first, beginning to fruit in 1890. In 1895 a very fine crop was produced, but during the following winter nearly all of the trees were root-killed. This was owing, in a large measure, to their being grafted on tender stocks. Since that time they have been propagated to some extent on Bird Cherry *(Prunus pennsylvanica)* stock. Some trees propagated on this stock in 1891 continue to do well. An exception to the almost general winter-killing of the cherries in 1895 6 was the Koslov Morello, sent out by the Ontario Fruit Growers' Association in 1890. Out of twenty-four trees only five died from the effects of that winter. These cherries are, however, on their own roots. The Russian plums planted in 1888 have all been winter-killed with the exception of two trees, Early Red and Voronesh No. 102, although these two trees are not very healthy. Other varieties have been planted of late years and some of these are still doing fairly well.

Russian Fruits, 1898 : Last winter was not a hard one on trees and there were scarcely any losses. Most of the trees in the Russian apple orchard, which were old enough, produced a good crop of fruit this year. Owing to the extremely hot, dry weather the summer apples—to which class nearly all the Russian varieties belong—dropped very badly. The trees on the whole made fair growth. No blight was noticed. About fifty varieties among those planted in 1898 and 1890 look thrifty. but some of these are evidently synonyms, which would reduce this somewhat.

Of the varieties which fruited this year, the following seem to be the most promising: Livland Raspberry, (Melonen). There seems to be no difference between these apples as grown at the Experimental Farm. Tree, upright, fairly vigorous ; fruit, medium size, roundish, conical ; skin, pale yellow, well splashed and washed with bright red ; flesh, white, tinged with pink near skin, firm, crisp, juicy, sub-acid, pleasant flavor ; good quality. Ripe, August 3rd.

Switzer : The Switzer grown at the Experimental Farm does not color so highly as that grown by Mr. R. W. Shepherd of Como, Que. Tree, moderately upright, fairly vigorous ; fruit, medium size, oblate ; skin, pale green, almost white, firm, crisp, juicy, sub acid ; good flavor with a high aroma ; very good quality. Ripe, August 10th.

Pointed Pipka (Summer Arabka, Broad Cheek, Throne, 135 M. Budd) : All the trees under these names seem to be of the same variety. Tree spreading vigorous, fruit above medium size, oblong, conical, ribbed ; skin, pale yellow, well splashed and streaked with purplish-red ; flesh, white, rather coarse, juicy, mild sub acid, pleasant flavor, good quality.

Romna (Hibernal, Aport, 244 Beadle, Longfield 56 M.—not Longfield as generally grown—Silken Leaf) : These are all apparently the same apple, as grown at the Experimental Farm. Tree, vigorous, spreading ; fruit, above medium size, sometimes large. oblate, conical ; skin, greenish-yellow, streaked and splashed with purplish-red ; flesh, yellow, tender, melting, juicy, acid ; quality, medium. Ripe last week in September. This is more valuable as a cooking apple than as a dessert fruit. It is one of the most vigorous trees that we have, but not more so than McMahan White, which, in my opinion, is a better apple.

Plikanoff : Tree, planted 1893, vigorous, spreading. Fruited for the first time this year, Fruit, large, roundish, slightly conical ; skin, yellow, well washed with bright red and splashed with a darker shade ; flesh, yellowish, tinged with red, rather coarse, fairly juicy, sub acid, good flavor ; good quality. Season, probably October.

Repka Winter : Tree, upright, fairly vigorous : fruit, above medium size, oblate, flattened ; skin, yellowish-green lightly streaked and splashed with purplish-red ; flesh, white, crisp, fairly juicy, mild sub-acid ; quality, medium. Will probably keep until February.

Antonovka Though sometimes favourably mentioned, this will, on account of its lack of color—it being a yellow apple—probably not be a profitable variety.

Winter Arabka : Did not fruit here this year. It is considered one of the best of the Russian varieties, and is a winter apple.

The Switzer and Pointed Pipka are the only two varieties fruiting this year which can compare with dessert apples of their season in the best apple districts of Ontario.

Other varieties favorably spoken of by those who have tested the Russian varieties in Canada are:—Stettin Red, Gipsy Girl, Titovka, Flat Aport, Amtmann, Boradovki, Belin, and St. Peters.

In the year 1890 a Russian seedling orchard was planted comprising about 3,000 trees grown from seed imported from E. Goegginger, Riga, Russia. The seed from which these were grown was supposed to be taken from apples grown North of Riga. Of these there are now 1,016 remaining, the rest having been killed either by blight or winter. These began to fruit last year, and this year about sixty trees bore fruit. None of these apples are sufficiently promising to be worthy of special mention, but a few of them are as good as the majority of the Russian varieties. These will be further tested at Ottawa, and scions sent to the farms at Brandon and Indian Head, to determine whether they are hardy there or not. The rest of the trees which fruited this year will be cut out.

Pears: The Russian pears, planted since 1895, have done well and have not been much affected by blight since that time. Only one variety, the Baba, fruited in the pear orchard this year, but two others, Gliva Kurskays and Sapieganka—which have borne heavy crops annually in the Director's experimental garden for some years—were again loaded this year. The Russian pears yet tested at Ottawa are in season but a very short period when they get soft and mealy. If used at the proper time, they are fairly good to eat raw and are very nice when preserved, but are not worth planting where other varieties will succeed.

Plums: The Europeans plums have not done well in the orchard at the Experimental Farm. The situation is very exposed and the trees have suffered severely. This year four Russian varieties fruited, namely, White Nicholas, Early Red, Voronesh (blue) and Yellow Voronesh. All of these but Voronesh (blue) are of good quality. The Yellow Voronesh is almost as large as Yellow Egg and of somewhat the same shape, is juicy, sweet, and of good flavor; cling stone; good quality. Ripe, August 22nd. Two of the hardiest of the European class of plums yet tested are the Glass Seedling and Richard Trotter.

Cherries: Of the cherries planted in the orchard from 1888 to 1895, the following varieties have survived—Strauss, Minnesota Ostheim, Ostheim, Cerise d'Ostheim, No. 207, Koslov Morello, Heart-shaped Weichsel, Orel 24, Orel 27, Riga 18, Shadow Amarelle, No. 206, Orel 25, Griotte du Nord, Spate Amarelle, Brusseler Braun, June Amarelle, Lutovka, Amarelle Hative. Most of the trees of those varieties which were planted in 1888 do not look as if they would live much longer. These trees are on tender stocks. Trees of a number of varieties in a nursery row, propagated on *Prunus pennsylvanica* in 1891, are very healthy and produced a heavy crop of fruit this year, as did also most of the other cherry trees which were old enough to bear. The best of the European and Russian cherries ripened in the following order this year: Amarelle Hative, June 26th; June Amarelle, July 2nd; Shadow Amarelle, July 3rd; Heart-shaped Weichsel, July 8th; Griotte du Nord, July 8th; Orel, July 25th; Cerise d'Ostheim, July 12th; Brusseler Braun, July 25th; Koslov Morello, July 26th. These cherries gave a continuous succession of fruit for about five weeks. The apparent gap between July 12th and July 25th is filled up by the Ostheim, the fruit of which ripened rather unevenly this year.

The Koslov bush Morello cherries, received from the Ontario Fruit Growers' Association in 1890, deserve special mention. These little, bush-like trees, after eight years' growth, now average only about 5 feet 6 feet in height. There are 21 trees yet living out of the original planting. Of these, 15 produced fruit this year, nearly all of which appear to be different. This is the first year that they have fruited to any extent, although planted for eight years. Most of the trees produced fruit of inferior quality, some being bitter, and others very acid. Two of the most promising, on account of their hardiness and lateness in ripening, are the following Koslov Morello (R. 6, T. 29). Tree, bushy, height, 5 feet 6 inches. Heavy crop; fruit large, long, heart-shaped, slightly flattened, firm ; stalk, very long, slender ; suture, rather indistinct ; skin, deep red ; flesh, deep red, juicy, very acid ; pit, large, long. Ripe, July 20th. Would probably make a good preserving cherry.

Koslov Morello (R. 6, T. 27) : Tree, bushy, height 6 feet 6 inches. Fair crop ; fruit, large, heart-shaped, rather deep red, firm ; stalk, long, stout ; suture, distinct ; flesh, bright red, very acid ; pit, large, oval, flat. Ripe, July 26th.

The observations made this year, and the opinions drawn, are unbiased, and should another year's experience change my views on the varieties mentioned I shall be glad to express them.

The SECRETARY: I am very glad to know what Prof. Macoun says as to the Koslov Morello cherry. I have five or six of those trees in bearing in the orchard, and I have been very favourably impressed with the cherry. As he says, there is a great difference in them. They are all grown as seedlings. Mr. Niemetz of Russia sent out 50 trees of that cherry to me in the year 1889 ; of which those sent to the Experimental Farm were a portion. He stated that the best way of propagating them was by the pit, and he thought they would begin bearing about five years from the seed. They have done so with me, although it is only the last two years that they have borne freely. As Mr. Macoun says, they are only bushes, and I think they ought to be grown as bushes and not as trees. I have mine about three feet apart in the row. I did not intend when I planted them to leave them so near together, but it has just proved to me that they might be grown in rows as we grow berry bushes, and cultivated as we do our berry crop, and that an acre would produce a tremendous yield of fruit. By picking the pits of the best fruit and planting them I believe we might continually improve on the quality and make a very profitable thing of growing that cherry for the market. It is very late, the latest cherry that I think I had in my orchard. Mr. Niemetz said that it was grown very largely by peasants in Russia, and he thought it might be very valuable indeed for the northern sections of Canada on account of its hardiness, and I also believe it would be valuable for the southern sections. It is figured and described in our Fruit Experiment Station Report of Ontario for 1897.

Mr. MACOUN : The Russian cherries have a flavor of their own, and this flavor is brought out distinctly when they are preserved. In the Ottawa local markets these cherries are sought after by the people there more than any others they can get. They always ask for these Russian cherries.

Mr. HUGGARD : You mentioned the Raba pear, considering it a hardy tree and a good fruit.

Mr. MACOUN : The tree that we have so far as I know fruited for the first time the year. The tree is apparently quite hardy. I think it was planted in the spring of 1896. The fruit is large ; it reminded me of the Bartlett ; to see it at a distance you would almost take it for a Bartlett pear. The quality is medium. If you take it at the proper time it is not bad at all ; it is not high flavored.

Mr. HUGGARD : I set out three of them in 1896, and one of the trees had fruit on this year which was inferior to the Keiffer pear.

Mr. ORR : How does the blight show on these trees, and have the ordinary varieties grown in Canada blighted as badly as the Russian varieties ?

Mr. MACOUN : No, the standard varieties have not blighted as badly as the Russian, although they have blighted considerably. It begins in the tips of the branches and runs in a very short time down the main stem. The practice Mr. Craig followed was to saw off the limb as soon as the blight appeared.

Mr. WHYTE : Mr. Brodie is here as a delegate from the Quebec Horticultural Society, and has had some experience in this line. We shall be glad to hear from him.

Mr. BRODIE : My experience in cherries has been similar to Mr. Macoun's, and I would like to recommend one variety, the Griotte d' Ostheim. The fruit is hardly compared with the Early Richmond, while the Early Richmond could not resist the early frosts in the spring. The Griotte d' Ostheim had a very hardy crop. I put it on the hardy list of the fifteen varieties of cherries I had fruiting. My cherry crop this year, both of Russian and our own varieties, started to ripen about the 21st of June, and I had them right on in August, so that made a pretty long cherry season. With reference to the Russian apples, there are two varieties I suggest to be placed on the list; one we call Golden White, a fall apple, in quality very much like the Northern Spy and about as large, more conical in shape, fine, bright red color, and sells well on the local market. Another variety is the Regal. The *Mercanos* are very much like the Canada Red, only more conical in shape, a little larger than the Ben Davis, and quality very good. I think it is the only really good Russian apple that I have fruited so far. The rest of them are only comparatively fall apples. As to Russian pears, my experience is where you can grow the Flemish Beauty like we can in Montreal it is not encouraging to go into Russian pears, but there were two varieties of Russians I thought might be well worth a trial. Say *Casa bianca*, that I got from the late Charles Gibb, which was entirely different from the one I got from Prof. Budd of Ames College, Iowa. My situation there is a little more favorable to pear culture than the Experimental Farm at Ottawa. I am not sure how it would be for hardiness.

Mr. CASTON: I have been growing some Russian pears, and I think they are a very valuable acquisition. I think they would succeed over a large section of Ontario. With regard to Russian apples, it was the late Chas. Gibb and Prof. Budd who gathered most of those that were grown in a latitude 600 miles north of the City of Ottawa, and they were grown as dwarfs, and the snow was very deep and they got protection in that way. Seventy miles north of Toronto some of them have failed and were tender, but having them propagated on a hardy root and growing as a dwarf in localities where the snow remained deep they would succeed very far north. One of the troubles about those Russian fruits is that I don't think we will find any good winter apples among them—nothing e. g that comes up to our Northern Spy. They seem to be mostly all early apples. For the most part they are hardy,—clean skinned and good bearers, and I believe they would be valuable for grafting on. I think with Mr. Macoun that a number are of the same variety with different names. I think it would be a good thing if they could be Americanized. Those Russian names are jaw breakers. Mr. Gibb made an attempt and published a pamphlet entitled "Nomenclature of the Russian Fruits," and he endeavored to straighten it up a little, but it is a good deal of a tangle yet. I have two varieties, one called the Hare Pipka, but they are close akin to the Alexander and the Wolf River. I believe the Russian apples and cherries would be very valuable in extending fruit culture farther north through this country. Most of them are hardy, and the Russian cherries for canning can scarcely be equalled—and that is mainly what cherries are grown for. They bear when they are young and they seem exceedingly healthy. They do not seem to be so liable to the black knot as a good many of the old varieties.

Mr. ARMSTRONG, (Queenstown): I would like to ask what protection those trees that were winter-killed at Ottawa had during the winter.

Mr. MACOUN: That winter there was a great scarcity of snow at the Experimental Farm; they had no protection from snow covering. They simply had a clover cover crop, which has been adopted at the Experimental Farm for some years. That year however the clover was killed, and it had not near the same protection that it would other winters on that account, there were more trees killed than would otherwise be the case. That was the winter of 1895-96

Mr. WHYTE: That winter there were many apple trees killed. It was the most disastrous winter in the Ottawa district on account of there being no snow to cover the roots.

PEACH BORER.

By Martin Burrell, St. Catharines.

I have not had very much experience with the Peach Bark Beetle. As far as the Peach Borer goes I have done a little experimental work in the last year or two, and as we all know it is one of the worst insects we have to fight, especially on a sandy soil. Probably most of you know a great deal about its life history. What we call the borer is not the bark beetle, as most of the wood boring insects are, but is the larva of a moth a good deal like a wasp. The female moth is $\frac{3}{4}$ of an inch long, and is bigger than the male The front wings are dark blue, and the hind wings quite transparent, and you can always know it from the shape of the body, which is a darkish blue with one large orange band around the abdominal segments. You cannot mistake it for any other insect. The male is very much smaller and inconspicuous. The wings are transparent, and there are some slight little marks about the body, but it is much smaller and less showy insect than the female. In this latitude I found that the moth never emerged before July 15th or 20th. It was thought at one time that the moth began to emerge very early in spring and commence laying, and it is rather an important point, as you can see, because in hunting out these borers, whether you put on a wash to prevent them laying the eggs, or put on papers, or whatever practice is adopted, it is necessary to know what is the best time to go to work. It was formerly thought that they came out very early, and it was necessary, in order to prevent them laying, to put on washes very early. As a matter of fact in New York State they do not come out until about July 15th, as Mr. Slingerman tells me at Cornell, and here I have never observed one out before July 20th. This is important for the reason that you are always safe if you can clear them out before that time, for you will destroy the crop for that year—that is you will prevent the moths emerging. If you use any wash to prevent the moths laying the eggs, the greatest difficulty is to find a wash that will remain on the tree the whole season, because the moths start emerging about the 20th July and keep on from that time until the 20th of October emerging and laying. There is only one brood a year. For instance, in the case of the moth that lays the eggs July 20th, the larva hatches and gets three-quarter grown by the late fall. It then passes the winter in the tree below the ground dormant, and the next spring starts working, and then turns into a chrysalis fairly early, about June, and remains about a month in the pupa stage. Those that come out in September do not hatch out until about the following September. The whole process is just about one year. That period of time extends very much longer than some people thought, and it is all the more necessary if you are going to have a wash to prevent the moth laying its eggs to cover the whole of that period from early in July to early in October. There are very few washes that will stay on the tree during that time intact, and if we go to the expense of two washes it makes the matter very much more cumbersome. Mr. Smith, of New Jersey, told me that he found 600 eggs in one moth, and Mr Slingerland has found 300 by examining them with the microscope very carefully. They have found as many as 28 laid on one tree. I have taken out 14 borers on one tree, and of course the tree was nearly gone. The danger is worst on the smooth trees, because the tree of course is only about two inches through. If a half-grown borer is there it can almost girdle it. Every man should examine peach trees before he plants them, because there is many a time you get a borer in a nursery row. I have often taken them out of the trees I had from the nursery, and taken them out before I planted them. Those of us who hunt them regularly generally hunt them out with a knife or a wire, and any time during the year; but the best time to do it would be once in the early spring before the larvæ matured, and the next late in the fall. I believe we get very much better results if we practice the application of some washes. A year ago last spring I tried three different kinds of paper—tar paper, bunches of wrapping paper, and ordinary newspaper, and also heaping up air-slacked lime around the trees and Bordeaux mixture, with half the amount of lime and half the amount of copper; the wash of Prof. Saunders, that is, a saturated solution of soda; and I also tried hydraulic cement and skimmed milk mixed together, and hydraulic cement and water; also the wash they used up in Mr. McNeill's district of ashes and lime. After hunting the trees, I put all these washes on before July 15th, and then observed the condition of the washes and of the wrapping in different periods during the season to see how long they lasted and the effect they had, and we came to the conclusion that as far as wrappings went, the cheapest and most satisfactory one was the ordinary newspaper wrapping, that is, just taking one ordinary newspaper to a tree and wrapping it up the tree, unwinding it when the tree begins to swell, so that you will not girdle your tree. We do not get any borers unless the moth gets past the newspaper. It is an effectual stop, and will stay on for more than two months. Of course it will not cover the whole period. None of the washes stayed on during the whole season with the exception of the two cement washes. Prof. Smith, of New Jersey, told me about both of them. The cement and water was just mixed up into a good thick paste and put on with a whitewash brush about twelve inches from the foot of the tree. About the middle of August the cement was just about as good as if it was put on in July. By the end of August that one had very considerably cracked. Skim milk and cement seem to make it more adhesive, and in September that wash was as good as it was when put on in July. It is easily put on, and especially on the young trees where the bark was not rough it was perfectly successful. I only found two borers on the trees after putting the cement and skim milk on, and they were in little spots, rough places where the cement had failed to cover. I would strongly advise everybody to try that particular wash—just the hydraulic cement and skimmed milk mixed up into thick paste and put on before that date.

E. MORDEN (Niagara Falls): What about earthing up in the late summer?

Mr. BURRELL: I would earth up earlier than that—just after I hunted. If I were putting on a wash I would examine my trees during May or June, and then I would put the earth after I examined early, and then the moths would have to lay above that point where the earth was. I would do it before July.

Mr. ARMSTRONG: As an old peach grower, the wash indicated by Mr. Burrell, particularly that one described as hydraulic cement mixture, has a tendency to harden tho new bark and hinder the sap coming up, especially in the young trees. I would not recommend it, and the coal tar has another effect which is very injurious to the growing trees, especially the young trees. I find the best wash I can get is simply the soft soap wash. It not only protects the trees from the insects but it assists in cleaning and clearing the bark.

Mr. BURRELL: I cannot say I have observed any injury in that way. I took note of all the washes I applied, and the Bordeaux and this lime and ashes and the cement were all about in the same condition; that is, they were smoother and shinier and in better shape. I put cement on two years running, not a very thick coat, and noticed to see if it would hurt. The peach trees were four years old. I saw no particular injury.

The PRESIDENT: Mr. Armstrong, you said you found coal tar was injurious to the tree. In what way? What is your experience?

Mr. ARMSTRONG: I have found that during the growing season the coal tar hardens the bark. I got it in St. Catharines fifteen or sixteen years ago, and I discarded it after a trial or two. I have found under the bark, instead of being thrifty and green and sappy it had a tendency to darken and stiffen the bark.

Mr. BURRELL: The cement is more or less porous; the tar would not be as porous.

The PRESIDENT: Was it a light coating, or was it put on pretty heavy?

Mr. ARMSTRONG: It was in July I think I put it on. I put it on lightly with a whitewash brush.

Mr. ORR: I have been using a mixture of lime and hardwood ashes. Last year, after careful searching, we found six borers out of 400 acres; this year we found five. The trees were in almost perfect condition.

Mr. PATTISON (Grimsby): I have been in the habit of using a composition of ordinary washing soda and soft soap which acted fairly well. It has the fault of not staying on as long as one might wish, but for a considerable period it acts very well.

Mr. BURRELL: What soil is yours, Mr. Orr?

Mr. ORR: Sandy.

Mr. BURRELL: Were you ever troubled much with borers before?

Mr. ORR: This is a young orchard. In the old orchard we were very badly troubled with them.

Mr. BURRELL: The satisfactory report may be because there were not very many borers about.

Mr. ORR: We mixed it with skim milk. Besides that, slacking the lime with hot water makes it more adhesive.

Mr. GREGORY (St. Catharines): Would you recommend laying bare the roots?

Mr. ORR: No; we get the collar entirely clean and then whitewash the limbs right down to the roots.

C. M. HONSBURGER: The old adage "An ounce of prevention is worth a pound of cure," is a good one. I would like to ssk Mr. Burrell what mode he would adopt in finding borers in young trees?

Mr. BURRELL: You can only get at them by picking them out with a knife.

GREETINGS FROM SISTER SOCIETIES.

The PRESIDENT: We have to-day a representative from the Quebec Horticultural Society, and I am sure every one in this room will hear him with the greatest of pleasure. We can always learn from those engaged in horticulture from other districts, and we take it very kindly that the Quebec Society has thought fit to send us a delegate, and I may say that in return, at the meeting of the Board last evening, representatives were appointed to attend the meeting of the Quebec Horticultural Society, and also horticultural societies in the States and at other points. I will now call upon Mr. Brodie, representing the Quebec Horticultural Society.

Mr. BRODIE: I have great pleasure in meeting you here this afternoon, and I greatly regret that my confrere, Mr. Shepherd, did not come along with me, as he is a much better speaker than I am. The first Horticultural Society in Quebec was started at Abbottsford, the home of the late Charles Gibb. Abbottsford in Scotland is connected with the name of Sir Walter Scott; here, in Canada, Abbottsford will always be connected with a name just as dear to us, that of Charles Gibb. (Applause.) Our Society comprises French Canadians as well as English speaking people, and it would do you good to see how well we get on together. There is no rivalry; everything is carried on, although sometimes there is a little delay in translation and so on; still we get on very harmoniously. I find that being able to speak both languages is a real blessing, so if you delegates come down to Quebec I hope you will not be disappointed if you hear a little of our discussions in the French language. We have had a great deal of difficulty in contending with severe winters. The winter of 1895–96 was most disastrous to us in our fruit work. Whole sections of plum orchards in the L'Islet and Kamarouska were destroyed with the exception of a few trees, and in my own orchard near Montreal I lost between 50 and 60 valuable trees. I noticed coming up here how clean you have your orchards. Well, we have to let the grass grow to be a protection to our orchards. Another reason why I like to have a good coating of grass under my trees in an autumn like this is that the apples ripen up very rapidly, and I had about 300 barrels of windfalls. We had a very wet October. If we had to pick up these windfalls out of the mud we would have realized a pretty small price for them, while for those we did gather I got from $1.70 to $1.90 a barrel in the Quebec market. That is one reason why I think what would suit your country up here would not suit ours at all down in the St. Lawrence Valley. Perhaps one reason is we have a greater rainfall down there; we are not subject to such great drouths as you have here. I believe in manure, and if we cannot get manure, we get wood ashes or fertilizer. I am fortunate in being able to get manure hauled on my place for ten cents a load. I can put a whole cartload on each tree, and in that way am able to grow fairly good apples. The secret of all is to spray the trees. I was surprised at the Ottawa Exhibition to see so many apples from the Ontario districts spotted and stung with codling moth. Had it been in the Province of Quebec, where we are not kings in horticulture like you are up here, I would not have been so surprised, but I found out from those exhibitors there they did not believe in spraying. Well, if they had only been at my orchard this year I think they would have gone home convinced, for my neighbor's trees had hardly a decent apple on, and they shook off the few they had, while I had 1500 barrels out of my orchard. I hope those who come to Montreal will not be disappointed, because we cannot get a gathering like you have here of representative horticulturists, but we will do the best we can to make it pleasant for you. (Applause.)

Mr. CARPENTER: As a Horticultural Society we are progressing rapidly. Two years ago we started with seventeen members, and now we have seventy four. We have been spraying more extensively in our section this year, and somehow we don't seem to see much difference between those that are sprayed and those that are not sprayed. My own crop would be about half culls. Others show very good results from spraying.

C. W. BUNTING being called on said: I am one of the officers of the Niagara Fruit Growers' Association. Our President and Secretary are unavoidably absent to-day, but on behalf of that Association I have great pleasure in welcoming to this peninsula the Ontario Fruit Growers' Association, and I trust your visit in this place will be productive of pleasant and profitable results to all the members who have made it convenient to attend; and I am sure I but echo the sentiments of the Fruit Growers of this section in welcoming you here.

Mr. MORDEN: We have in Niagara Falls a system of spraying on a gigantic scale nowhere else seen on the face of the earth—we have the Falls of Niagara. The fruit growers emulate that system in spraying, but I cannot report very much in that direction, though I am satisfied that the future fruit grower will do more spraying. We are getting on fairly successful. We have had a good membership and no doubt some good has come from our Society there. When you go to the Falls in the summer I hope you will come out and see us, and we will take you all through our fruit plantations, and let you look at this beautiful fruit. (Pointing to the display of fruit on the table, amid applause.)

The PRESIDENT read a letter from Mr. Walter Ross directed to Mr. Boulter, our Director in Prince Edward County, from one of our valued societies, in which he speaks most highly of the satisfaction given by the Canadian Horticulturist, and the good success of their work at Picton.

EXPORT OF FRUIT PULP.

Mr. C. C. James, Deputy Minister of Agriculture for Ontario, then read to the meeting a series of letters on the export of fruit pulp, from Mr. Harrison Watson, Curator of the Canadian Section of the Imperial Institute. These letters have already been published and distributed and need not be reprinted here. Copies may be had by applying to the Department at Toronto. A lengthy discussion took place of which the following may be given here:

Prof. ROBERTSON: I had the pleasure last summer of seeing Mr. Harrison Watson and several large importers of fruit pulp in Britain. I found there is a demand usually for raspberry pulp and apricot pulp only. The others are a very small trade and an uncertain demand. The very top prices are about £40 per ton, rarely £42, usually from £18 to £26. Now, these prices would nett in Canada not more than 5 cents per pound for the raw fruit at the very best, down to almost nothing when the pulp sells for £18 a ton; so if the fresh fruit can be sold at all at anything like the common prices then it would not pay to turn it into pulp for export. But sometimes there is a surplus of fresh fruit that is unsalable either from very small size or poor quality, and that might make a fair quantity of pulp; but at £40 per ton the 8½ cents per pound there would not nett more than five cents per pound for the green fruit after taking off the cost of the package, the cost of the fruit, the commission and allowing 10% for shrinkage for the evaporation of the fruit during the preserving process. When it gets down to £20 per ton, the cost of the package, freight, commission and shrinkage reduces the account sales into a cipher for the man who ships; so that in the normal conditions of the market there is not a cent a pound for our green fruit, and in the abnormal conditions which have existed the last few years it would not be five cents a pound for the raspberries and the apricots. If any of the fruit growers are anxious to try this business and will furnish the pulp, our Department will take charge of the shipment of such pulp and see that they are put in the best markets of England, and give full returns for the fruit before the trial is made. I am not hopeful that any large trade will grow up for that stuff from Canada, since we have such a good market now for those two classes of fruit which are wanted in the form of fruit pulp.

Mr. Boulter (Picton): At £40 per ton it would not realize quite as much as Prof. Robertson stated, that is, taking out ordinary charges. However, later on I will be able to ship pulp, and if any members of the Association have large plantations of raspberries that are any way convenient to Toronto it could be got very cheaply. I intend to give this a thorough test the coming season. My theory is that unless a grower can get at least four or five cents a pound for his raspberries in their natural state there is not a great deal of money in it; and unless it could nett that to the grower—which we have always failed to do in our county—I would not advise a person going into it unless he were skilled in putting it up. It costs considerable to get it up. It is a good idea that that invitation came, because for the last two years raspberries have been a drug in Ontario, and they have not been selling as they should have, for what reason I do not know. There is a variety of raspberry that might be cultivated for pulp—the Shaffer. It is an enormous bearer, much better producer than the Cuthbert, but inferior in quality, and it will not do for our business in Canada in what is called preserving, being too soft and going to pulp. Cuthberts will stand up under the cooking necessary to be done. Possibly as they could be grown for one to two cents a quart less than Cuthberts, and a success might be made of them. I have sent some of them over to see if they would do as well as the Cuthberts have. In the prices quoted, you must remember that a ton is a long ton, not 2000 pounds, but 2240, which cuts quite a hole in the amount you expect to receive. My own opinion at present would be that there is nothing in the pulp business except for raspberries. Do not attempt anything else. Do not attempt strawberries. This pulp is an experiment yet, but I intend to send over quite a lot next year if the crops are good.

Committee. Messrs. W. Boulter, of Picton, A. McNeill, of Walkerville, and Rev. W. J. Andrews, of Grimsby, were appointed a committee to investigate the subject and make arrangements for some trial shipments.

Canners and others interested are requested to correspond with this committee.

PROSPECTS FOR EXPORT OF TENDER FRUIT.

Prof. J. W. Robertson, Commissioner of Agriculture, said: Mr. President and Gentlemen: Before I say much for the prospects for an export demand for tender fruits I would like to make a few observations on the present status of the business of growing tender fruits in Canada. In thinking over why many people went into fruit growing, one is soon led to the conclusion that the general fall in the prices of cereals a while ago made many give up grain farming, in which they had had experience, and for which they had natural fitnesa, and go into fruit growing, without either the special knowledge or personal aptitude for making a success of that business. Great areas of Canada are devoted to fruit growing for that reason. When the ordinary operations of farming did not pay well, there was general discussion as to whether fruit growing would not pay better. There was a great deal of information of the most indefinite kind diffused over the Province in regard to the benefits and advantages and profits of fruit growing, and the consequent agitation led a great many men into that business. That was a good thing for agriculture and a good thing for those men, because for a while the fruit growing business paid very well—much better than the land which was devoted to it had paid the occupiers through ordinary farm work.

GLUTTED MARKETS. That leads one in looking over the fruit growing business, particularly in Ontario, to examine into the kind of fruit that these people have been growing and why they grow the kinds they do grow. Most of the men have planted the kinds that can be grown easiest, with least risk, and that yield largely without regard to whether there would be a permanent or large enough demand for that class of fruit. In addition to growing the kinds that I have alluded to, they have grown a great many kinds, and still grow them just because they have some *interesting* characteristics, and because the cuts of them look well in some nice book or catalogue. Just go over a fruit farm and find the kinds that are growing and why they are being grown, and while my statements are rather unpalatable, they are quite true in regard to most farms where fruit growing is carried on. That has led to this state of things in Canada, that the Canadian fruit growers are growing more tender fruits than their home markets take care of. I do not say that they are growing more tender fruits than the people of Canada can and would readily consume if they got the kinds they want in the condition they like them, because we import more tender fruit from California than would fill the pockets of a great many Ontario fruit growers with all the profits they could expect from their business The markets are glutted not because the Canadian appetite is satisfied with Canadian fruit, but because Canadian fruits have not been of the sort or put up in the way that the Canadian consumer wants; and if not suitable for the Canadian, how much less for the ten times more fastidious Englishman? I want to have you think of that before I speak of the prospects for an export trade in tender fruits.

If one grows a great many varieties of any sort of fruit, his only chance to make any money is by having what I will call a particular personal market. The grower can go direct to the home eater and meet his needs But if a man has to put his products on an open market of this country or Britain, or the general market, then he must not have a whole promiscuous assortment of fruit, but he must have a few definite varieties that they like. Otherwise he cannot make it pay. In promiscuous growing he does not grow any variety on a large enough scale to have his expenses low enough, and he does not have enough quantity of any one kind to attract attention in a good market. Confirmation of my judgment on this subject from the bulletin just published by Prof. Bailey of Cornell University that came to my hands even after I had my subject thought out for this meeting. He makes this very clear in his bulletin, that the kind of fruit-growing which a man may follow with profit, for the personal market where he supplies the fruit to the homes in his locality, is quite different from the kind of fruit-growing a man may follow who puts his fruit on the open general market.

That being so, if we have in Canada now considerably more tender fruits than our own markets will take care of, can we find an outlet abroad at profitable prices for these varieties of fruit? That is the problem; and I will tell you a little of our experience. A man who follows fruit-growing for his home market will find customers who pay special prices for special quality, but the man who grows fruit for a general market can get only the current prices for ordinary good quality. The two markets are quite different in regard to returns the grower may get. More than that; the man who grows fruit for the home market may carry on the work on a small fruit farm, put a good deal of expenditure into the carrying on of his business, and get paid for that by the specially high prices that people will pay for just the particular things they want; whereas if a man throws his stuff on the general open market he has to take the price which the man who grows fruit on a large scale with the least possible expense is willing to take. If we are to have an export trade for the finer fruits we will have to confine ourselves to a few staples in the fruit foods and get these produced of the best quality and at the lowest cost to ourselves.

DEMAND. That brings me to the inquiry, "Is there any demand in Great Britain?" which I take to be the market for which we are catering, when we speak of an export demand. Of pears, Britain usually imports about a million dollars' worth a year; sometimes more, sometimes less; of plums about a million and a quarter dollars' worth a year; and of grapes about two and a quarter million dollars worth a year from various countries. I have not mentioned apples because they do not come under the heading of tender fruits. The British market does consume an enormous quantity of tender fruits. The market is only opened for them. It is not by any means developed and supplied. In the past the price of pears has been so high that the demand has not been one-tenth of what it may be and will be if Canadians put their pears on the British market as abundantly as they put their apples on the British market. There is a tremendous demand and market there for high-grade pears, because pears enter into the food of the people, through cooking and in many ways. That is an important consideration when you try to estimate the capacity of the market. On the contrary, grapes are always and only a dessert fruit—not a food fruit; and for them the demand is consequently limited, and also more fastidious, because in a dessert fruit people want something particularly pleasing to their eye and palate. They cannot mask the flavor by cooking or in any other way.

SOME ESSENTIALS TO SUCCESS. Then can an export trade in tender fruits be made a success of from Canada? I suppose twenty times a month men write me problems "Will it pay me to do so-and-so?" Anyone who has done work of investigation can say whether a certain principle is applicable or not, or whether a certain statement is true in regard to it coinciding with principles; but no man can say of a business proposal, "That will be successful," or, "That will not be successful." Success depends on the personality of the man and not on the nature of the business. I do not know whether exporting tender fruits can be made a success except as I learn the kind of men who take it up. There are principles and there are reasons, and as far as a man understands those and applies them he can make it a success; but the success depends on the person and not on the opportunity, because the opportunity may have existed for twenty years, but so far the person has not risen to make success out of the opportunity. It may have been for want of information, it may have been for want of transportation conveniences, it may have been for want of cold storage in the ships; still that is the state of things to-day. Can they be altered from this time on?

QUALITIES WHICH DETERMINE VALUE. The person who undertakes the shipping of fruit to Britain must know the conditions that the British consumer and importer impose on him. I have learned by experience that the British consumer and importer does not care a snap of his fingers for the fancy names of the specially esteemed kinds of fruit. He does not care a brown bawbee if it has been cracked up by every specialist in the country. Soundness is the first consideration, then keeping qualities, then nice appearance in regard to color, size and shape, and lastly he looks for as nice flavor as you can give him. The latter is not a matter of the first importance at first in the commerce of this business. Soundness, keeping qualities, appearance, and then flavor, is the order. Too often the fruit-grower reverses that order and says, "Oh, but such a kind of fruit is the most delicious and high-flavored." It may be, and may pay to grow for the personal, particular market of the man who is going to pay a high price for special intrinsic quality; but the British market will pay just the common price in the order of those qualities. I want to repeat that over and over again; it is the secret of the whole situation, soundness and keeping qualities after the fruits are there, then nice appearance, and then a flavor as good as you can get.

When trial shipments were made by the Department of Agriculture at Ottawa in 1898, we found those things that we had learned in 1897 were still further emphasized. In 1897 the Department took charge of 7,141 packages of tender fruits and sent them to Great Britain. In 1898 the Department took charge of 3,815 packages of tender fruits. We sent in 1897 about 3½ times more than in 1898. The less quantity was not because the Department was less willing to take the fruits and test them in the British market, but because for various reasons, mainly climatic, the shippers in the Grimsby district were not able this year to provide as much fruit as they expected, or as the Department wanted to carry on its trial shipments. The fruits shipped were practically the promiscuous gatherings from various farms. That was unfortunate. The arrangement with the shippers was that the Department guaranteed a certain price at the shipping point, and if there was a revenue above that, that also went to the shippers. The kind of package that was used was a comparatively small package, measuring inside 22 inches by 11¼ by from 4 to 6 inches deep according to the size of the fruit. The packages were light; they were open for ventilation and for cooling the fruit; and they had an attractive appearance, and also the good quality of being reasonably cheap, costing about six cents apiece. They held all the way from 24 to 30 lbs. of fruit according to the size of the individual fruits. Each separate fruit was wrapped in tissue paper, and the packages were filled from the side so as to cause the least surface to be faced.

Ripeness. The condition of ripeness desired when the fruit was picked was that the pears should be of full size and quite green and firm. The California pears that go to England are sold particularly well because the receivers there say they can keep them for two weeks after they get them. Observe!—soundness, keeping quality. Anybody in Canada knows that a Bartlett is a joy to eat compared with a tough old tasteless pear from California—(laughter)—still, the pears from California would fetch nine shillings a case whereas our best would fetch only six shillings because the California pears would keep, and the man who bought them did not fear losing them next morning. The same was true in regard to the condition in which it was desired to have peaches picked; but it is exceedingly difficult in practice to tell when a peach is at the right stage of ripeness. I do not know any means of determining that, and I have not found any fruit-grower who can. I went through the orchards in Grimsby and elsewhere and I found they told by the appearance of the peaches and then by "the feel" of them. They were quite often disappointed that way. A peach will ripen a great deal in half a day if the weather is hot; and it is practically useless to pick peaches at the same condition of ripeness as can be observed in the picking of pears.

After the fruit was packed in the cases it was cooled down in the cold storage room at Grimsby to between a temperature of 36° and 40° Fahr. The cold storage could be easily held at these temperatures, and as the packages were small the fruit was cooled to the core to about 38° Fahr. at the time it was put in the railway car. The Railway Company furnished refrigerator cars. They went forward to Montreal without loss of time, and the fruit was delivered on the steamships in very good condition, with this exception to that remark: that quantities of the tomatoes and some of the peaches were considerably too ripe before they were put into the cold storage at Grimsby. A low temperature does not seem to have the same power to arrest the ripening of tomatoes as it does to retard the ripening of pears. I had pears put into cold storage at Ottawa; and two months after they were put in they were perfectly sound, firm and hard. Tomatoes put in under the same condition became too ripe in ten days' time at a temperature of 36° and 38° Fahr.

Pears. The quantity of pears sent over was 2,208 cases. The cases were not weighed, but were estimated to hold about one basket and a quarter, and they held from 26 pounds to 28 pounds—I think I found one weighing 30 pounds of fruit, which was quite exceptional. Taking the prices at which the several lots were sold and averaging them these pears realized on the average 73.6 cents per case at Grimsby after the freight charges and all expenses were taken off. The shippers would realize 67 cents for that quantity of pears after allowing for the cost of the package. Now I think that is a very good price. I do not know whether you fruit growers would be satisfied or not with that price for pears—(Voices, "Yes, yes")—but that was a fair price, and includes two shipments when the

British market was said to be dull and glutted for pears. Now, all pears are not alike in the British market; the buyers won't pay the same price for all pears; and the nett returns at Grimsby showed a much greater difference than the selling prices in Great Britain, because you have the very same freight charges, and the very same insurance and other charges to take off the low-priced pears in England, as off the high-priced pears. The first shipment of pears that went over realized all the way from one dollar a case at Grimsby to forty six (46) cents a case at Grimsby; that is, one portion of the same shipment fetched a dollar and the other portion forty-two (42) cents. I took the average of all the highest prices at which the pears in each shipment were sold, and then the average of all the lowest prices. In the second shipment they netted from sixty-three (63) to fifty-five (55) cents per case; the third shipment from ninety-six (96) to seventy-six (76) cents per case at Grimsby. The smaller sized pears fetched the lower prices I have mentioned. This year, these pears were not creditable to Canada. I am not imputing any blame to the shippers at Grimsby beyond saying that the pears this year were small, and not creditable to Canada as showing what we can do usually. The weather was unfavorable during part of the season, even to the extent that some shippers were not able to send pears at all after the first shipment. If we could send forward the best quality of Bartlett pears we would have an enormous market, I am sure, because the people like them so well there is an almost unlimited demand under ordinary conditions at the prices I have mentioned The very best prices that were gotten for any considerable quantity were six shillings and threepence (6s. 3d.) a case in England for these small cases. That would nett at Grimsby one dollar and twelve cents ($1.12) cents a case containing from 26 to 30 lbs The difference in price between the varieties was hardly noticeable. In one case the Duchess fetched from four shillings and sixpence (4s. 6d.) to four shillings (4s.); and in another case the Keiffers fetched from four shillings (4s.) to three shillings and sixpence (3s. 6d.).

The English market likes not a monster pear, but a large pear, or rather a large medium size; about 70 pears to the case weighing 28 pounds were a fine size. They would weigh about three to the pound. Those would be pears of first-rate size.

Peaches. I want to deal next with the matter of peaches. We sent altogether 324 cases of peaches. For one small shipment we realized one dollar and fifty cents ($1 50) a case nett at Grimsby, and for a great many other shipments we realized 32½ cents less than nothing at Grimsby. That was a loss of the total expense of carrying them to England, because they sold for nothing there, in fact were condemned by the health inspectors. They were carried in the same refrigerator car, in the same part of the ship, and at the same temperature as our pears which fetched those prices I have mentioned. Those were mainly the Bartlett and other tender pears. It was not that the cold storage was not sufficient; it was that the Crawford peaches sent from Canada had not the qualities in them to let them be in good keeping condition in the English climate 20 days after they left Grimsby by any system of cold storage we have yet devised. A few peaches each time were excellent, and a few peaches each time were rotten, and a number of peaches each time were pithy, dry and tasteless. There comes the difficulty of making a commercial success of shipping peaches. If they are picked just the least little bit too green they have almost no flavor and are not mellow when they come out of the cold storage. If they are just right they stay right; but if they are a little too ripe they go to soft rottenness on the other side the day after they come out of cold storage. In some cases where the peaches were sold for good prices the purchasers brought them back next day and demanded their money back saying they would get the health officer to condemn the peaches unless they were settled with at once. There is the difficulty: unless you have some means of determining just when the peaches are sufficiently ripe, and not too ripe, you would have so many losses that they would take away all the profit from those that were in good condition.

Mr. Burrell: Did you see anything of the African peaches, the Cape peach, because I was told by friends in England that they had arrived in very good condition and realized splendid prices.

Prof. ROBERTSON : The Californian peaehes also arrived in good condition and realized good prices. I did not see the African peaches myself. They come in after our spring is about begun, but the Californian peaches arrived in some cases in excellent condition, because they have toughness of flesh, and the shippers seem to have a better means of getting a large quantity in the right condition of ripeness.

TOMATOES. Of tomatoes we sent 428 cases. Most of them, I think, were a little too ripe at Grimsby. One or two of the latter shipments I saw in Montreal were also too ripe in appearance. Here is the difficulty with tomatoes, that they keep on ripening slowly at low temperatures. When the tomatoes were taken from the cold storage in England, they often looked fairly well, but they simply collapsed in two days in most cases. Tomatoes that go into England from outside markets do not go in cold storage; they go on the decks of the ships, where the ventilation is thorough. They are allowed to ripen gradually, and they do ripen very well during the period of ten days ; but longer than that makes it exceedingly difficult to have them delivered safely. If they were picked green, then cooled at once and gradually warmed to 50, or 60, Fahr. before they were exposed to the air in England, they might fetch a good price, but the price they would fetch would hardly tempt anyone to lay himself out to grow tomatoes in Canada for the English market. A few cases realized thirty-seven (37) cents at Grimsby, a few thirty six (36) cents, and nearly all the rest were failures to the extent of realizing nothing and causing loss to the extent of the freight paid on them. They went in the same cold storage chambers as the pears that we landed in first-rate condition and at the temperature that the Californian shippers keep their fruit at viz., from 38 to 40 degrees, on the way across.

QUINCES. Fourteen cases of quinces realized fifty-nine (59) cents, but I do not know that we have exact information enough in regard to quinces to give any information as to whether they may be carried safely as a rule or not. Some of the 149 cases were landed in good condition and some were not. That seemed to be owing to the condition of the quinces when they were put in the cases at Grimsby.

APPLES. Of apples in those small packages, 254 cases were sent. They realized forty cents at Grimsby, but the reports all said, " Do not send any more apples in such small cases ; larger sized cases will pay you very much better. " Apples of tender sorts, that cannot be sent at all without cold storage, have been sent to England in the very best of condition through cold storage, and they realized very fair prices. Mr. Brodie of Montreal was telling me this morning of some apples he shipped from Montreal in cold storage that netted him fair prices this year.

Apples like the Duchess, that could not at all be sent to England hitherto, can be sent in excellent condition in cold storage if they are properly packed ; but a discussion of that will come under the head of Transatlantic Transportation.

Mr. BRODIE : This shipment of mine was sent direct to London. It was 20 days from Montreal to London. That was a long voyage to remain in cold storage.

Prof. ROBERTSON : What did they realize at Montreal ?

Mr. BRODIE : About $2.25 a barrel ; but the dock charges were something tremendous; also cartage 15 shillings on 30 barrels of apples from the London dock to Covent Garden Market—about 12½ cents a barrel. For 2½ cents we can get apples carted from one end of the city to the other in Montreal.

Prof. ROBERTSON : I think anyone who has large experience in consigning small shipments to England will agree with Mr. Boulter, that the English commission merchant has wonderful facility and thoroughness in devising new items of expenses that he can add to account sales and in making a long, long list of charges.

GRAPES. I have a few observations to offer on the trial shipments of Grapes. There were 441 cases forwarded. Twenty packages that were sent to Glasgow realized seventy (70) cents at Grimsby for about 18 pounds to the case ; twenty-five packages realized (41) cents per case, sixty-two packages realized nineteen cents (19) cents per case ; but the other grapes did not fetch anything at all worth mentioning.

Mr. PATTISON: With the grapes that were successful, was it a matter of varieties or of condition that they arrived in?

Prof. ROBERTSON: It was a question of the market they happened to strike The grapes that were sent to Bristol were landed in first-class condition; there was no fault to find, but simply the people did not like the flavor and would not pay a price. Grapes from other countries were so low in price that they would not take any risks with the new thing.

EXTRACTS FROM LETTERS.

Pears. In the matter of pears, the first extract I have to mention is from a letter Oct. 18, by an agent of the Department in Great Britain, who writing about the California pears, says:

> "Pears—(and these went by way of Montreal from California by our cool route)—sold from 7s. to 9s. 6d. per case of from 18 to 20 pounds of fruit; and plums sold from 6s. 6d. to 12s. per case of from 18 to 20 pounds of fruit. The fruit was all in fine condition, having been picked green; in fact some pears will not be ripe for some weeks, but they sell well for keeping stock.

Seven shillings to nine shillings and sixpence because they had keeping qualities; the keeping qualities are what they pay for in England in the meantime. That fruit was landed from the ship's cold storage at from 38 to 40 degrees. The next short extract I have in regard to pears is in a letter also from Mr. Grindley, of Oct. 22, in regard to the shipment of fruit in one of the steamships:

> "I am glad to say it is turning out in regard to condition much better than the first three consignments. Pears very good, Peaches in very fair condition, some cases still too ripe. Tomatoes sound and still green."

Those were the tomatoes that two days after they were sold collapsed and would not keep after they came out of cold storage.

Then there is a letter of Oct. 4 from the firm of Elder, Dempster & Co., the steamship owners, and also the men who sold the fruit. They have developed an enormous trade for the distribution of fruit in England. They say:

> "Pears have made what we consider a good return, and the shipments received since have been in better condition than the first, and we show considerably better results by these." Mr. C. W. VanDuzer's pears very fine, and should advise shipping large quantities to this market.

I happened to see two of these lots of pears that were selected,—about the size and shape and quality to throw on the open market. The next quotation I want to make is from Elder, Dempster & Co., speaking of pears again:

> "Packing of pears satisfactory, but we should like them a little greener than they have been. Tomatoes absolutely useless, and we should prefer that this packer sent no more to this market."

MR. McNEILL: May I enquire whether that Canadian packer had any experience locally in shipping tomatoes?

Prof. ROBERTSON: I suppose that this man had, because all seem to grow tomatoes and ship them to the local markets in Canada. We find that tomatoes will do very well carried in a ventilated space but do not seem to keep well in cold storage. The tomatoes that we put to the test in Ottawa seem to have gone in the same way. This is from Thomas Russell, a fruit merchant in Glasgow, to whom a shipment was sent:

> "The pears sold well, especially as at the time of their arrival our market was in a manner glutted with French pears which were being sold very cheap."

I have this further to say before I leave the pear subject: That you will see from the reports even from the last observation, that the pears from Canada this year did not strike any special catch market. On three different occasions the report was, "The market is rather glutted and dull from large arrivals from the continent."

Mr. PATTISON: Can you tell us anything as to the varieties of pears?

Prof. ROBERTSON: They do not give us any statements of preference for any particular variety. The reports are for soundness, keeping quality and appearance, and then for variety or flavor after that.

A DELEGATE: Do you know if there were any Kieffers sent?

Prof. ROBERTSON: Yes, in the last shipment, and they were sold at from 4s. to 3s. 6d. per case of about 28 pounds; that would bring from 59 to 47 cents nett at Grimsby, and that was at the time when the price was lowest in England.

Mr. SMITH: Are we to understand there is no preference for any variety of pear?

Prof. ROBERTSON: The Keiffers were sold for within twelve cents a case as much as the Duchess. So far as our testing of the English market goes, the price paid is according to the soundness, the keeping quality and the appearance, and then the flavor is considered. California pears were sold at much higher prices than even our Bartletts, because they had keeping qualities. The flavor and other eating qualities must be fair.

The SECRETARY: Last year one shipper who received a case of Keiffer pears in Great Britain said that he did not care to buy a second box.

Mr. BRODIE: Do they use that Kieffer pear for table decoration or for use? (Laughter.)

Prof. ROBERTSON: I am unable to say that. Some kinds must be used for table decoration, but that is not the kind that should be sent. While soundness and keeping qualities and appearance are things wanted now, in the course of a few years they will begin to discriminate, and if we have given them good pears with fair keeping qualities all along we will have the first place in the market. In the meantime their money is paid only for the fruit having soundness and keeping qualities; so let us get our fruit there in that condition, and of the best flavor and flesh we can. We will then have the preference in the market in the long run when the keener competition comes.

Peaches. The following are a few extracts from letters in regard to Peaches:

> "Peaches turned out six over ripe in eleven cases and 40 cases are now in Elder, Dempster & Co.'s back yard completely rotten."

These went in cold storage at from 36 to 38 degrees. The second says:

> "Peaches already shipped have the appearance of having been chilled, besides, on being exposed to warm temperature, they gather moisture which hastens decay—some of the paper wrappings being quite wet."

That is, from being very cold, moisture from the English atmosphere was condensed on them; and that hastened their decay. The next quotation on that matter is in a letter from Elder, Dempster & Co., of 4th October. They say:

> "Peaches.—We would advise you to stop shipments of these as they will cost senders more money than they will realize. Your Mr. Grindley has seen these goods, and, we understand, he is advising you to stop shipments of them."

Then on October 24 the same firm writes:

> "Peaches realized much better prices than we anticipated, but since selling these by auction we have received numerous complaints with enquiries for money to be returned. They arrived here in a condition which we are unable to put into words, namely: Dry. They being absolutely useless for dessert fruit. We should advise this packer not to ship any more of these in cold storage, and if you can pack in smaller packages, containing about two dozen peaches, wrapped in wool, and picked green, so that they can ripen on the voyage, we are sure you should make a good market here."

That would seem to indicate that they would like trial shipments, not in cold storage but in ventilated space. The peaches I put in cold storage kept all right, but those that we put in green became dry and almost quite tasteless. The difficulty is to get the peaches just at the right condition of ripeness for shipment.

Plums. Then there is a remark about Plums:

> "Plums were in very bad condition, they being picked when a little too ripe. Apples in good condition, but packages are too small to pay for voyage."

Grapes. The quotations I have next are about Grapes.

From Mr. Grindley, Oct. 7 :

"I have cabled and written to you several times regarding the unsatisfactory condition in which the peaches and tomatoes are reaching here, and should advise the stoppage altogether of consignments of both peaches and tomatoes, and I might also add grapes, for although they arrive in fair condition, there is no demand for them owing to the flavor."

Then on October 18 :

"I noticed in Bristol one large fruit dealer was selling our grapes (card in window) as 'Choice California.' They told me nobody wanted 'Canadian Grapes,' but they sold some as Californians."

I am giving you the facts without being able to account for all the mysteries of English commerce and of the English palate. The varieties shipped were mostly Rogers Red, Rogers Black, Lindley and Niagara ; and I think only a few Concords. I think the bulk of them were Rogers Red and Rogers Black. I think the grapes this year were representative of the best grapes in the Niagara Peninsula at the time the shipments were made.

Mr. GREGORY : Have you a statement of what the grapes sold for per pound ?

Prof. ROBERTSON : Most of them fetched no price at all ; they were nearly all given away. The four shipments from Mr. Linus Woolverton illustrate the rest. In the first shipment of grapes there were sent ten cases which netted twenty-three (23.9) cents a case at Grimsby ; that would be about sixty (60) cents over there. The next netted 19¼ at Grimsby ; the next lot were a complete loss ; and also the fourth a complete loss, leaving the freight and other expenses to be paid on the last two shipments, in addition to the loss of the fruit and the packages.

Mr. GREGORY : Was that in the same market ?

Prof. ROBERTSON : The same market. After the first two shipments, they would not buy them. There was not any complaint as to the condition of the grapes. They were not mildewed or soft or out of condition by falling off the stems.

The next extract in regard to grapes is from Glasgow, in which the salesman says :

"Grapes--The demand for these were very slow on account of the peculiar flavor which they have and which is not relished as yet by our countrymen."

In these cases the grapes were Wilder, Agawam, Lindley and Niagara. They were sold all the way from five shillings and eightpence per case, the highest—(that is, $1.36 per case over there)—down to eightpence per case (that is 16 cents per case over there). There were a few Wilder grapes sold for four shillings and eightpence—(that is $1.12 over there). That would realize about 72 cents at Grimsby. Nine cases of Agawams were sold for three shillings and eightpence ; Lindleys for two shillings and one shilling and threepence. Twenty-eight other cases of Lindleys were sold for four shillings and fourpence. Niagara grapes were sold for from two shillings down to eightpence per case. Thirteen boxes of Red Rogers were sold for four shillings and eightpence, and seven boxes of Black Rogers were sold for five shillings and eightpence. These were all sold in Glasgow. The grapes which were sent to Bristol in the last two shipments were simply given away.

Tomatoes. Another extract from Elder, Dempster & Co.'s letter :

"As we have previously told you the grapes and tomatoes are useless to us, and we are bound to claim from you any money which may be due for freight on them."

The next letter is from Mr. Grindley, the agent of the Department, dated November 10, in which he says :

"I examined tomatoes from Canary Islands packed in peat dust, and brought here as deck-loads, and they were in perfect condition."

That is where England gets most of its tomatoes from abroad. Then from the fruit salesman October 4.

"We are not satisfied by your putting these goods in cold storage, as the low temperature is detrimental to the shipment, especially for peaches and tomatoes."

"Tomatoes—These have deteriorated considerably, as have peaches, owing to their being in cold storage, and we have had continual complaint from our customers of them. When they have been placed on show they melt into water, and 24 hours after being bought they are in a useless condition, and we have been compelled in many cases to return the money that was made at sale."

Then from Glasgow there comes the report:

"Tomatoes—There was no great demand for these on account of the cold weather, and the plentifu supply of local grown fruit."

Now, Mr. Chairman, I have come to the end of the extracts, and also to the end of my remarks, except these few things I have to say in conclusion. I think the prospect for a profitable trade in the exportation of Canadian pears is very good. We have the conditions for producing abundantly this class of fruit which the British public are both able and willing to pay good prices for.

A DELEGATE: How would quinces be?

PROF. ROBERTSON: So far we find them sometimes being sold well and sometimes being given away.

MR. PATTISON: Is there any prospect of putting plums on that market in good shape?

PROF. ROBERTSON: I think little prospect of making them pay well, because of the suitability of their own climate for growing them in most years. I think we might have a "snap market" occasionally.

A DELEGATE: What is the method of cold storage?

PROF. ROBERTSON: Mechanical refrigeration by the use of ammonia to a temperature of 36 to 40 Fahr.

PROF. MILLS: Do California apples, tomatoes, plums and peaches reach there in good shape?

PROF. ROBERTSON: Their main trade has been in pears, and they were at it four or five years before they made a success of it. This year they have added peaches. They had failures for two years, the shippers were said to have lost $200,000 in one year. After they had learned to pack and carry pears successfully they have gone into the peach business, and apparently are making a success of that.

PROF. MILLS: Have they done anything with tomatoes and grapes?

PROF. ROBERTSON: I think not with tomatoes. They have with grapes; their grapes have thick skins and tough flesh.

A DELEGATE: Did you send any Sultana plums?

PROF. ROBERTSON: No, and as far as I could learn on the spot from talking with merchants, the English grown plum is usually sufficient for their own needs at fair prices, and we have not any chance of getting a demand for our plums at a profit.

With regard to peaches it does not seem to me that we can expect a profitable trade in exporting peaches from Canada to Great Britain by means of cold storage, nor can we expect a profitable trade at all in sending over Crawford peaches from Canada to England. The fruit is so tender that unless picked at a particular hour of the day, when its development is just right, there would be a risk of loss so great that no commercial man would take up the venture on a large scale.

With regard to tomatoes the position is still doubtful, but the increased production in the south of England and the Canary Islands is putting the price down there so low that counting our extra expense and our extra risk I am not hopeful we will have a trade in tomatoes. Even if they could be carried safely it is doubtful if we could make it pay as against these other competitors.

I do not think we need look for trade of large volume in grapes.

A DELEGATE: Could you give us the month in which the peaches were shipped.

PROF. ROBERTSON: I think the first shipment of fruit went out on the 7th September.

A DELEGATE: Do you know if any Smock peaches were shipped?

THE SECRETARY: There were a few.

PROF. ROBERTSON: An effort was made through Mr. Woolverton's own enterprise in sending thirty cases of grapes to one of the jam-makers, and he reported that they were entirely useless for his purposes.

In the case of the more tender sorts of apples I think a very large trade can be developed, and only developed by shipping them in cold storage.

GENERAL CONCLUSIONS.

My conclusions so far as they can be stated with any satisfaction to myself with some sense of the responsibility under which I say them, is that Canadians may have a continuously growing trade in the exportation of pears; that there is a possibility of getting a trade that may leave a living profit from shipping tomatoes; that there is no likelihood of making a success of sending over Crawford peaches; and that the demand for Canadian grapes does not exist, and it is a question to be considered whether it would pay us to send about one carload a week of our best sorts to further try to create a demand or not. Other tender fruits such as raspberries and currants and things of that kind could only, I think, be sent across profitably in the form of pulp, and that may or may not be profitable just as there is a scarcity or a large crop of these small fruits in Great Britain for the year. If the crop there is large the price goes so low that there will be no profit in sending them over from here.

THE SECRETARY: Why could not Crawford peaches be sent in pulp?

PROF. ROBERTSON: The price of all fruit pulp, except rasberry pulp, is from £18 to £22 per ton. I asked if they could take anything but raspberry pulp, and they said other things would have to create a demand for themselves. At £22 per ton, after taking off the costs of preparing the cost of packages, transportation and commissions, I do not think there would be enough left for the fruit to induce our people to provide it.

MR GREGORY: What is the charge per ton for transportation and for freight for grapes and pears?

PROF. ROBERTSON: The freights from Grimsby to Montreal are 33 cents per hundrsd pounds. The freight on the ship is by measurement, usually about twenty shillings per forty cubic feet in cold storage. The total expenses for transportation this year comes to 34 cents per case.

MR. GREGORY: Per case of 28 pound?

PROF. ROBERTSON: Yes; that was the whole expense—transportation and dock dues and everything on the other side excepting the item of commission, which was only three per cent. on these shipments.

MR. PRESIDENT: Now, I am sure that the time the Professor has taken up has been well spent indeed, and before we take up the next subject, which we might take up jointly with this the privilege will be given of asking the Professor any question you wish to ask.

MR. CASTON (Craighurst): There is more profit in the growing of early apples than in any other crop if you can get a maket for them, but they come in at a time when it was very hot. I would like to ask in regard to the ventilation of the barrel. There seems to be a difference of opinion as to how they should be shipped on board the car.

The PRESIDENT: That will come up under the head of transportation.

Mr. CASTON—Then I will confine myself at present to asking the Professor this question: Does he find the tender variety of apples deteriorate very fast on the other side? That is what the commission men tell us; they are trying to discourage the shipment of apples in cold storage.

Prof. ROBERTSON: The reports I have are that when apples are taken out of cold storage in warm weather moisture forms on them, and that causes them to deteriorate. Without cold storage they cannot be sent at all. A Montreal shipper shipped Duchess without cold storage and they were a complete loss.

Rev. W. Wye Smith: Would the Professor tell us whether the Canadian manufacturers have any good prospects for canned fruits in the Old Country?

Prof. Robertson: I saw a good many samples of Canadian canned fruits in Britain. I spoke of them as favorably as I could at the Board of Trade, when I met merchants, and I examined some cans in the hands of merchants there, who said they were pleased with them. I think that is a growing trade. Just how profitable it is I do not know. There is no chance at all of Canada putting up sweet preserves or jams and sending these from Canada to compete with those made in Britain. The cost of the sugar and the cost of the glass and the tin packages are so much greater here than there we are out of that trade.

Mr. Brodie: I might mention one matter in connection with shipping apples in cold storage. The moment they are taken off the trees and put in a barrel they should be put in cold storage immediately, because if they are left even a couple of days the ripening process goes on and they will be a total loss to the shipper.

TRANSPORTATION.

The President: As the questions seem to come in the line of transportation I think it would be well to take that subject up now; and as you have had so much to do, Prof. Robertson, in the transportation of fruit, I would ask you to open the discussion, and then Mr. Caston and others who are desirous of speaking on that subject will be gladly heard.

Prof. Robertson: What I have to say on this subject will be rather suggestive than didactic. The more quickly an apple ripens the more quickly it rots. Ripening of apples goes on only when the fruit is held at a high enough temperature. If the temperature be put down low the ripening process practically stops. Now, unless some external means are taken to reduce the temperature, the ripening process goes on, and the ripening itself produces heat, and therefore makes the ripening go on still faster. I did not know one of the main uses of cold storage until I learned this morning from the paper read in the convention that the cause of the ever-increasing heat in apples was traceable to the actual presence of the devil in the fruit. (Laughter). Then I began to see that the devil himself, accustomed to a warm place, could not go on working in a very cold room. The reduction of temperature would certainly destroy the works of the devil, and that is said to be the highest use of human talent. Apples in ripening do create heat, and there must be a chance for letting the heat that is generated escape, and also a means of stopping the production of heat.

The early ripening apples should be cooled down below 50° just as soon as possible after they are taken off the trees; and then they should be cooled down as low as 40° as soon as may be after that. By that means even the very earliest ripening sorts could be landed in Great Britain in first rate condition. Now, if they are put in barrels at even 60° Fahr. and headed up close they will get up to 70° Fahr. in the centre of the barrel in a short time. If they are put in the hold of the ship, the whole place gets above 70° Fahr. in a short time, and then the apples all arrive as "wets" and "slacks." In 1897 a lot of over 500 barrels was sent, and the half that went in cold storage sold for 18s. a barrel and the half that went not in cold storage went for 8s. a barrel at the same time. There is no way of carrying these tender apples across except in cold storage.

Our large apple trade, saying nothing of the tender and early-ripening and early-decaying sorts, is not in a good way; it is not on a good basis. I think I am quite within the mark in saying that 60 per cent. of the apples that go to Great Britain fetch less than two-thirds the price they could fetch if they were properly graded and properly and safely carried across the sea. Now, the grading and the packing and the carriage should not cost any more when done properly than in the haphazard way that has been allowed in the past. Just a word in regard to grading. It will pay any man who grows apples to feed all the small, mis shapen and in any way blemished apples to his pigs, and not to try to sell them in barrels—particularly if for the British market. Half a barrel of good apples well selected, well assorted and safely carried will fetch more money than half a barrel of good apples plus half a barrel of poor apples; and the expense of carrying the poor apples has to be charged against the price of the good apples. To protect ourselves—we will have to get some way of rousing the growers to a realization that they must not allow any man to pack their apples unless he does so in the best possible way. If the growers allow the other practice to prevail they are simply cutting off the best market, because the British public won't pay the price for mixed apples that they will pay for graded app es.

The English merchant sells on commission, and he says, "Send in barrels," because he can sell more in barrels than in boxes; and the commercial man of to-day does not take any trouble if he can help it. Now, I would send apples across in bushel boxes and let the commission man fume for a while. A while ago they said, "You can't send any eggs here except in large cases." Now they all say our Canadian egg cases are the best on the market. Retail merchants tell me, "We can sell a small box of apples when we could not sell a barrel." It would pay a locality to have a cold storage into which the apples would go for three days before they are shipped. The steamship owners, without any contribution from the Government, have engaged this autumn to put in what they call ventilated cool storage in the ships; and apples will go better this way than in cold storage. It is provided by a duct to carry fresh cold air to the hold where the apples are. There is a cowl on top to catch the wind. Another duct leads from the top of hold to allow the warm air to escape. That makes a nice cool draught through the hold and allows the heat to escape. I think the apples should be cooled at the starting point, then carried in cool cars and in ventilated places on the steamships.

Dr. Mills: Would your recommendations apply to all varieties of apples?

Prof. Robertson: All apples that are moved in hot weather. If every apple is cooled down before it is shipped it simply gives it so much better keeping quality when it gets to England.

A Delegate: What line of steamers is it that is going to put in these ventilators?

Prof. Robertson: The Allans to Glasgow and London; Elder Dempster & Co. to Bristol; Thomsons to London; the Donaldsons to Glasgow, the Dominion Line to Liverpool, and others. There are several big lines out of Montreal arranging to have them for the carriage of apples. Without them apples and cheese were being carried in such bad condition that the trade was being imperilled. I think if the Fruit Growers' Association of Ontario and the Fruit Growers of Canada do not take hold of this transportation problem and bring about better methods and facilities, they may as well go out of the business. The fruit-growing has been done very well, but there has been so much loss and damage and dissatisfaction from the spoiling of fruit on the way to the markets, both for our home and foreign markets, that the matter must be taken hold of and corrected. It would pay every fruit locality to have a special cold storage building and a special agent to look after the transportation.

Mr. Boulter: The cattle men have spent a great deal of money and did succeed in impressing the Government with the necessity of having a man in Montreal to see that those cattle were properly shipped at Montreal on those vessels. Now, has the Fruit Growers' Association any more interest than they have? And I want to ask, has anyone been appointed by the Government to look after the storing of fruit in the vessels and see that it is properly put on?

Prof. Robertson: We have a special cold storage Inspector in Montreal, who looks after the cold storage on the ships, because the Government contributes part of the expense. I think the Government would not be willing to interfere—"Interfere" with a capital "I"—unless the trade ask them to; but if the fruit-growers ask to have a man at Montreal and St. John, N. B., to look after the proper storing of fruit, in the steamships I think the asking would likely be the receiving. (Hear, hear.)

Mr. BOULTER : I am sure something of that kind should be done. On the 8th or 10th an article appeared that our High Commissioner, Lord Strathcona, was in hopes of being able to get our evaporated apples in the British navy as ship stores. Now he has just arrived in Canada, and I think if he was waited upon by a deputation, something perhaps might be done. If that could be done there is an inexhaustible demand for our evaporated apples. We could thus use the immense quantity of apples that are not fit to ship to the Old Country. I think it is very important that some definite action should be taken by this Association to look after that while Lord Strathcona is in Canada.

A. H. PETTIT : I would like to ask what is the prospect of capacity in cold storage on board our steamships : A great many want to know if there is space enough for them to ship?

Prof. ROBERTSON : I am not able to answer the question just yet, because negotiations are pending for a enlargement of the cold storage in the ships that now have it and the putting of it in the new steamships that are coming out. During this last season the cold storage chambers were more than filled from about the end of August. The applications for room in them were greater than the capacity of the cold storage from about the first week of September onwards ; and the steamship companies are now offering to put in larger cold storage apartments on certain conditions, but the negotiations are not yet carried to a conclusion. The probability is there will be enough cold storage accomodation next year for all the tender fruits that are ready to go, and a better ventilated cool storage space for some variety ot apples that are half way between the very tender ones and the fall ones.

Mr. GREGORY : Is there any prospect of a more speedy transit of fruit across the Atlantic being obtained in the near future?

Prof. ROBERTSON : The ships that are fitted with cold storage now are what they call nine and ten day boats from Montreal.

Mr. GREGORY : I notice the time you gave in your report was seventeen to twenty-one days. It seems to me that is longer than necessary from the time of its receipt on the ships till its arrival in the Old Country.

Mr. BRODIE : My experience is in shipping to Britain that when the market is glutted there are many slacks and wets, but when the market is firm the prices are good. I notice there are a great many commission men over here from the Old Country buying apples. Montreal is a great fruit centre. I think the best plan will be to have them come here and buy apples in Montreal. They cannot do without Canadian apples. American apples have no keeping properties, except Newtown Pippins, which bring better prices than some of our Canadian apples, but Canadian apples lead in price. I was speaking to one of our shippers in Montreal, and he told me there were more men from the other side buying apples than ever before, and he expected in the near future to see them all come over here to buy (Hear, hear).

Mr. CASTON : We have such a big country ourselves, we have a very large market within our own Dominion if we can land the apples there in a proper state. Great complaints come from Winnipeg and the Northwest about Ontario fruit arriving in such terribly bad condition, and the immense quantity of California fruit used there to the exclusion of ours. That is a very bad state of things. We require to study up the question of transportation within our own Dominion as well as across the ocean. I would like to ask the Secretary a question about the ventilated barrel There is a difference of opinion as to whether the fruit goes best in a refrigerator car, in a close barrel, or in a ventilated barrel. Some here have used the ventilated barrel, the Secretary among others, and I would like to know what his experience is in that respect. It is nearly always hot weather when the early fruit is packed, and if it is put in a close car I do not see how you can expect it to get to the Northwest or any distance in good shape. The temperature of a good refrigerator car with three or four tons of ice is about 45 deg., but it would carry fairly well in that. The question is, would it be well to have a ventilated package even in the refrigerator car, or have an ordinary close barrel? This is an important question, because there is a country from the head waters of the Ottawa to the Rocky mountains with a large mining as well as agricultural population, and in that stretch of country they will never be able to produce any of our fruits; and the farmers in the Northwest want our apples for cooking purposes at harvest time. (A voice: "That is right"). The transportation problem is in the way. The charges are too high. If we begin with the Duchess and follow that with our fall apples and lay them down so that the farmers could buy them, there is an immense outlet for our apples that is going to increase and grow. They grow No. 1 wheat and bring it down to compete with us, and we can retaliate with an article that they cannot grow. It is largely a question of transportation I think nearly everyone is aware that there is a great reduction coming in force in the year 1898 in the freight charges to the Northwest of 33 per cent.

Mr. BOULTER: It is not in force yet.

Mr. CASTON: That reduction in freight with quick transit facilities ought to give us a great outlet for our fruits. I think the same thing would be true about grapes up there, but transportation charges are so high as to put them out of the reach of the ordinary consumer. I think the fruit growers ought to take some action to see that there are proper intervals for re-icing those cars. I have known a man losing $100 on a car because the Railway Company would not undertake to re-ice the car. If these things are all in good order I do not see why our tender fruit should not be laid down in our own Dominion at a reasonable price to the consumer.

The SECRETARY: I think it is quite settled that the ventilated package is the only package for cold storage transportation. I have found that in my experimental shipments, and I have this summer sent some Astracans and Duchess across in a ventilated package with perfect success. This small package of Red Astracans has sold as high as five shillings for a case which only holds about a basket and a third, so you see that was exceedingly satisfactory. With regard to the ventilated barrel, I have used about 1,500 of the Kerr Patent Ventilated Barrel. I was very glad after the last was shipped, because the reports from England were that the ordinary tight barrel was the best, but that was not in cold storage. I believe for ordinary conditions the tight barrel is the best, but for cold storage I am satisfied you must have the ventilated package.

Mr. BOULTER: Last year I was in hopes that some of our own fruit was working its way into Winnipeg. The bulk of all the fruit in Winnipeg is from Missouri and Oregon, and complaint was made to me by one of the largest dealers that they could not get good early apples from Ontario. They want the apples out there in August, because they are commencing to work then. There is an unlimited demand for our early apples, but there are two very important items against them—first, the C.P.R. do not seem to understand it would be a great benefit for the people of Ontario to get apples into that country—it costs near $2.00 to get a barrel of apples to Calgary; then in the shipping of them they claim that they are not properly packed, and perhaps they are justified in the complaint. Why are not the apples properly shipped? The trouble is the C.P.R. discriminates. Sometimes I have had the same rates by rail as I have had lake and rail. If we could ship our apples there in a refrigerator car and get them all rail it would be very helpful. Last year I sent good Northern Spys to Rossland, and you would be surprised at the fine remarks I got as to them. A party I heard from came from Peterboro, and he said he had not seen a Northern Spy for the last six years in Calgary. It is a shame we cannot supply that country with our own Ontario apples. There is going to be a wonderful demand for our fruits in British Columbia. But we talk these things over and get very nervous and excited about them, and the thing collpases, there is nothing done; we appoint a committee, but what is everybody's business is nobody's. Let a little money be spent by some practical business men in seeing that arrangements are made to get these goods out there.

Dr. SAUNDERS: I would just like to say somewhat in extenuation of the position of the railway and express companies, that during the last year the express company reduced its rates from British Columbia to all points in the Northwest from $4 to $2.25. It was a big drop, and I believe the railway has also made some reduction in that direction, and I have no doubt the same rates, if they have not already been obtained, could be obtained in Ontario. That was a point I was going to bring out to-night, and I did not want to anticipate.

The PRESIDENT: I would like very much to hear from the representatives of the steamship lines, and if they are present we will take time to hear them, with pleasure. (Hear, hear.) Is Mr. J. D. Hunter present? Is there a representative of the Reford Company present? (Hear, hear.) It is evident they are not in the building, and it is very unfortunate they should leave the building just at a time when their subject is under discussion.

Mr. M. PETTIT: Unless the question of better transportation facilities in apples to Great Britain is discussed again I think we should not let these drop without taking some action. (Hear, hear.) Prof. Robertson has told us that if we ask for an Inspector, or whatever he may be called, to look after the better shipping facilities at the shipping ports, that we will likely get it. Well, I think we should appoint one or more delegates from this Association, and have our Secretary correspond with the Quebec Horticultural Society, and also the Nova Scotia Society, and have a delegation go to the Federal Government and urge strongly upon them the importance of having something done in this way. There is no question but there are hundreds and thousands of barrels of apples that are shipped across the ocean that are ruined on shipboard by being put in the wrong place, and if better facilities were brought about in this way it would be one of the greatest works that this Association has ever accomplished.

Mr. McNEILL: I quite agree with that view of it if it is a motion.

The PRESIDENT: You simply anticipated me in this matter. Acting on the hint that Prof. Robertson gave us I immediately named a committee to take action in the matter. It is one that I think is very important, and to save time I would appoint the Secretary, Mr. A. H. Pettit, and the Vice-President, Mr. Orr, as a committee to memorialize the Government and if necessary to act as a delegation to the Government and if possible to get them to appoint a man to see after the safe storage on ships and proper ventilation of holds.

Mr. M. PETTIT: It is right so far as it goes, but I think we should authorize our Secretary to urge upon the other societies the importance of joining with us in asking that this be done; it would strengthen us very much.

The PRESIDENT: I will ask you to appoint this Committee, and I will ask you to draw up a resolution to pass this evening giving them proper instructions. Will that be satisfactory? ("All right.")

The President read a letter from the Allan Steamship Company regarding cold storage, addressed to Mr. Hunter, and also a letter from the Reford Company to the Secretary of the Association.

The PRESIDENT: As a representative of the steamship companies are not here I do not see that we can do anything further. Meeting adjourned at 5.50 till 8 p.m.

ADDRESS OF WELCOME.

The Mayor of the City, Mr. GILLELAND, said: It affords me a great deal of pleasure to meet so large and influential a body of men as compose the Fruit Growers' Association of Ontario, and to extend to you on behalf of the citizens of St. Catharines a cordial and hearty welcome. The industry represented by this Association is one that in the last few years has been making very rapid progress. It is not so very many years since it was a rare thing to find upon farms, even in the most favored localities for fruit growing, any fruit of any great variety. Of course we had the old standard apple, and in this section we wish we had more of it this year as we are a little short. But of late years it would be almost impossible to find a farm but has plenty of fruit growing upon it. While I would not be favourable to putting a farm entirely in fruit, it is important to have fruit. The methods adopted have been very much improved of late years. We see here in the corridors machines for spraying fruit and bringing it to its greatest perfection. We think it is very fitting that this Association should meet in the old Niagara district—a district that has been noted for raising fruit and good fruits for so long a time. We who live in the County of Lincoln think we have the choice locality for fruit, although there are other localities heard from, and that favorably. When it was decided to hold your meeting here we were very pleased to hear you had done so. We knew full well the benefits to be derived from meetings of the Association to those engaged in this locality in the business who might not have had opportunities of any Association meetings previously. We knew it would be interesting to hear the topics discussed by those who were so competent to deal with them. I can only say we are glad to have you with us. I trust your Association will continue to make such favorable progress as you have in the past. I am told by a member of the Association that not a great while ago your meetings were comparatively small, but of late years they have been growing so much in interest that the Association has been gradually growing larger. I will only repeat my hope that you will enjoy the meeting here, that you will find it pleasant and agreeable, and I can assure you that anything that can be done by the members of the Council of the city and by the inhabitants generally to make your visit pleasant and agreeable will be done, and I trust that you will never have cause to regret having fixed your place of meeting in the city of St. Catharines. We welcome you, hope you will have a good time, and will be glad to have you repeat your visit at any future occasion. (Applause.)

The PRESIDENT: I am sure on behalf of the Fruit Growers' Association that very few words from me are necessary in reply to your address, because if you will look into the countenances of the officers and directors of this Association you will see that they are pleased already with their visit to this city. We are convinced, too, by the intelligent audience before us that the efforts of the Associatien are appreciated. A few years ago the work of this society was on very different lines from what it is in the present day. Then fruit growing was profitable without labor, I may say—that is, the labor that is now expended upon the industry. At the present time the efforts of the society have been directed not only to the prevention of the ruination of our orchards by disease, fungi and insects, but to meeting the problem of over-production of our local markets and towards finding other markets for our products. That always is a very important matter, and one of deepest interest to everyone engaged in the fruit-growing industry, because having invested their means in the growing of fruit, they naturally wish to follow the occupation out on those lines. It is not an easy matter to change from a fruit grower to a grain grower. It is very much easier for a grain grower to go into the fruit business. Having trees coming into bearing, and having fruit maturing each year, there must be an outlet for that if they are to continue in the business, and to go out of it would mean a heavy loss in capital and time. I am happy to say that the efforts of the fruit growers in that direction are bringing about happy results. We have received the greatest consideration from not only the local Government but the Dominion Government in that line. They have responded to our requests most nobly in every way where we have brought our troubles under their notice, and we are happy to say that with their efforts we believe we are now working on the lines which will bring us safely over the troubles I have indicated. But as far as St. Catherines is concerned, and the county of Lincoln, and indeed the whole Niagara Peninsula, everyone recognizes that in no part of this continent is there a more desirable situation for this industry, taking it from every point of view. It has flourished in the past, and while for a few years the outlook was rather poor, I believe we have a bright future before us. We certainly feel grateful to the city of St. Catharines and yourself and the Council for the hearty manner in which they have welcomed us. We are trying to do good. We labor in this institution without pay or favor, and labor for the common good; and the greatest gratification and the best pay that we can have as members of the Association is to know that our efforts shall be crowned with success.

THE PRESIDENT'S ANNUAL ADDRESS.

By W. E. Wellington, Toronto.

It is always a source of gratification, when the head of a corporation can meet his Board of Directors, with a satisfactory balance sheet. The President's address is then one of a congratulatory nature, and the work is necessarily much lighter than when he has a long list of losses to explain in justification of his management. While we are not working for, or looking forward to dividends, in the Ontario Fruit Growers' Association, we are all much interested in the success of our Society, both from a financial point of view, and the accomplishment of the work that we give our time and thought to.

I am proud to say that I am able to congratulate the officers and members of the Ontario Fruit Growers' Association, on a successful year's work. Financially, I think the Society now stands higher than ever before in its history, and I believe the work of the Association is of the greatest benefit to the fruit growers of Canada.

Our monthly journal, under the able and industrious efforts of our Secretary and editor, is constantly improving, and is highly thought of, not only in Canada, but in many parts of the neighboring republic. While I do not think we have yet reached that point of excellence and superiority we should be ambitious to attain, we certainly are improving, and if we continue to improve in the next few years, at the same rate as the past year, we may look forward to soon publishing a journal that will take high rank with the best horticultural journals in America.

A few facts and figures will speak more eloquently than any words I can command. Last year, we reported $3,325.17 paid in fees, and this year we are able to report $4,147.13 paid in fees. The number of paid members in 1897 was 3315, while for 1898 we have 4,151 paid members, and in addition 375 members still unpaid, and this we look with confidence to receiving within a very short period of time.

The total receipts in 1896 have reached the magnificent sum of $6,585.94, and after paying all expenses, we are able to report a balance in hand of $784.96. This I think will be very gratifying to every member of the Association, and with this balance in hand, I would strongly recommend that for the incoming year efforts should be made to increase the size of the Journal, and also to increase again the subscription list. In fact, I believe if the size of the Journal is increased, and made at least one-third larger than at present, there would be little difficulty in securing additional members enough to carry on the work profitably, and also increase the benefits to every member of the Society in a practical way.

I wish particularly to draw attention to the numerous photogravures which illustrate the "Canadian Horticulturist", and which I think very materially increases its attractiveness. This is a decided improvement on the old style colored plate illustrations, and I think we can well afford to continue on these lines in the future.

Turning from the financial success of the Society, I would call your attention to the practical work of the Association, which I believe has been correspondingly successful.

The local horticultural societies are an interesting feature of our work, and are looked upon with great favor by the Department of Agriculture. These affiliated societies, are far more successful in their operations than the old agricultural societies, which benefited only a few professional prize-winners. Our plan is that every member should receive an equal benefit, either in literature or in plants. The number of Societies reported last year was 27. Now we have 36. In addition to this, there is the prospect of several more uniting with us during the present month. The Fruit Growers' Association has agreed to send a lecturer once a year, to each of these societies. This will keep them in touch with us, and us with them, besides carrying out one of the most important conditions of the Agriculture and Arts Act.

I would call the attention of my hearers to the article on page 438 of the November number of the "Canadian Horticulturist" which describes the meeting of the Orangeville Horticultural Society. This is only a sample of the meetings held by the different societies with which we are affiliated, and will carry a very good idea of the interesting work that is being done. The enthusiasm which is awakened at some of these local meetings, is most gratifying, and encourages me to suggest that the work in that direction should be considerably extended the coming year.

Another work which may well be placed to the credit of the Ontario Fruit Growers' Association mainly, is the efforts to stamp out that terrible pest, the San José Scale. As you well know, a delegation from this Association was sent to Ottawa, to confer with the Minister of Agriculture regarding the importation of American stock, which has been so largely infested with this pest. On behalf of myself and colleagues who visited Ottawa, I wish to publicly thank the Hon. Sydney Fisher, for the courteous manner in which he received the delegation, and also for the prompt way in which he responded to our wishes. We found the Hon. Mr. Fisher had become fully alive to the importance of our mission, and his subsequent prompt action, shows that in him we have a man, who has thoroughly at heart the interests of the fruit growers of Canada.

The Local Legislature has in every way seconded the efforts of the Dominion Government in stamping out the San José Scale. I believe they have followed the work with vigor and energy, and are now able to show a comparatively clean sheet, and thus avoid the danger which threatened our fruit growers, of having their fruit excluded from the best foreign markets. Now, while Germany has excluded California fruit, there is no bar to that from Canada We can now reasonably hope, that with the measures that have been adopted, the dreaded pest of the San José Scale will be kept in subjection in Canada, and we can only hope that at an early day, our neighbors across the line, who have now become very thoroughly awakened to the danger to fruit-growing in that country, will be able, by their efforts, to stamp out the pest, and that commercial relations may soon safely be resumed between the two countries.

Another important department of work, which has been largely brought about through the agency of our Association, is the Fruit Experimental work. I need not go into details of this work, because you are probably as familiar with it as I am. The reports printed by the Government are very full, and will give every member the fullest details as to the work of the different Stations. I think this work will prove of the greatest possible benefit to the Fruit Growers of Canada.

Not only have Stations been established in the well known fruit-growing districts of the Province, but the Board of Control have established Stations in the more exposed districts of Canada, where fruit-growing has never been successfully carried on.

At the last meeting of the Board of Control the Hon. Minister of Agriculture for Ontario, suggested that the Government Farm in Algoma might be used for experimental work, and it was decided to accept the offer, and plantings of the hardiest varieties of trees known to the Board will be sent to Algoma in the spring, and thoroughly tested. An experimental station will also be started at St. Joseph Island in Algoma, which is confidently hoped will be of estimable value to the settlers in northern districts.

At our southern stations efforts are being made to test nut culture for profit; also new varieties of fruits, that otherwise might be lost to notice, and which, if of merit, we hope to bring into prominence.

In connection with the work of the Board of Control, a descriptive work on fruits of Ontario is being compiled by the secretary. Photographs of the different fruits are taken from year to year, as they can be obtained, and accurate descriptions written, so that at no distant date, we hope to present a work to the public, that will be reliable and of the greatest possible value to the fruit growers of this Province. We are also making the attempt this year to prepare a catalogue of fruits adapted to all parts of onr Province.

Another important feature of the work of the Association is the plant distribution. Not only are the plants and trees distributed, of value to the subscribers, but sent as they are, to all parts of the Province—in fact, to all parts of the Dominion of Canada—it submits the different varieties to a test that will show their adaptability to the section in which they are planted. To give you an idea of the work that this distribution entails, and the interest with which the members of the Association regard it, I give you a list of the plants and trees distributed for 1898. They were :—430 Paeonias ; 1,582 Crimson Rambler Rose ; 292 Gault Raspberry ; 171 Victoria Black Currant ; 1,151 Wickson Plum

Still another important feature of our work, is the encouragement which has been given to the export of fruit in cold storage to Great Britain. Especially has this been beneficial to fruit growers, in giving them practical knowledge as to the proper way in which to pack and prepare tender fruit for shipment in cold storage to Great Britain. Plans were formed by this Association, and submitted to the Minister of Agriculture, which have been carried out by him, and which are likely to prove of the most vital importance to the fruit growers of our country. Our own markets were beginning to be so over-stocked, that remunerative prices were no longer received for our produce, and our fruit growers were becoming discouraged, and were beginning to feel that they would have to give up the business.

Now, after two years of experiment, we have demonstrated clearly, that our pears can be exported to Great Britain, with the greatest success, and also bring to the grower the old prices which made fruit growing so profitable an industry in the past. Also that tender apples, such as Astrachan and Duchess, can be exported with success, and bring long prices in the British markets. Tomatoes also, with proper carriage, and if picked in a green state, can be safely exported, and will pay hansomely. I believe too, that in the near future, we shall find a profitable market for peaches, especially if varities are grown that are not so soft as the Early Crawford.

The experiments of two years, have on the whole, been attended with very gratifying results, and as we gain experience we shall soon be able, I feel certain, to land our best, and even some of our most tender fruits, in the British market, where prices will be realized that will be encouraging and profitable to our fruit growers. This work of the Society is of inestimable value to the fruit grower generally.

I might go more fully into facts and figures, but do not consider it necessary, after the article that appeared in the August number of the *Horticulturist*, on page 303. This article alone, with its accompanying illustrations, is worth many many times the expense attending the membership of this Society.

I might still further enlarge my address by referring to the crops of the different fruits in Canada and the United States, but this I think is needless because all such information is furnished in our magazine and other horticultural journals published on this continent.

We all know that for the past two years the apple crop has been rather light in most sections as compared with 1896, when the crop of apples from Canada and the United States was 69,879,000 barrels, which decreased in 1897 to 41,536,000, while this year the total crop is only 27,681,000 barrels. Nova Scotia this year is fortunate in having a crop of superb quality and fair proportions—the famous Annapolis Valley yielding 75 per cent. of the full crop, or three times the number of barrels produced last year. The quality is fine, and dealers are readily paying $2 per barrel.

The Ontario crop is decidedly short, Western Ontarlo having the best, but the heavy fruit belt from Buffalo around the head of Lake Ontario has a light crop, and the surplus for export will be comparatively small.

It is interesting to note that the number of apple trees planted in Ontario over fifteen years of age is 6,221,000, and under that age the number is 3,459,000. Probably, in round numbers, 10,000,000 of apple trees are growing in the Province of Ontario.

The apple crop in Europe being short, prices there will probably average higher than for many years past. I think on the whole the outlook for the fruit grower is encouraging.

I have as briefly as possibly gone over the main points of the work of this Association, and I trust that the members will agree with me that the year's work has been very satisfactory, not only financially, but that the practical work of the Association is such as to give it the confidence of the fruit grower; and I believe I am safe in stating that in no other way can as much be obtained for one dollar as by becoming a member of this Association and subscribing to the *Canadian Horticulturist*, issued by the Fruit Growers' Association of Ontario.

I have now completed my second year of the presidency, and resign the work to the hands of the incoming president and officers, with every confidence that the good work will continue and that each year progress will be reported.

I wish to thank the officers and also the members of the Association for the help they have given in reaching the present gratifying position which the Fruit Growers' Association of Ontario holds.

MANITOBA AND THE NORTHWEST TERRITORIES AS MARKETS FOR ONTARIO AND BRITISH COLUMBIA FRUIT.

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

In view of the fact that Ontario is increasing so rapidly in the volume of fruit which it produces annually, it becomes of the greatest importance that we should look around for new markets, and that we should take advantage of every opportunity afforded us of increasing our sales in every direction. Although we now produce large quantities of fruit, we grow but a tithe of what we could grow provided we could find sufficiently large markets for our surplus. This subject has been given me, I presume, for the reason that travelling as I do across the Dominion every year, and sometimes twice a year, I have opportunities of becoming fairly familiar with the country and its products.

Extent of Country.—I shall first call your attention to the extent of this country. Manitoba extends 320 miles along the C. P. R., and has its two additional southern lines running parallel; it has also a line running north in the Dauphin Lake territory. A very important point in connection with the demand in any country for fruit is the number of villages, towns and cities to be supplied. Winnipeg now has a population of 40,000, Brandon 6,000, Portage la Prairie 4,500, and besides these larger towns there are many small places with a population varying from 200 to 1,000 or more in each. In addition there is a large population of farmers scattered through the country, and most of them, owing to the good crops which have been grown there for some years past, are very well to do, and as far as I know the people there are exceedingly fond of fruit and willing to pay almost any reasonable price for a good article. The cheaper it is, however, the larger the consumption will naturally be. Passing on to the Territories, we have a further stretch of settled country for 200 miles beyond the Manitoba boundary until we reach what is known as the Moosejaw district, where the general settlement of the country practically ends. Beyond that, for another 400 miles, until you reach the foot-hills of the Rocky Mountains the country, is more or less arid, and while agriculture is quite possible where irrigation can be practised the greater part of the country is bare of any attempts at cultivation, and is mostly used for ranching, bands of cattle and horses being kept at different points. As you approach within fifty miles of the Rocky mountains, you reach the town of Calgary, another important centre of population with about 4,500 people. It is also a railway centre, having a line running north for 200 miles to Edmonton, passing through many villages and small towns on the way to the terminus, and another line running south to Fort McLeod, which connects with the Crow's Nest Pass Railway at that point, and carries supplies to the population in the mining districts. So you see, taking those sections of the Territories together with the eastern part, Regina with its population of 2,200, Qu'Appelle with about 1,000, and Broadview 800, and a number of other small places along the main line, together with the branch line running from Regina to Prince Albert 250 miles, you have a stretch of country which although as yet sparsely populated is filling up with a fair amount of rapidity, many thousands of new settlers coming in every year, some from Europe and some from the United States. Throughout this whole region there is a growing demand for fruit which will admit of a consumption far exceeding anything we have at present any idea of, provided we can get the surplus stock which can be easily produced in Ontario landed there so as to be sold at reasonable rates. Talking with a gentleman from Prince Albert some time ago on this subject of fruit, he said, "Why, we have been so accustomed to pay about fifteen cents a pound for fruit that now it has got down to eight and ten cents a pound it seems to be a comparatively cheap article of diet, and we are making use of it very freely."

Fruit Growing in the North-west Country.— I shall next call your attention to another aspect of the subject, and consider what these people living in this district, extending for a thousand miles from east to west, and 350 from north to south, are able to do for themselves in the way of growing fruit. The cultivation of strawberries has been tried at a great many different points in this part of our country, and it has not been attended with much success. Strawberry vines are hardy, but in the autumn, about the time when the young runners begin to root, the ground in the North-West is usually so dry that for an inch or two the soil becomes almost like ashes, and the winds are so frequent that the vines are rarely still, and the runners are blown about from point to point and never stay long enough in one place to send out roots, and for that reason there is seldom much success in propagating the strawberry. Where irrigation can be practised that difficulty can be overcome. Under such circumstances plots of strawberries may be grown with a fair measure of success as far as multiplication of the plants are concerned. But there is another difficulty to contend with. In the springtime it often happens that heavy frosts occur in the morning and a hot sun shines during the day. This occurs usually in April and sometimes in the early part of May, after the strawberries are in flower, and you know the effect of severe frost on strawberry blossoms—it destroys them completely, and so lessens the crop that strawberry growing cannot be relied on anywhere as a profitable industry, and this fruit is chiefly grown by amateurs. Raspberries are cultivated more successfully, and some fairly good crops are grown in some parts of Southern Manitoba, and also in the neighborhood of Winnipeg, but there is not a sufficient supply to give the general public what they want in this line. Black cap raspberries are less hardy, and blackberries are usually too tender. Red and white currants can be grown very successfully all over Manitoba and the Territories, provided there are no severe spring frosts to injure the crop after the blossoms open; in that case they can be depended on as a fairly reliable crop. The same may be said of black currants, all the varieties of which are hardy and succeed well, and, barring the effect of frosts, where they get a favorable season the crops are usually good.

Among the large fruit no success in a general way has attended the efforts to grow apples, pears, such plums as we grow in the east, or grapes. At the Experimental Farm at Brandon—and similar experiments have been carried on 200 miles further west at the Experimental Farm at Indian Head—we have tested over 200 varieties of Russian apples of the hardiest sorts that can be found. We have also tested all the hardy varieties of pears, plums and cherries, and have also tried a large number of small fruits. None of the larger fruits have succeeded, although we have been working on this line at Brandon and Indian Head for more than ten years. We have sent thousands of apple trees to these farms but have never yet succeeded in producing an apple. Hence, as you see, we have not had much encouragement thus far. Near Morden in Manitoba, which is in the Red River Valley and south of Winnipeg, at an altitude very much the same as that of Winnipeg, that is about 700 feet, or nearly 500 feet lower than the experimental farm at Brandon, there is one farmer who has an exceptionally sheltered spot who has grown fair crops of crab apples on a few trees, and he has also produced a few larger apples of several Russian varieties. This is considered quite a feat in that country, and is chronicled in the newspapers, and specimens are photographed and made much of, showing that it is a feat not often or very easily accomplished. I visited this plantation several years ago. It is owned by Mr. Stevenson, who is an enthusiast in this work. There have also been a few crab apples produced in the neighbor-hood of Winnipeg, and a few more in Southern Manitoba, and that is about the extent to which these fruits have been grown in that country thus far. I visited Edmonton, 200 miles north of Calgary, several years ago, and almost the first person I met when he knew who I was and where I came from said, "Oh, you must go and see Mrs. So and-So's garden; she has got a Tetofsky apple on a tree, and you must see that before you go." So I went over to see this prodigy, and there happened to be an American friend travelling with me with a camera, so I asked him to come along and take a photograph of this wonderful fruit. When we got there we found that the apple was not a Tetofsky apple at all, but a Whitney Crab. (Laughter) As there was but one specimen on the lower part of the tree, and it was pretty well covered with foliage and the lady was much disappointed when it was pronounced to be a crab, we left the place without taking a photograph of this fruit. Altitude in the Northwest country often makes more difference and stands more in the way of success in the growing of trees and shrubs than latitude; hence in going west, as you rise higher and higher the difficulties increase. At Brandon, where the altitude is 450 feet greater than it is at Winnipeg, we have had no such success as that I referred to as having been had by Mr. Stevenson near Morden. The only variety of fruit that can be called an apple which we have yet produced at Brandon is the berried crab *Pyrus baccata*, a small crab which grows wild in the northern part of Siberia. This fruit, which is about as large as a cherry and with a stem almost as long would scarcely be recognized in this country as an apple—yet it is valuable for making jelly, for most of you no doubt know that jelly comes chiefly from the core, seeds and under the skin of the apple, and as these little apples are nearly all core, seeds and skin they make more jelly per pound than the larger apples would, and it is just as good. We are, however, trying some experiments at Ottawa which I hope may result in increasing the size of this apple. The *Pyrus baccata* has been crossed with such apples as Tetofsky, Duchess, Yellow Transparent, Fameuse and Ribston Pippin and quite a number of other varieties, including some of the hardier Russian forms, and we have now growing at Ottawa 750 of these young cross-bred trees, each one of which is a distinct variety, and we are hoping, by multiplying the chances in this way, to produce something good eventually, and trust that in a few years we shall be able to thus improve this small, wild Siberian crab and increase its size so as to make it a tolerably useful apple to the people in the Northwest country. We do not expect to produce such varieties as will be competitors to any extent with the fruit that Ontario could ship there, but if we could grow an apple equal to the Transcendant crab and produce it in abundance it would be worth hundreds of thousands of dollars to that country. In many districts remote from railways the people seldom taste fruit at all, and to be able to grow fruit as palatable as the Transcendant crab would be something to be proud of. Householders would rejoice in such a production to an extent which these of you who are privileged to be surrounded by beautiful fruits can scarcely understand. Besides, the growing of such apples in that country would not only add largely to the comforts of the householder, but would give the climate of the country an additional recommendation As you go further westward the altitude increases, and by the time you reach Calgary you have attained an elevation of 3,388. If so little can be done at Brandon at a height of 1,150 feet, but little success can be expected in the higher altitudes. In Manitoba in the river valleys, in the lower altitudes, the wild plum is common and usually fruits well, but the quality of the fruit is very variable. A large proportion of the trees produce inferior fruit. Some of them, however, have fruit which is very acceptable to the people, and it varies in color as the wild plum does in the east, from yellow to red. The trees are generally hardy, and they will not only grow in the river valleys, but when transplanted to higher altitudes most of them will grow and bear well. The Sand Cherry, *Prunus pumila*, is also found throughout most of that section of the Dominion, growing in many localities as far north as Prince Albert, where the fruit is produced in considerable abundance. The fruit of this shrub varies also, like the wild plum, very much in its quality and character. Some bushes produce cherries that are quite a good size. I have seen them nearly as large as the English Morello; then again you find them but little more than a skin stretched over the stone, with no pulp at all worth speaking of, and not only astringent but bitter. By selecting the best of these varieties of Sand Cherry, as has been done at Brandon, and growing seedlings from them and propagating these by layers and distributing them among the people, we are doing a work which is much appreciated. Should the experiments now being tried on the *Pyrus Baccata* prove successful, and the further work of producing good varieties from the wild plum and the Sand Cherry by careful selection meet with good results, we have along these three lines of work some promise of useful fruits for this western country in the near future.

Some Native Fruits.—In some districts wild strawberries are found, but not to any extent—the wild raspberry is much commoner. The fruit of the wild black currant is also common, and is used very generally, though it is rather strong in flavor. The Saskatoon berry is another favorite fruit in that country, and in plentiful years it is collected in large quantities and dried. The fruit is very much like what we know in the east as the Shad bush or June berry, and reminds one somewhat of the Blueberry in its flavor, and is a very good berry, especially if you are fruit hungry and cannot get anything else of that sort to eat. The Pin Cherry, *Prunus Pennsylvanica*, which grows in the east also has a very small fruit, yet it is regarded there with favor by many people, who gather it and make jams and jellies from the little pulp there is over the stone; and by gathering plenty of the fruit one can succeed in getting a reasonable amount of jelly. These smaller fruits, with the wild plum, the Sand Cherry, and further east down towards Rat Portage the Blueberry, make rather a meagre bill of fare. Hence there is a very large demand for good fruit, most of which Ontario and British Columbia could supply, but up to the present time about eighty per cent. of it has been supplied by the United States, some of it coming from California, some from Oregon and Washington, and some from the Western States of Illinois, Michigan and Minnesota. It seems scarcely creditable to the enterprise of our fruit growers that four-fifths of all the fruit that is at present used over this whole stretch of country, populated at present probably by nearly 250,000 people, is sent in from the United States. Here is a market that Ontario should do something to capture.

Fruit Growing in British Columbia.—Let us see what British Columbia is doing, and what she can probably supply. Crossing the Rocky Mountains at a height about 5,000 or 6,000 feet you descend on the other side into what is known as the Columbia Valley, where the first crossing of the Columbia River occurs. In this valley, from Golden to Donald, which is at an altitude of about 2,530 feet, and much sheltered by high mountains, some experiments are being carried on in fruit growing, and although they have not been conducted long enough to demonstrate much, still there seems to be fair prospects of success with some of the hardier fruits in that valley. The Columbia River flows north at the first crossing, and makes a great bend above the base of the Selkirk range of mountains, and then flows south, so that after crossing the Selkirks, which form the second range of mountains at about the same altitude as that at which the Rockies are crossed, you descend into another valley where the Columbia is crossed the second time, and there the altitude is less. At that second crossing, at Revelstoke, it is only 1,475 feet—about 300 feet higher than we have at Brandon—and much more sheltered. There the climate is milder, and along that river valley from Revelstoke down to Rossland there have been within the last three or four years some very successful efforts made in the way of growing small fruits, and there are a few old-timers who have been there a number of years who have had apples and other trees which have been producing of late fairly good crops of fruit. Hence that may be taken as the beginning of the fruit growing district, or the eastern extremity of the fruit growing districts of British Columbia. After the third range of mountains known as the Gold range, is crossed, which is not nearly as high as either the Rockies or Selkirks, you strike another series of valleys at a point which you will find on the railway guide marked as Sycamous, a station which is 1,300 feet above the sea level, and stands at the head of what is called the Spulmacheen valley which extends south about 30 miles, and south of that lies the Okanagan valley, which most of you have heard of as a fruit growing district, where Lord Aberdeen has a large ranch, and has a 200 acre apple orchard which is coming into bearing very nicely. There is quite a large number of apples produced in that valley, but they get prices such as you would not dream of getting here. I travelled through that district in August last and visited Lord

Aberdeen's ranch at Coldstream, which is in the upper part of the Okanagan Valley, and another orchard which he has near the town of Kelowna, situated about the middle of the valley. At Kelowna the manager told me he had sold all his apples to a firm in that town at three cents a pound. All he had to do was to pick them and take them in in boxes, not packed in any way, and they undertook to pack them and ship them to the mining districts, and were doing fairly well with them, buying them at that figure. At the other ranch the manager said he was not willing to take such a low price, that he was doing better by shipping them direct to the mining districts. $1 80 a bushel would be considered a pretty good price for apples in this neighborhood, but there it was not regarded as anything extraordinary. Such prices are mainly due to the difficulties of getting fruit in from the outside on account of the great distance from the points of production and the expense of transportation. In the Okanagan valley there are large numbers of varieties of apples grown, and they do very well, and bear abundantly. There are also a number of pears produced, such as the Bartlett, Flemish Beauty, Anjou, and other good sorts, and these also bear well. Plums bear abundantly and cherries also have good crops, but the season is not long enough there for the ripening of grapes. The season is too short also in the Coast climate of British Columbia to permit of grapes ripening well; so that as far as grapes are concerned Ontario has no competitor in this western country as far as the Dominion is concerned. California is the only country which can compete with you in that particular. I was surprised on going through the Okanagan valley last year to find in several places quite a number of peach trees in bearing. I had heard of peach trees down there doing wonderfully well, but had never before seen any trees with fruit on them, and as this was my third visit to the valley I began to think that possibly they never bore; but this year there was a considerable quantity of peaches of good quality, some of which I had the pleasure of testing on the trees, which sold in the orchards at five cents a pound, and must have netted their owners very good returns.

Fruit in the Coast Climate.—Starting from the terminus of the Canadian Pacific Railway at Vancouver, and coming east again, we have between Vancouver and the Coast range of mountains—which is the last range you cross in going to the Pacific Ocean—about 100 miles of territory in which there are a large number of valleys where the land is rich and the country sheltered by mountains, and the climate is very much like the climate of England. Here apples, pears, plums and cherries can be grown in the greatest abundance. Plums I have never seen grow so abundantly anywhere as in that region, and the apple trees also bear very heavily. Throughout this whole territorry a great deal of enterprise has been shown of late years in fruit growing, and orchards are being planted in every direction. During the past year, 1898, the weather has been warmer than usual, and at Agassiz, where the Experimental Farm is located for that Province, which is 70 miles east of Vancouver, we have succeeded in ripening quite a number of varieties of grapes, including the Delaware, Agawam, Brighton, and a number of other sorts, some of which have not ripened on that farm in any season before. The experience of this year shows, however, that in favorable years a limited quantity of grapes, such as people can eat, may be grown, but they are not thoroughly ripened or such as you wou'd call fully ripe in this section of the country; they are, however, quite eatable and are in demand there. The quantity of such fruit available, nevertheless, even in a favorable season, is quite insufficient to supply the home market, and the crop is too unreliable to induce extensive planting. British Columbia, however, may be expected to be a formidable competitor of Ontario in the production of plums, apples, pears and cherries, and every year as the new orchards come into bearing—and they are coming into bearing very rapidly—the quantity of fruit produced will be increased very much. In point of distance, taking Winnipeg as the great distributing centre, which it is, Ontario has an advantage, for while Vancouver is 1,464 miles from Winnipeg, Ottawa is only about 1,300, and Toronto would be somewhat nearer. For Calgary, however, and Regina, and the lines running north, British Columbia is nearer, and would have some advantage in supplying those districts. The fruit growers in British Columbia have been very much handicapped by the heavy rates which have been charged in past years for transportation. Four years ago six cents a pound was charged to carry fruits by express from Vancouver to Winnipeg, subsequently it was reduced to five cents, and the year before last it come down to four cents; but as fruits began to be produced in considerable quantities and the surplus had to be shipped somewhere the growers could not afford to pay four cents per pound to send plums to Winnipeg —it made the price too high to permit of the consumption becoming very large—so they organized and formed an Association, and made arrangements with the railway for cheaper rates by freight, and sent a man through with each carload of fruit, who landed a certain number of boxes at Calgary, other lots at Regina and other points, taking the remainder of the car through to Winnipeg. They had the privilege of thus unloading as they went along, all at the same rate. This reduced the cost of transportation to something less than two cents, but it delayed the distribution of fruit very much, and by the time the car had reached Winnipeg with all the delays incident to the journey, the fruit which was left was usually in bad order. In the meantime the express company found they would have to do something in the way of reducing rates, if they were to secure any part of this business, so this year negotiations were opened between the Association of Fruit Growers of the Fraser Valley and the Dominion Express Company, and the Company very generously brought the rate down to $2.25 from Vancouver or any point in British Columbia to Winnipeg or any point in the Northwest. This great reduction has given a wonderful impetus to fruit growing in that Province, and has given the growers courage, so that they are trying to make the best of their opportunities and are doing remarkably well. In connection with their shipping association they have meetings to discuss the best kinds of packages, and instead of shipping their fruit in clumsy rough boxes as they used to do two or three years ago, they are using the California packages now, those small light boxes with four baskets in a box, and all their plums are sent to market in that way. They are also paying more attention to the selection of their fruit, which is a matter of great moment if a profitable business is to be done. In that Association every grower must put his name on every box of fruit he ships, so that the careless packing is easily traced to its source, and the man gets such a rubbing down from the secretary who looks after the affairs of the Association that he is very apt to mend his ways in a short time; hence a much better condition now exists than formerly. Fruit reaches the consumer in about three days from the time of shipment by this arrangement with the express company and usually in good condition.

An Opening for Ontario Fruit.—Ontario could secure a large part of this trade with Winnipeg and the west for apples and pears, also a considerable part of the trade in plums and cherries as far west as Regina, and as far as the grape trade is concerned, as I have already remarked, the whole of that is open to Ontario growers. Here is a market for our own fruits where the tastes of the people do not require to be educated to appreciate the flavor, for instance, of our grapes. Indeed, many of the people having been brought up in the east will prefer,—and I have been surprised at this—the Ontario grown grapes to the California grapes, which to my mind are very much better than those of Ontario; but having acquired a fondness for the musky flavor found in many of our grapes they will give the preference even at the same price to Ontario fruit. At present, Ontario fruit has not a very high reputation in Winnipeg, largely it is said, for the reason that in the past it has been very carelessly shipped. To put a lot of baskets of grapes in a freight car and have them bumped and thumped against other freight cars for four or five days on the way to Winnipeg, generally shakes the baskets of this fruit to such an extent that a large part of the grapes are reduced almost to a condition of pulp. When bruised in that way, they soon get mildewed, and in a closed car, unless the car is iced, the chances of getting fruit of that character to Winnipeg in good condition in such packages as you use to send them to Toronto is not very great. Indeed, there must be a very thorough reformation in that particular, and the interests at stake will warrant the taking of any reasonable pains to bring success, and I do not think that any form of package yet devised is better adapted for this purpose than that used by the British Columbia fruit growers, which is the California package. In this there are four baskets, each holding about 6 pounds, the whole package weighing about 25 pounds, a weight which is easily handled. I have no doubt that arrangements could be made by Ontario fruit growers with the express company whereby they would get at least as good rates as are given to

British Columbia people, and by this route fruit could be delivered in three days from time of shipping to any part of that country on the main line as far as Regina, and Ontario grapes if well put up and carefully handled should stand that length of time in transportion and reach their destination in perfect order. A word to the wise, it is said, is sufficient. I hope that some Ontario fruit growers, although they may have made unsuccessful attempts in the past, will use their best efforts towards capturing some fair share of this market. It will not do to run away with the idea that any sort of fruit will suit the Winnipeg people. In talking recently with the largest fruit merchant there, he said: "If you have at any time the opportunity of talking to the large fruit growers in Ontaria, impress upon their minds the fact that nothing is too good for Winnipeg, and that it won't pay them to ship inferior fruit." He said "It is disagreeable for us to handle it, we have so many complaints, and it gives no profit whatever to the shipper, because so much of it has to be rejected" A demand for Ontario fruit once established in the Northwest country would be an ever-increasing one as the population multiplies, and would in a short time, I am sure, get to be a trade quite well worth looking after. Through the kindness of the manager of the Macpherson Fruit Company at Winnipeg I have been furnished with some particulars as to the quantity of fruit handled by that one firm during the past year, from that source. Mr. Scott tells me that they have handled of British Columbia plums this season about 10,000 cases of about 20 pounds each, besides small experimental shipments of 200 cases of strawberries and 25 cases of cherries. Many of the earlier shipments of plums he says, came in bad order, but the later shipments were all right. In regard to Ontario fruit, he said, "We have not had good results yet from plums or peaches, and we are inclined to think that it is a difficult matter to ship these two varieties of fruits to this point at a profit." He says it takes some time in a comparatively small market like that to dispose of a car load of fruit, and in the meantime the perishable varieties depreciate very rapidly. Grapes, however, he says, tomatoes and pears in baskets, or packed in boxes as the California pears are sent in, come in perfect condition, and if shipped in good refrigerator cars well iced, there would be no difficulty in carrying any quantity from Ontario to that market.

I might also speak of the demand further east, and nearer home, where there is another town of importance, Rat Portage, with 4,000 to 5,000 people, and some other smaller places between that and the fruit-growing districts of Ontario, which can scarcely be said to extend much further west than Pembroke. Beyond that you may say that fruit-growing is largely experimental, and the quantity of fruit produced is entirely insufficient for supplying the needs of the people. The residents in the west are hungry for fruit, and continually wondering why it is that with such vast quantities of fruit in Ontario, much of which is said to be sold at unremunerative prices. they should be debarred the privilege of disposing of large quantities of it at reasonable rates. I hope that some arrangement will be reached in the near future whereby the large surplus, which is an accumulating one in Ontario, will be made available to these fruit hungry people in the Northwest.

Mr. McNeill: I am sure a few remarks will be in order just here without waiting for an invitation. I have been waiting for this opportunity for some time. I am really pleased to have a chance now to express myself plainly and clearly. I am sure that we must all have been pleased as fruit-growers with the earnest efforts of Dr. Saunders in this direction of making markets for us. It is that end of the fruit-growing business that must be attended to, and we are extremely obliged not only on this occasion, but on every other occasion, when he has had the chance to do something for us. At the same time he has given an opportunity to-night of saying a few plain things which I hope will reach the people of Manitoba. Here we are, fruit-growers of Ontario, with any amount of fruit, anxious to sell it and willing to give them the very best, and here are the people of the Northwest anxious to get it. But we cannot get our money out of it when we send it up to them. There are the plain facts of the case. Surely there is intelligence enough in this Association to get at the reason, and find out why it is that there should be such a discrepancy between the fruit-grower and the fruit-eater. These remarks come a little personal from the fruit men in Winnipeg to myself. I have shipped these last two years something like ten car loads of fruit to the Winnipeg market, and I know this, that many of the people in our section who have shipped very largely up there positively refuse to let one pound of fruit go to Winnipeg unless they got their money before the fruit left the station. Now, those are the hard facts of the case. I do not believe that every fruit merchant and every commission merchant is a rogue, but I do say we have been rascally swindled by some of the people of Winnipeg. They have spread reports about the manner of packing our fruit, and about the condition in which it got there, and I have every reason to believe—and I say this with the feeling that I shall be reported in Winnipeg—that the reason the reports were sent out were simply that they might have an excuse for sending us a less return than they otherwise would. Now our dealings with Winnipeg this year were much more satisfactory than usual, because most of us said, "Show us the color of your money before we send the fruit," and in most cases they did so. The fruit that went up from our section to Winnipeg—and we appear to be a little better situated than you are here in Niagara District for shipping of small lines of fruit, I don't know why—went up, the most of it having been paid for before it left our section; and strange to say, there were no bad reports, or very few bad reports, of any carloads that were paid for before they got there; but as to any carload that went up there that was not paid for before it got there, there was the most terrible muss with that car—it was mildewed, rotten, poorly packed, and everything that was bad about it. (Laughter). I do not mean to say but what that there was some foundation for these reports of badly packed fruit, but I say it is not all the fault of the packing. I personally packed a very large number of cars of fruit that have gone to Winnipeg, and we have packed those in freight cars, it is very true. I might say in that respect that we like nothing better, having tried refrigerator cars, and they were not at all satisfactory. We have tried it over the Northern Pacific, the Canadian Pacific, and we have tried the ordinary grain car, and we found that the best results came from the ordinary C.P.R. car with open windows in each end. We packed the grapes, for instance, in 10-lb. baskets, packed them in two layers, that is in two baskets five high, then put a heavy platform that separated the next tier of five high. Those were all packed in so securely that they could not move in any direction, and yet not so close but that the air could circulate freely through it. You can easily see that those baskets were packed so carefully that not even the ingenuity of the trainmen could stir them from their position; and yet they were not so tightly packed but that when the car was in motion there was a current of cool air—especially when they got up north—constantly passing through these baskets, and they got up there in good condition, where we had an independent report of it. Now, I have seen those cars packed. With any information I have from years of shipping up there I cannot suggest any better mode of packing the baskets than the method which is adopted; nor can the merchants themselves suggest to us any improvement. We have asked them personally to suggest some way by which we could pack our fruit more satisfactorily, and there has been no suggestion that came down from them that has not been adopted that proved good, and I think it is time that these reports of the bad packing of the Ontario people should cease. (Hear, hear). With regard to tomatoes there is no difficulty whatever in shipping our ordinary tomatoes up there, and in those years when they have no crop up there—which is about three years out of five—it is a very profitable trade indeed; but it is a trade that is rather delicate to handle, because it requires considerable experience to select the tomatoes that are fit for shipping. In regard to peaches, they are a little more difficult to ship; but with regard to pears there is no difficulty whatever, and the people of Winnipeg this year I know personally were supplied with pears, ton after ton of them, from our own section, and the returns we made were about thirty cents per bushel. Now, if the people of Winnipeg are not satisfied with pears that return to us only about thirty cents per bushel, they cannot be very fruit hungry—and the very best of pears at that. However, let it be understood that we are extremely obliged to Dr. Saunders, who has always been one of the best friends of this Association, and we hope he will do more of this missionary work for us.

Dr. Saunders: I suppose human nature is pretty much the same all over the world. We heard these reports this afternoon from even such good people as the British people, that under certain conditions the apples were all slacks, and I suppose there are such people in this country perhaps, and under conditions where they are tempted financially to do so they make things appear worse than they really are. However, I may say that in coming through Winnipeg about the end of August I spent a day there, and spent a good part of it among the fruit shops, and I was shown three cars of fruit that came from Washington that had just been opened up, and some from California. I was also shown quantities of fruit from British Columbia, and some from Ontario. I suppose Mr. McNeill in his remarks refers principally to apples.

Mr. McNeill: I have been engaged more largely myself in grapes and pears.

Dr. Saunders: I did not see any Ontario grapes this time. The market seemed to be bare of them just at that particular period. I must say that I saw some very fine apples exhibited there for sale, and they were getting five dollars a barrel for them and they were going off very rapidly. Just at that time also there was a large quantity of Duchess apples that had been sent from Ontario, that had evidently been very ripe when they were sent, and they came in there on a Saturday afternoon, and in order to get rid of them they were obliged to sell them at about twenty to twenty-five cents a basket, which would not return anything to the shippers; but they were so far gone, if they had not been sold at that price they would have been dumped out on Monday morning, showing there are two sides to this question. While I saw some very good fruit, I saw also some that should not have been sent in such quantity and so far gone in ripeness. The fruit from British Columbia also was very variable. I found in many packages of plums perhaps three or four large plums on the top, and then mixed through some that would not be more than half the size, and here and there a partly decayed one. Such fruit as that does not impress a buyer favorably. If you have got a lot of small apples, grade them and put the small ones all in one box. If a man buying a box of plums sees one or two large plums, he naturally thinks they all ought to be that size, and then he says, "These others are inferior." Many of those California and Oregon plums that I saw were rather small in size, but they were all the same size in the same box, and hence did not give rise to any question or thought in the purchaser's mind about being inferior. I have no doubt a large part of the discredit that has attached itself to the shipment of Ontario grapes in the Winnipeg market arises from the fact of their being sent forward by freight instead of by express. Freight cars will take six or seven days at least.

Dr. Saunders: I have travelled up very often with an express car, and it is only two and a half days from Ottawa. Toronto would be about the same. Well, three or four days makes a wonderful difference to fruits of that texture when they are really ripe, and makes all the difference sometimes between getting them there in first-class order and very poor condition; and if you have ever ridden in a freight car,—I have had some of that experience, too much of it—and been subject to the jarring and jolting that nearly knocks you off your feet when the cars collide, you would not wonder at the fruit being mashed in four days of that kind of jarring.

Mr. McNeill: But the fruit by express was put into exactly the same car, only it was attached to a passenger car.

Dr. Saunders: Exactly, but the passenger train is not jolted about the way fruit cars are. When you have an opportunity take a ride 50 miles in a freight car, and you will be perfectly satisfied my remarks are not fiction. (Laughter.) I believe the plan that would lead the fruit-growers of Ontario to the greatest good would be to make some arrangement with the express people, and I fancy they would be just as approachable to the Ontario people as they are to the people of British Columbia, and it is far better to pay $2\frac{1}{2}$c a pound to get your fruit through in good order than to pay a cent a pound and get it through in poor condition.

Mr. Gregory: I do not believe it is altogether the fault of the growers or the fault of the commission men in Winnipeg why we do not receive better prices for our fruit. I believe one of the principal causes of that may be remedied if an effort is made by this Association. I think one of the crying evils of the fruit-growers of this country is the kind of cars in which we have to ship our fruit to the Northwest Territories and other points. The railway people have promised various times to build us ventilated cars such as are required to successfully ship grapes and fruits of that kind to the Northwest and other distant points, and they have neglected or refused to do so to the present time. I believe it is practically impossible for us to ship fruit with the cars that are now being provided, as box cars are totally unfit for the service. I do not see why the railway people should not build cars the same as the Northern Pacific people have built for California. The industry has grown here to such enormous proportions that it certainly would pay them to provide cars of a suitable kind to carry the fruit. I believe there is something in the package. but with the package such as suggested by Dr. Saunders, placed in suitable cars, we can send grapes by freight to get them through for one and a half cents. Their being on the road four or five days will not deteriorate them. They go through in good condition if it takes them five days to go through. This Association could take steps to induce the railway company to build cars suitable for the through traffic.

The PRESIDENT: This discussion is getting very interesting, but I am sorry to be obliged to shut it off at this time, but it would not be courteous to Dr. Mills, of Guelph, who is to follow, if we kept it open any later at present. The hour is already advanced, and while I recognize the importance of this discussion I do not think we had better continue it to-night any longer, but to-morrow morning if any member wishes I will arrange it so that the discussion can be resumed. Meantime think it over, and if there is any way you can suggest by appointing a committee to attend to it, embody it in a resolution and then we will put it in practical shape. The Fruit Growers' Association are only too glad to do anything of that kind; that is their work.

HORTICULTURE AT THE ONTARIO AGRICULTURAL COLLEGE.

BY DR. JAMES MILLS, PRESIDENT O. A. C., GUELPH.

President Mills, of Guelph, conveyed greetings from the Agricultural College and congratulated the people of Ontario on having so great a variety and such an abundance of delicious fruit. Few people, he said, were better off in that respect; and for one he could not forget the record made by Ontario in the fruit competition at the World's fair in Chicago—more points than Michigan, Ohio or New York, more even than California or any other state in the Union. Surely this was something worth recalling from time to time, and the facts of the case indicated how we should proceed in order to be successful in the future. Our natural advantages were not so great as in some states across the line; but the intelligence of Canadian farmers and fruit growers was of a high order, and that was the most potent factor in production. So our hope for the future must rest on the wise and thorough training of the rising generation. We could not change our soil or climate, but we could do much to increase the industrial skill and aptitude of our people. By general and technical education, we could make them more skillful, progressive and successful workers—better mechanics, stock raisers and fruit growers; keener, shrewder and more prosperous merchants and manufacturers. Much depended on the general education and special training of our young people. In general education, Ontario has done and was doing well; but in the matter of industrial training, she was far behind. He would like to speak on the need and importance of having a good industrial High School in each county; but time and place forbade.

A fruit grower needed to be an intelligent, wide awake man,—a man of good education who had learned how to use his head, his eyes and his hands,—a chemist, geologist, botanist and entomologist, a very keen observer and a man of sound judgment. The time had certainly come when fruit growers should understand the use of the microscope and be well versed in botany and entomology. The loss of crop from fungous diseases in the United States was from $150,000,000 to $200,000,000 a year. The proportion of loss from this cause in Canada was quite as great—from rust, smut, apple scab, black knot, pear blight, peach yellows, leaf curl, ripe rot, mildew, anthracnose, and many other diseases—all caused by minute vegetable organisms. How important, then, that farmers generally and especially fruit growers should be familiar with that branch of botany which deals with these low but very troublesome forms of plant life? The annual loss from insects, including San Jose scale, was perhaps greater, and it went without saying that fruit growers should be practical entomologists, men who know the character and habits of troublesome insects and could avail themselves of the best known methods of preventing their ravages.

At the College, they were giving horticulture more prominence than formerly. This was true as regards both teaching and practical work. Students of all the years had lectures, with a fair amount of practical instruction in fruit growing, vegetable gardening and greenhouse work. A new orchard had been set out, their vineyard has been enlarged and a great number of variety tests had been made. The tests during 1898 had been with 15 varieties of red raspbarries, 15 of black raspberries, 9 of blackberries, 13 of currants, 13 of gooseberries, 219 of strawberries, 11 of tomatoes, 270 of geraniums, and 30 of coleus. The results of these tests would be found in the next annual report of the College. The department had a complete set of greenhouses with an extensive collection of plants for use in lecture room and laboratory practice. The work done was abreast of the times; and it had reached a stage when they thought that they might say that it was of considerable practical value to the students at the College and to farmers and to farmers and fruit growers throughout the Province.

The College and the Fruit Growers' Association conjointly had charge of the Fruit Experimental Stations of the Province. Two representatives of the former and four of the latter constituted the Board of Control. At present there were thirteen stations, and two more would be established after the next meeting of the legislature. The new stations would be in the northern part of the Province, one on St. Joseph's Island and the other on the Government Farm at Dryden, about eighty miles east of Rat Portage. These stations were doing excellent work for the Province in testing varieties of fruit on different soils and under different climatic conditions, and in preparing a description o the Fruits of Ontario, a most valuable work containing good cuts, and a clear, reliable, description, with the strong and weak points of every variety of fruit grown in the Province. The next annual report of the Board would contain this description as far as it had gone.

The Fruit Growers' Association had done good work for Ontario in testing varieties, giving information about planting and cultivation, and keeping the subject of fruit growing before the people; but he was inclined to think that it had not done all that it was capable of doing and ought to do in the way of finding satisfactory markets for the fruit of the Province. It was important to grow good fruit, but no less important to find good markets for it; and this latter part of the problem demanded the most searching investigation and vigorous action by the Asssociation at the present time; for was it not a fact whenever there was a really good crop of any variety of fruit in the Province, it was impossible to sell it so as to make anything like fair returns for the labor and capital invested. The grower very often had to choose between being robbed by commission men and letting his fruit rot on the trees. Was it not so in the case of both small and large fruits? If one had a special or permanent market, it was his interest to look carefully after it; and he could give it direct personal attention; but most growers had to place their fruit on the open market or markets of the country and rely upon the machinery of trade to dispose of it. All such needed the help of some organization or association to look after their interests—to direct their attention to the best markets, negotiate for cheap, rapid and suitable transportion, and work for the enactment of such rules and regulations as would be likely to secure something like a fair and honest disposal of the fruit sent to commission men. What about the northern parts of Ontario, the Province of Manitoba, and the Province of Quebec? Could any of our fruit be dispoeed of in these places, without allowing express companies and commission men to absorb the whole product? Could information be given to fruit growers through the press or by private circulars as to markets during the selling season? Here was a field for some committee or individual to be appointed by the Fruit Growers' Association—here was room for the exercise of the best business talent in the Association; and he took the liberty of commending the matter to their prompt, earnest and most careful consideration.

The PRESIDENT: I am sure we have listened to Dr. Mills' address with the greatest of pleasure, and I quite recognize that the points he brought out are points that should be taken into consideration and acted upon in a vigorous manner by the Fruit Growers' Association. I may say that while we may not have done as much as should have been done in the past in that regard, it is only within the last few years that the subject has been impressed upon our minds that we had over-production in fruit. There are a great many difficulties to be overcome in carrying out the suggestions which Dr. Mills has made, and time will hardly permit of my answering it altogether at the present time, although before the meetings close I hope we will find time to have a little further discussion of that subject, because it is one of vital importance, and there are points to be brought out to show that the officers of the Fruit Growers' Association have not been negligent in this respect. One point I will call attention to, and that is the fact that we have not had in the past years at our command any money with which to go about or undertake the fight which Dr. Mills has suggested. It takes money to do that sort of thing, and also it necessitates the co operation of every member of the Association. (Hear hear.) It cannot all be laid upon the Directors. You must understand, too, that the Association is only allowed a certain amount, and that it has devolved upon us to exercise the greatest of care as to every dollar we expend, and until we are in such a position—which we are rapidly obtaining, I am glad to say—we have not felt that we were able to undertake the contest that has been urged upon us; but I believe that before this meeting closes means will be taken to enter into this matter, and that good will be brought about. I am very glad that the Doctor has so emphatically brought the matter before the members of the Fruit Growers' Association; but I want to say to you, do not leave it all on the officers. It is in your power; it is to you that the hints were thrown out by the Doctor to bring before the Association every point that you can think of, and also bring results before the Association, and your officers will act upon them. (Hear, hear.)

The SECRETARY read minutes of last meeting held in Waterloo in December, 1897; also letter from Rev. E. Burke, Prince Edward Island; also letter from Winnipeg re Western Horticultural Society; also letter from M. M. Black, regretting that he could not supply the paper asked for; also from Mr. A. McD Allan, of Goderich, regretting inability to be present, he having been invited to speak on preparation for the Paris Exposition, 1900; also letters of regret from J. A. Morton, of Wingham, and Mr. Nicol, of Kingston.

The PRESIDENT: I am sure we are very much pleased to receive such correspondence, showing that the influence of the Society is extending to sister provinces.

The SECRETARY: I thought best this year, in order to give as much information as possible to all the members of our Association, to have a detailed account of the expenditures printed for distribution at the meeting. The premiums last year were larger and better than before, and a part of the money paid to Mr. Beall was due him for work done last year.

Mr. SCARFF (Woodstock) moved the adoption of the Report as read.

The motion was seconded by Mr. Murray Pettit, and carried.

Mr. A. H. PETTIT, as one of the auditors, read the Auditors' Report, finding a balance of $784.96, to which the bank's voucher is attached. He moved the adoption of the Report, which was seconded by Mr. Orr, and carried. The Report is as follows;

TREASURER'S REPORT, 1897-98.

Receipts.		*Expenditures*	
Balance on hand Dec. 1, 1897	$ 266 02	*Canadian Horticulturist*	$1,941 87
Government grant	1,800 00	Salary secretary, editor and assistant	1,200 00
Membership fees	4,147 13	Commissions	670 00
Advertisements	337 92	Premiums	455 78
Bound Vols. and binding	16 05	Illustrations	305 98
Back Nos. and samples	7 37	Affiliated societies, organization and lecture course	385 07
Miscellaneous	11 45	Directors' expenses	203 75
		Printing and stationery	139 13
		Postage and telegrams	135 86
		Committees	115 92
		Reporting	112 95
		Express and duty	45 50
		Auditing	31 00
		Collection and discount	27 24
		Book binding	26 45
		Care of rooms	3 00
		Balance on hand	784 94
	$6,585 94		$6,585 94

Details of Exenditurers, 1897-8.

Canadian Horticulturist—

Dudley & Burns, Toronto, November '97, $163.78 ; December, $134.07 ; index '97, $30.00 ; January '98, $154.15 ; February, $181.17 ; March, $176.00 ; April, $184.86 ; May, $177.10 ; June, $146.73 ; July, $147.15 ; August, $147.06 ; September, $153.40 ; October, $146.40. $1,941 87

Salary—

Secretary-Editor, Assistant and Treasurer 1,200 00

Commissions—

December '97, $20.83 ; January '98, $49.80 ; February, $20.95 ; March, $24.00 ; April, $24.60 ; May, $22.60 ; June, $8.50 ; July, $1.80 ; August, $4.95 ; September, $184.35 ; October, $247.10 ; November, $61.00 .... 670 00

Premiums—

Morris, Stone & Wellington, $385.91 ; R. A. Nelles (postage for premiums) $28.36 ; L. Woolverton, (cost of packing premium plants and trees) $47.51 .... 455 78

Affiliated Societies—

Organization, Thos. Beall, $170.90 ; Lecture Course, Wm. Bacon, $51.37 ; M. Burrell $29.80 ; Wm. Gammage, $22,50 ; G. C. Caston, $6.95 ; A. McNeill, $103.55 .... 385 07

Illustrations—

Grip Engraving Co., $278.06 ; Gardening Co., $5.80 ; Times Printing Co., $5.05 ; *Globe* Printing Co., $10.82; Stecher Lith. Co., $5.25 .... 305 98

Directors' Expenses—

H. Jones, $23.50 ; G. Nicol, $20.35 ; W. Coulter, $20.35 ; Thos. Beall, $15.30 ; W. E. Wellington, $6 00 ; T. H. Race, $.9.00 ; R. B. Whyte, $23.85 ; A. M. Smith, $6.50 ; L. Woolverton, $8.00 ; W. M. Orr, (Kingston Meeting) '96, $2.00 ; Zimmerman Hotel, Waterloo, (L. R. Taft) $1.50 ; A. McNeill, $15 .70 ; J. S. Scarff, $10.80 ; M. Pettit, $11.90 ; R. L. Huggard, $11.00 .... 203 75

Printing and Stationery—

A. M. Millward, (Printing) $109.75 ; R. A. Nelles, (Stat.) $8.30 ; J. A. Livingston, Printing) $17.00 ; Wm. Forbes, (Stat.) $1.20 ; Buntin, Gillies & Co., (Stat.) $1.20 ; A. F. Hawke, (Stat) 43c. ; Martin Bros., (Stat.) $1.25 .... 139 13

Postage and Telegrams.

R. A. Nelles, (postage) $99.70 ; Bell Telephone Co., $13.25 ; G. T. R. Agent, (telegrams) 71c. ; C. P. R. Agent, (telegrams) $1.97 ; stamps transferred from cash, $20.23 .... 135 86

Committees—	
W. M. Orr, (Tariff Guelph) $7.05; W. E. Wellington, (San Jose Scale, Ottawa) $21.10; A. H. Pettit, (Ottawa) $23.05; M. Burrell, (Ottawa) $29.55; E. D. Smith, Ottawa) $27.92; W. M. Orr, (Finance) $2.15; M. Pettit, (Finance) $2.10; A. M. Smith, (Finance) $2.00	115 92
Reporting—	
Thos. Bengough	112 95
Express and Duty—	
R. A. Nelles, (Express and Duty) $41 19; J. S. Randall, (Freight) $2.90; J. Blair, (Freight) $1.91; L. Woolverton, (Cartage) 50c	46 50
Auditors—	
G. E. Fisher, $11.00; A. H. Pettit, (two years) $20.00	31 00
Collection and Discount—	
Bank of Hamilton, (Collections) $8.79; Bank of Hamilton, (Discount) $18.45	27 24
Binding "Canadian Horticulturist"—	
Brown Bros.	26 45
Care of Rooms at Annual Meeting—	
I. Hoffman, (Waterloo)	3 00
	$5,800 98

We, the members of your Finance Cemmittee, have carefully examined the accounts for expenditure made by the Secretary-Treasurer for the current year. And we beg to report that they were made in the best interests of the Association.

We have pleasure in stating that we found the accounts in perfect order for inspection.

Committee { W. M. Orr, M. Pettit, A. M. Smith.

REVISION OF THE CONSTITUTION.

Considerable discussion arose over the proposed changes in the constitution and by-laws. Amendments were made to articles 2, 4, 6 and 7 of the constitution, and clause 1 of the by-laws was amended and made article 9 of the constitution. A new clause was adopted as article 10. Clauses 3 and 4 were adopted as articles 11 and 12 respectively. A new clause was adopted as article 13.

Mr. Race moved that the following clauses and the closing recommendation of the committee be adopted as amended, and that the clauses of the amended and revised constitution and by-laws be numbered consecutively from the beginning, removing all "constitution and by-laws" distinction. (Carried.)

The constitution and by-laws as amended are as follows:

CONSTITUTION OF THE FRUIT GROWERS' ASSOCIATION OF ONTARIO.

1. The Association shall be called "The Fruit Growers' Association of Ontario."

2. Its object shall be the advancement of the science and art of horticulture in all its branches and the encouragement of tree growing by holding meetings for the discussion of all questions relative to horticulture and forestry, by collecting, arranging and disseminating useful information, and by such other means as may from time to time seem desirable.

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

4. The officers of the Association shall be a president, vice-president, a secretary and a treasurer, or a secretary-treasurer, and thirteen directors and two auditors, to be elected at each annual meeting.

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

6. This constitution may be amended as provided for by section 32, subsection 1, of The Ontario Agriculture and Arts Act

7. The said Officers and Directors shall prepare and present at the annual meeting of the Association a report of their proceedings during the year, in which shall be stated the names of all the members of the Association, the places of of meeting during the year, and such information as the Association shall have been able to obtain on the subjects of horticulture and forestry in the Province during the year. There shall also be presented at the said annual meeting a detailed statement of the receipts and disbursements of the Association during the year, which report and statement shall be entered in the journal and signed by the president as being a correct copy; and a true copy thereof, certified by the secretary for the time being, shall be sent to the Minister of Agriculture within forty days after the holding of such annual meeting.

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

9. The Board of Directors at its first meeting shall appoint from among its own members or otherwise a Secretary and a Treasurer, or a Secretary-treasurer.

10. The President, the Vice-President and Secretary or Secretary-treasurer shall be *ex officio* members of the Board of Directors; and the President, or in his absence, the Vice-President an *ex officio* member of all committees.

11. The President, Vice-President and Secretary shall constitute the Executive Committee of this Association, whose functions it shall be to manage the affairs of the Association, to control the finances and make the necessary disbursements throughout the year, and to bring a report of the same before the Board of Directors at each annual meeting for approval.

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

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

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

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

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

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

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

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

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

21. At a special meeting, no business shall be transacted except that stated in the Secretary's circular.

22. The order of business shall be: (1) Reading of minutes; (2) Reading of Directors' report; (3) Reading of Treasurers' report; (4) Reading the Auditors' report; (5) Reading reports of Standing Committees; (6) President's Address; (7) Miscellaneous business.

23. The by-laws may be amended at any general meeting as provided for by section 32, sub-section 1, of the Agriculture and Arts Act.

24. The election of officers shall take place at the morning session of the last day of the annual meeting in each year, the newly-elected officers to assume their respective duties and responsibilities at the close of the said meeting.

25. The reasonable and necessary expenses of directors and officers in attending meetings of the Board of Directors and Committees, shall be provided from the funds of the Association.

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

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

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

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

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

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

By-Laws for Affiliated Horticultural Societies.

(*Prepared by Mr. Thomas Beall and Mr. L. Woolverton, as ordered by the Board of Directors of the Fruit Growers' Association of Ontario.*)

This Society, known as the Horticultural Society of the of , organized under the provisions of the Agriculture and Arts Act of the Province of Ontario. Chap. 43, R.S.O. 1897, agrees to conduct its affairs in accordance with the several provisions of the said Acts, and with the following by-laws and regulations.—Sec. 13.

1. The members of this Society for any year shall be residents and ratepayers of this municipality to the number of at least fifty, and also others, who shall have paid one dollar into the funds of the society as membership fee for that year.—Sec. 7, s.-s. 1 (b).

2. The objects of this society shall be to encourage improvement in horticulture, and to secure to each member equal encouragement therein.—Sec. 9, s.-s. 2.

3. There shall be at least public meetings in each year for discussing local horticultural matters, and for hearing lectures on improved horticulture.—Sec. 9, s.-s. 2, (a).

4. At any public meeting there may be an exhibition of such plants, vegetables, fruits and flowers as may be in season; and wherever such an exhibition is held, there shall be present at least one expert gardener who shall give such information and instruction appertaining thereto as may be required; but no prizes of value shall be offered for competition by the society at such meetings.—Sec 9, s.-s. 2, (e).

5. The annual meeting, and all other public meetings shall be open to the public free of charge. But members only shall have the right to vote at any meeting.

(*a*) When exhibitions are held at such public meetings, the public shall be invited to exhibit such horticultural products as may be thought suitable for the occasion by a committee appointed by the Board to superintend such exhibitions.

(*b*) This committee shall take such means as they think proper to secure exhibits for the occasion, and also procure proper conveyance for collecting and returning the same free of expense to exhibitors.

(*c*) These exhibitions shall be open to members and other exhibitors free of charge.

(6) A sum of money not to exceed dollars may be offered in prizes in any one year for essays on any question of scientific enquiry relating to horticulture.—Sec. 9, s.-s. 2, (d).

7. Each member shall be given by this society a free membership in the Fruit Growers' Association.—Sec. 9, s.-s. 2, (b).

8. There shall be procured for each member, trees, shrubs, plants, bulbs or seeds of new and valuable kinds in each year, sufficient in quantity to exhaust the funds of this society after allowing for necessary working expenses.—Sec. 9, s.-s. 2, (a).

9. The annual meeeing shall be held at half past seven in the evening of the second Wednesday in January, when there shall be elected a president, a first vice-president, and not more than nine directors, who together shall form the board of directors. At this meeting, the society shall also elect two auditors for the ensuing year.—Sec. 7. s.-s. 1 (e).

(*a*) At this meeting, only those members who have paid their subscription for the ensuing year shall be entitled to vote.—Sec. 10, s.-s. 1.

(*b*) At this and all subsequent public meetings, ten members shall constitute a quorum.—Sec. 10 s.-s. 1 (e).

10. The board of directors at its first meeting shall appoint a secretary and a treasurer, or a secretary-treasurer.—Sec. 7 s.-s. 1 (*f*).

(*a*) Five directors shall constitute a quorum for the transaction of business.—Sec. 14.

(*b*) Subject to these by-laws, the directors shall have full power to act for and on behalf of the society and all grants and other funds shall be expended under their direction.

At each annual meeting the directors shall present a detailed statement of the receipts and expenditures for the preceding year, and also a statement of the assets and liabilities of the society at the end of the year, certified to by the auditors.—Sec. 11, s.s. (c).

11. The said statements shall, when approved by the meeting, be placed on permanent record in the books of the society, and such portions thereof, together with what is further required by sub. sec. (a) of Sec. 11, shall be sent within one month to the Department of Agriculture.—Sec. 12.

12. The Director of the Fruit Growers' Association of Ontario for the Agricultural District in which this society is situate shall be considered an honorary member and receive notice of the meetings.

13. These by-laws and regulations cannot be altered or repealed except at an annudl meeting, or at a special meeting of the members of the society, of which two weeks' previous notice has been given by advertisement.

AGRICULTURAL DIVISIONS.

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

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

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

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

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

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

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

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

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

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

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

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

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

R.S.O., 1897, c. 43, Schd. A.

ELECTION OF OFFICERS.

The report of the Nominating Committee was read by Mr. Race, and, on motion was unanimously adopted. The list of officers will be found on page 2.

COLD STORAGE OFFICIALS AND INSPECTION.

Mr. M. PETTIT moved "That the Secretary be authorized to communicate with the Montreal and Nova Scotia societies, requesting them to appoint one or more delegates to join a delegation appointed by this Association to interview the Government, and urge upon them the importance of appointing officers whose duties shall be to see that proper ventilation and greater care be given to the storage of apples and other fruit exported to Great Britain on ocean steamers, and that the Secretary shall make all arrangements and dates for meetings of such deputation." Mr. Pettit said: I regard this as very important work for this Association, and I believe if it is fully pushed, it will mean thousands of dollars to the fruit growers of this Dominion. This devil of Mr. Pattison's, that we heard about yesterday has one of his hiding places in the holds of these ocean steamers, and he can get up as much smoke, and steam, and heat there as any place else where it is found, and I think it is the duty of this Association to try and chase him out.

Mr. BOULTER seconded the resolution.

The SECRETARY.—It seems to me that the object of that Committee might be a little bit enlarged. This Association has often asked the Government to do a little in the way of inspection of fruit for export. It appears to me that it is practicable to do a little in that line now, because we are beginning a new business in exporting fruit in cold storage, and it is quite practical that everything that goes in this cold storage compartment should be inspected by a Government official. As a matter of fact, it has been done already in a small way. The special shipments that have been already made have all been inspected by Government officials, and marked "Inspected Canadian Fruit," and I think, if that work could be made permanent, it would mark a new era in our export trade. It is very important that the Government should be asked to act in this particular. Of course, we do not expect that every package will be inspected—they do not do that at the present time with our experimental shipments, but about one in ten is opened, perhaps one in one hundred, if you like, at random, but a sufficient number is opened to satisfy the inspector that the goods are up to the mark that is on the exterior of the package. We have certain grades which should be observed, and I think that every package should be guaranteed to be up to that grade, and it is very important that this Committee should be charged with asking from the Minister of Agriculture some provision in this particular. I do not suppose it is possible that all the outside general business of exporting apples in barrels should be thus controlled, as it would be too great an undertaking; but I think, in the special export trade in cold storage such as the Government has now adopted in cases, these could all be inspected, and it would be a great advantage to fruit growers to have all their fruit placed on the British market as inspected fruit. I would move that the words, "and to make provision for inspection" be also added to the objects of this Committee.

Mr. A. H. PETTIT.—You do not mean to make that compulsory?

Mr. BURRELL.—Do you think that an inspection of them by opening them up when carefully packed in tissue paper and so on would be advisable?

The SECRETARY.—Yes, I think just as soon as this special trade is thrown open to the public, a great many will put up fruit in improper shape. I do not know what provision could be made to prevent it, but I think we should ask the Department to make some provision.

Mr. HUGGARD.—In the resolution Mr. Pettit has just now presented, I think he hardly goes far enough in the way of invitation to these other societies to co-operate with the Committee appointed by this Association in the transportation of goods. Fruit growers know perfectly well that the rate of transportation, at the present time, is neither fair nor satisfactory.

Mr. BURRELL.—Excuse me, but I believe that question of transportation is coming up in a separate resolution.

Mr. A. H. PETTIT.—If the Secretary's clause in regard to fruit being inspected when sent forward means that the work will be entrusted to a man whom the Government might appoint to look after the shipment, and the matter made voluntary with those who request it, it could be accomplished, but to make it a compulsory matter would be a different thing.

THE SECRETARY.—I only ask that some provision be made for the inspection of fruit. I would far rather that all my packages of fruit should bear the inspection mark than have them shipped without that. I consider it a great advantage to me to have my packages marked "Inspected Canadian Fruit;" but I would like to know how it would be possible for me to do that unless there is a Government official to do it. It would be of no gain to the British purchaser to know that a fruit grower inspected his own package. If it is an advantage to me it is to every shipper to have some provision made by which, at some expense even—for I would not object to paying a small fee for the inspection of 100 packages—some provision should be made by which those who wish their goods placed on the British market as inspected fruit might do so.

Mr. BURRELL.—Does Mr. Woolverton think, for instance, that inspection will attain the ends that he imagines? My view of a Government inspection is that it is no good unless it is thorough—unless everything is inspected and inspected thorough. That is an impossibility, and if it is not thorough is it not almost valueless? Would it not be sufficient protection if every man was compelled plainly to brand his name on every package as it went on, instead of having a partial and therefore inadequate inspection? would it not defeat it own object?

Mr. M. PETTIT.—I have amended the resolution so as possibly to meet the views of the Secretary and others. (Resolution read as amended.)

The PRESIDENT.—I would suggest that you add "and branding." I believe every package of fruit sent out to any market, even the local market, should bear the fruit owers' name.

Mr. BUNTING seconded the motion as amended.

The Secretary read the motion as finally proposed by Mr. Pettit, seconded by Mr. Bunting, which was put to the meeting and carried.

The resolution was as follows:—"Resolved, that the Secretary be authorized to communicate with Nova Scotia, Quebec, and other Provincial societies, requesting them to appoint one or more delegates to join the delegation appointed by this Association to interview the Government and urge upon them the importance of appointing officers, whose duty it shall be to see that proper ventilation and greater care be given to the storage of apples and other fruits exported to Great Britain in ocean steamers, and that the Secretary shall make all arrangements and dates for meetings of said deputations; and, further, this Committee shall discuss with the Minister the advisability of adopting some system of inspection and grading."

TRANSPORTATION OF FRUIT.

Moved by G. C. CASTON, seconded by M. PETTIT, that we the Fruit Growers Association of Ontario here assembled, believing that the transportation and marketing of raw fruits is the most important question affecting our Association at the present time, and that decisive measures to that end should be taken by our Association, hereby resolve that a Committee be appointed to be styled the Committee on Transportation and Markets, to be composed of the following gentlemen, viz.. W. E. Wellington (alternate W. M. Orr), Alexander McNeill (alternate E. D. Smith), M. Pettit (alternate T. H. P. Carpenter), W. H. Bunting (alternate R. W. Gregory), and that an appropriation be made from the funds of the Association, the limit of which shall be fixed by the executive to cover the necessary expenses of the committee.

Mr. CASTON, in speaking to the resolution, said that the reason for appointing alternates was that something might occur to prevent a person nominated from attending and it would be necessary that the locality particularly interested in this matter should be represented, and therefore it was wise to provide alternates. There are a great many details with which this committee will have to grapple. It is an old saying that corporations have no souls, and large corporations will have to be attended to; also the question of fast freights. It will be necessary for this committee to get together before they interview the railway and transportation companies so that there will be unanimity amongst them. Then with regard to securing more favorable rates, the distinction between the short and long haul is something enormous in this country. The competition is all over now; the two railway companies have embraced each other. Then there is the question of re icing cars. I am told by a gentleman here that the cars are re iced at North Bay. That is not the place. I have known instances where the ice was all melted before they got to Winnipeg and the fruit was spoiled. They should be re-iced at Sudbury. Then the charges for icing are too high. In places where they have no cold storage the railway company should give a person a little chance. Where a man is willing to provide his own ice it is necessary for the fruit to be cooled down immediately it is picked before it is sent away. The railway company should give a person reasonable time to load, and for the fruit to be cooled down before shipping. One of the anomalies existing in the railway situation is that the competition between trunk lines is so keen that the business is cut down to small profits, and they calculate to make up for it on the short haul. I do not know whether this Committee can do anything in regard to that, but that is really the state of affairs, and the difference between the long and short hauls is simply outrageous in this Province.

The resolution was then put and carried.

REPORT OF COMMITTEE ON NEW AND SEEDLING FRUITS

Prof. HUTT gave the report of the Committee on New Fruits as follows: Nearly all our cultivated fruits are variations or improvements upon some wild type. The many choice varieties of pears now grown in our orchards or gardens have been brought about by gradual development and improvement one after another upon a wild form, which Downing speaks of as the "most austere of all fruits, the choke-pear of our fields, which seizes our throat with such an unmerciful gripe, really being a great improvement upon this wild species." These variations, or new varieties, as we call them, may arise in two different ways:

1. By bud-variation; that is, when a single branch develops some striking difference from the tree or bush upon which it is growing, an example of which we have in the Golden Queen raspberry, which is supposed to be a bud variation from the Cuthbert.

2. By seedlings. This is by far the most productive source of all our new varieties.

Whenever a seedling or bud-variation appears which is possessed of any particular merit, it can be propagated or increased almost indefinitely by such asexual means of multiplication as taking cuttings, layering, budding and grafting. But on the other hand when a variety so propagated is allowed to propagate sexually, that is from seeds, it gives all sorts of varieties, or as we say, does not "come true from seed." It is this constant tendency to variation, with the possibility of something of superior value appearing, that gives to the work of growing and fruiting seedlings such interest. To many persons it is a work as fascinating and as exciting as a game of chance, and as usually carried on it is but little more than such.

That there is so much uncertainty about it is because so few of the players understand the game or put any skill into it. The great variety of the new varieties introduced from time to time are "chance seedlings," or "fence-corner varieties," of unknown parentage, brought up without care, and if they come into prominence it is because their inherent qualities have attracted kindly notice Some few are the product of seed which has been selected and planted, and the young seedlings cultivated and cared for till they come into bearing. In the production of such a variety some degree of skill has been bestowed, and knowing the variety from which the seed was obtained we have a partial knowledge of its parentage. But those varieties upon which the greatest skill has been bestowed are the offspring of crosses, where both parents have been wisely selected, with a view to combining or improving in the resulting cross some of their particularly good qualities. Of such breeding are the Roger grapes, the Ontario apple and the Dempsey pear.

We do not wish to discourage the growing and introducing of chance seedlings, for many of our choicest fruits can boast of no other pedigrees, but we believe that much more would be accomplished, in a much shorter time, if greater attention were given to plant breeding. Let him who has the time and taste for such work make a study of the laws underlying plant breeding; let him not go at it hap-hazard, and wait to see what may turn out, but let him get before his mind some reasonable ideal, and then go to work systematically and make his ideal a reality.

It is during years of the greatest fruit production that the greatest number of seedling fruits are brought to notice. The year 1896 will long be remembered as producing the greatest apple crop on record; and at our annual meeting that year nearly forty seedling apples were reported upon. The past season has, in some respects, been a fair one for fruit, yet it has not produced the abundance of other years, and the number of new fruits sent to your committee for inspection has been comparatively few.

In the following table we give, with brief notes, a list of what has come before us during the past year:

Sender.	Remarks.
SEEDLING APPLES.	
*Chas. Swinnerton, Barrie, Ont	Seedling of Duchess, but later.
*Dr. Saunders, C.E.F., Ottawa	"D'Arcy Spice"; as Eng. russet.
Rev. Prof. Campbell, Yoho Island, Muskoka	A Muskoka seedling, like a medium-sized well-colored Greening.
Dr. J. S. McCallum, Smith's Falls, Ontario	A good sized winter apple, much like Canada Red.
J. A. Mooney, Inverness, Que.......	Of Alexander type, but smaller and of inferior quality.
John Joliffe, Rockwood, Ont........	Seedling of Duchess, but later. Quality not equal to Duchess.
*Joseph Knight, Renfrew, Ont......	1. Resembling somewhat Scarlet Pippin; of high quality for dessert; season, October.
" " " "	2. Med. size; red; good quality; season, winter.
*James Rusk, Bracebridge, Ont	Large and handsome, resembling Duchess; fair quality; season of Wealthy.
SEEDLING PEARS.	
*F. W. Glen, Brooklyn, N.Y	"P. Barry"; like Clairgeau, but keeps till April.
Samuel Nelles, Grimsby	Med. size; color of Bartlett; a little coarse, but good flavor.
John McLaren, St. Catharines	Size and shape of Boussock, of bright yellow color and good quality.
M. A. Reid, Pt. Dalhousie	Like a small Clairgeau, but brighter colored.
SEEDLING PLUMS.	
*A. W. Peart, Burlington...	"Ireland's Seedling"; med. size; dark blue; early, but too small.
A. W. Walker, Clarksburg..........	Med. size; dark maroon; early; good quality; freestone.
John Mitchell, Clarksburg	"Drake's Seedling"; size and color of McLaughlin; freestone: good quality.
*David Matheson, Ottawa	"Cooch"; large; dark red; fair quality; September.
J. K. Gordon, Whitby.............	Size and color of Lombard; good quality; freestone; August.
Harry Marshall, Hamilton..........	Med. size; round; red; fair quality; clingstone; August.
SEEDLING PEACHES.	
*Dr. Stewart, 152 Dowling Avenue, Toronto	Large; yellow flesh; good quality; later than Late Crawford.
*Mrs. Fairbrother, 119 D'Arcy St., Toronto	Large; yellow flesh; handsome color; freestone; season of Early Crawford.
*R. T. Smith, Hamilton	1. Large; white flesh; red cheek; good quality; freestone; season after Hale's Early.
*R. T. Smith, Hamilton	2. Very large; 3 by 3 inches; handsome; good quality; yellow flesh; freestone; season of Rareripe.
Alex. Glass, St. Catharines..........	Peach much like Foster.
*M. Fitch, Grimsby, Ont......... ...	Large; yellow flesh; freestone; fair quality; season September 10th to 15th.
A. McLocklan, Guelph, Ont........	Med. Size; yellow flesh; freestone; fair quality; September 15th.
*Mrs. J. T. Ross, King Street East, Hamilton........................	Med. size; $2\frac{1}{4}$ by $2\frac{1}{2}$ inches; yellow flesh; freestone; fair quality; October 20th.
SEEDLING GRAPES.	
*W. Bachus, St. Catharines, Ont....	White; size and flavor of Concord; early as Moore's Early.
*O. F. Wilkins, Bridgeburg, Ont	White; about size of Concord; good quality season of Moore's Early
SEEDLING CHERRY.	
*John Gormley, Pickering, Ont.	Size and shape like Eng. Morello; bright red; flesh like a Bigarreau; firm, and a long keeper.

In the following paragraphs are given further descriptions of a few of the most promising seedlings above noted. Unless a seedling has about it some particular quality,

superior to named varieties of the same season, we do not think it is well to recommend that it be propagated and added to the already long list of named varieties. Hence there are but few of the seedlings which can be so recommended.

Apples.

Seedling Apple. From Charles Swinnerton, Barrie, Ont., January 26th, 1898. A large, handsome apple. A seedling of Duchess of Oldenburg; much like its parent in appearance and quality, but a longer keeper. The tree, like the Duchess, is an early and heavy bearer.

D'Arcy's Spice or Baddow Pippin. Received from Dr. Wm. Saunders, January 24th, 1898, who received it from Ipswich, Suffolk, England. Mrs. Prof. Heaton, of the British Association, says it is an apple held in very high esteem in Great Britain. The apple is of medium size, with prominent ribs; color yellow, nearly covered with greyish russet; stem, short in a small round cavity; calyx, nearly closed in a shallow uneven basin, with five prominent crowns; flesh, white, crisp, juicy; flavor, rich, aromatic; condition, excellent. Scions of this apple were sent to Mr. A. W. Peart, Mr. Freeman, and Mr. W. H. Dempsey, and several were grafted at Gravenhurst. Mr. W. E. Wellington says, under date of January 28th, that the apple is so much like Sharp's Russet that he does not think it would be worth adding to our already numerous collection of varieties.

Seedling Apple, from Joseph Knight, Renfrew. Sample came to hand October 22nd, 1898. Has the quality of a first-class table apple. Fruit of medium size, beautifully shaded with bright crimson on the sunny side, and light straw colour in shade splashed and striped with light and dark red. Calyx closed in a small deep basin; stem, short and thick, in a small, deep cavity with five deep grooves, somewhat resembling the Scarlet Pippin; flesh, white crisp, tender; rich, peculiarly delicious, half-sweet aromatic flavour; season, October-December; quality, first-class for dessert.

Seedling Apple, from James Rusk, Bracebridge, Ont. Received, November 1st, 1898. A large, handsome apple, most likely a seedling of the Duchess, as it somewhat resembles that variety in size, shape, and appearance. Quality, fair; season of maturity about that of Wealthy.

Pears.

The P. Barry. This is one of the promising new varieties which has been before the public for the past few years, and is particularly valuable on account of its lateness. Mr. Woolverton received samples of it this year on August 3rd from Mr. F. W. Glen, of Brooklyn, N.Y., and makes the following remarks concerning it in the September number of the Horticulturist:—"At first we thought it like Beurre Clairgeau kept over in cold storage, for it resembles that variety much in form and size. It is a winter pear, ripening in April, very large; orange yellow when ripe; juicy, fine grained, and of high flavour. Perhaps this will prove the very pear we want for export to Great Britain in cold storage." It is now on trial at two or three of our Experimental Stations, and will be reported on later.

Plums.

Seedling Plum, from A. W. Peart, Burlington, Ont. Known in the Burlington district as "Ireland's Seedling." We have noticed this plum in Mr. Peart's orchard for two or three years past, and he has given us the following notes concerning it:—"Fruit, medium sized, nearly round, distinct suture, reddish purple, thick bloom, juicy and rich; stone very small, flesh adhering slightly to it; season, last of August (this year exceptionally early on account of drought); midway between Ogon and Bradshaw; has tendency to rot as it ripens, and, therefore, has to be picked when firm." Tree, spreading; moderate grower; close jointed; blossoms tender, variable in productiveness. In this district, a crop perhaps once in three years; not as satisfactory and as sure a cropper as some of our standard sorts. Its extreme earliness insures fair prices.

Seedling Plum, from David Matheson, Ottawa, Ont., who suggests that, if it is entitled to a name, it should be called "Cooch," after the man who grew it. Mr. Woolverton gives a photograph, and the following description of it in the October number of the Horticulturist :—" A plum of good size, measuring two inches long, $1\frac{3}{4}$ inches in width ; somewhat one-sided, with a very distinct suture on one side. In form it is somewhat broadened towards the apex. The stem is short, about half an inch in length, inserted in a shallow cavity. Colour, a very dark red, with greyish bloom. Flesh, greenish yellow, moderately juicy, soft of texture, moderately sweet. Quality, very good for cooking and market purposes. Season, late. Sample photographed came to hand September 10th."

Peaches.

Seedling Peach.—Raised by Dr. Stewart, 152 Dowling Ave., Toronto, and on exhibition at the Industrial, Toronto, September 9th, 1898. As shown in the accompanying photograph, this is a large round peach, measuring about three inches in diameter. The skin is light yellow with red cheek ; flesh, yellow, firm, of good quality ; freestone of the Crawford type. Originating in Toronto it may be that the tree will be hardier than Crawford ; at all events it is well worthy of trial. Buds were secured by Mr. A. M. Smith, St. Catharines, who is propagating it. This seedling will be tested as soon as possible at a number of our Fruit Experimental Stations.

Seedling Peach.—Grown by Mrs. Fairbrother, 119 D'Arcy St., Toronto, and was exhibited at the Industrial, September 8th, 1898. A large, handsome, yellow peach, with bright red cheek ; flesh, yellow, juicy and of good quality ; freestone ; season of early Crawford. Worthy of trial.

Seedling Peach, No 1, from R. T. Smith, Hamilton, Ont. Upon this Mr. Woolverton makes the following note in the September number of the Horticulturist :—" A sample of this seedling was shown us on the 25th of August, at a season when good peaches are very scarce. 'Hale's Early' was just over, and 'Honest John' not yet ready. It is large, with beautiful bright red cheek ; has a distinct suture, a deep cavity and quite a depressed apex. The skin is easily removed without a knife. The flesh is white, very tender, sweet, rich and very juicy. A freestone and capital dessert peach."

Seedling Peach No. 2, from R. T. Smith, Hamilton, Ont. The following account of this is given in the October Horticulturist :—" On September 27th Mr. R. T. Smith, Hamilton, showed us another fine seedling peach of about the same season as Steven's Rareripe, and just in advance of Smock. It is very large in size, 3 x 3 inches ; almost round in form, with distinct suture ; skin, yellowish green, with dull red blush on the sunny side ; flesh, tender, juicy, fairly sweet ; freestone. A first-class dessert peach, and one which on account of its large size should be valuable for market."

Seedling Peach, grown by Mr. M. Fitch, Grimsby. Sample shown September 13th, 1898. The following account of this appears in the October Horticulturist :—" A beautiful peach, quite equal to Early Crawford in appearance, rounder in form ; size, $2\frac{1}{2} \times 2\frac{1}{2}$ inches ; yellow, with deep red blush on sunny side, and partially suffused with red in the shade: down very perceptible to the touch ; skin, thick and easy to separate from the flesh ; flesh, yellow, fine grained, juicy, but not quite so much so as Early Crawford, melting ; flavor, lucious ; quality, first-class for dessert or canning ; value, first-class for market, and probably a better shipper than Crawford ; season, September 10th-15th, immediately succeeding Early Crawford. A seedling worth testing."

Seedling Peach, from Mrs. J. T. Ross, King St. East, Hamilton. Received October 20th. Medium in size ($2\frac{1}{4} \times 2\frac{1}{2}$), greenish yellow skin, with faint coloring of red ; moderate down ; deep and narrow cavity ; distinct suture ; flesh, dark yellow, juicy and of good quality ; freestone ; season, late in October. Promising as a late variety.

GRAPES.

SEEDLING GRAPE.. Grown by W. Bachus, St. Catharines. On exhibition at Industrial, Toronto, September 6th—10th, 1898. In size of bunch and berry, this seeding is about the same as Concord; in color it is like Niagara; quality, excellent; very early, about the season of Moore's Early. Worthy of trial.

SEEDLING GRAPE, from O. F. Wilkins, Bridgeburg, Ont. Received September 12th, 1898. Bunch of good size and form; berries, white, round, of medium size; flavor agreeable, somewhat foxy, but much sweeter and pleasanter than Concord; skin thin and tender; pulp, tender and separates readily from seeds. Is said to ripen with Early Ohio. Worthy of trial.

CHERRY.

SEEDLING CHERRY, from John Gormley, Pickering, Ont. Received July 22th, 1898. The following note on this seedling appeared in the August Horticulturalist. "On page 317, Vol. 20, we referred to this cherry as being of great promise. To-day, July 12th, we have received another sample lot, and consider them even superior to those received a year ago. Being of Canadian origin, no doubt the tree is very hardy, and would succeed over a wide extent of country."

"The color is bright red like the Montmorency; the form about that of the English Morello, and the flesh like that of a Bigarreau, not very juicy; it parts easily from the pit, without dropping its juice; flesh, yellowish; a wonderful keeper, and therefore a good variety for distant shipment, Mr. Gormley writes, 'This is a seedling cherry-tree about 25 years old. I remember the tree coming up in a fence corner. It has never had any care, but has grown well under neglect. I would like to know if it is very valuable, as the quality cannot be excelled, and it bears every year'."

Mr. MORRIS. I would like to make a suggestion. That Report deals only with the seedlings of this country, and I suppose there is not one in a hundred that is worth propagating. Now, I think that it would add to the usefulness of the Committee's work, if they would extend their operations, and get every new fruit that nurserymen are offering for sale and report on them. I think that would be information that would be worth ten times more to this country than information on seedlings that are never grown afterwards or anything done with them. I think if they were to report on new fruits that nurserymen put in their catalogue it would give people information and a guide in the way of planting that would be valuable.

Mr. HUTT. That is a work of great value, which we are trying to do at our fruit stations. These are being tested. It would be difficult to get fruit of all these varieties. We might see a variety advertised in a nurserymen's catalogue, but the difficulty for this Committee would be to get a specimen of that so that they could pass on the fruit itself. We simply took note of any new Canadian seedling that came to our notice during the year.

Mr. MORRIS. Of course the work is very good that is being done at these experiment stations, but perhaps it will be six or eight years before we can have those fruits put on our lists. I do not think it would be difficult to get samples of any new fruit that is offered for sale by nurserymen. Perhaps the greatest hybridizer and the most successful that has ever been on the continent is Burbank, of California. He sends samples of his new plums to parties east whenever they are requested, particularly of this Japan class, and there is quite a number of new varieties coming up, although not even in the nurserymen's catalogue.

The SECRETARY. I am sure that the members of this committee are always pleased and glad to receive samples of new fruits that are grown by nurserymen that are sent to them. We shall always be pleased to receive them, and quite ready to report on them as well as on any other fruits that are sent in by any private individuals who grow them. I would move the adoption of this report for publication.

Mr. HUTT seconded the motion which was carried.

GRADING FRUIT AS TO SIZE.

By E. H. Wartman, Kingston, Ont.

The grading of fruit as to size has been one of the chief difficulties of packers. Having no standard to go by, but eye measurement, it is not to be wondered that we have so much irregularity in fruit grading; and that we find stunted, medium and superior size, all in the one package. But as the trade has recognized brands, designated XXX, No. 1 and No. 2 and have so often been disappointed, finding some packers of No. 2 equalled by other brands marked No. 1, and many a No 1 not equal to another packer's No. 2; the question is asked, how can we remedy this state of affairs. The remedy as to sizing all kinds of fruits properly, is simple, if the means are provided. At present there are fruit graders on the market, that will do the grading as to the size required in a most perfect manner, at perhaps a cost of 1c. per bbl. Each barrel is designated by a standard grade brand 2, 2½, 3 or 3½ inch diameter grade, or any other size that may be required. These fruit graders are durable and cheap, and when fruit sized by them is put on the market it will bear being poured out and a striking uniformity is at once noticed. By the use of these machines, we do not propose to say to to the growers that we will not take their small fruit. We will be glad to get it and mark it as to size, and it will demand its relative price. But we must remember that in a year of an enormous crop we must set our standard higher than in a year of scarcity. Let a 2½ inch diameter apple be the smallest size put on the market in a plentiful season, so that thousands of barrels being screened out, there will be a tendency to keep our markets steady. There are other ways of using our small apples more profitably than stuffing the centre of packages with this inferior grade. This imposition and fraud should be a thing of the past. Facing with large beautiful fruit, and putting inferior sizes in centre of packages, has been in vogue long enough. Buyers no longer credit barrels or boxes as to top facing, or being true to size throughout, but always pay a price for a second class size to be on the safe side. If these beautiful facers, top and bottom, were put in cases by themselves and marked as to grade, they would bring the top price in the market, whereas, used as they are, they only bring a second class price.

Some may say, "Sizing is very well, but what about color and fungus spots?" If apples are generally affected by spots, growers cannot afford to throw this class away; but grading this class to uniformity of size makes it very much more valuable to the trade. As to off color, if fruit is graded according to the scale, this class is not objectionable and will find a ready sale. In my experience of packing and shipping fruit for the last 25 years, the sizing has more often brought my stock into good repute than any other cause.

In trying to make sale of fruit, where you have no sample, the first question usually asked is, "How is your fruit for size?" If graded by a proper grader, and marked accordingly, how easily and truthfully is this question answered! I have a 100 bbls. Golden Russets 2½ inch diameter grade. What does this mean? That there is not one apple in the 100 packages under this diameter. Is this not more satisfactory than saying they are a fair size, or average sample? For what one man may think extra, another may only call ordinary. The question of rebating on fruit not up in size and quality would be disposed of and all parties would be more satisfied with this way of grading as a more profitable, scientific, etc., up-to-date method.

For packers to say they can divide their fruit into two sizes by eyesight and draw the line as to size correctly is a mistake. You are always running too far towards small sizes and dropping culls in with your best grade. Large size mixed with culls was a very common occurrence in the old guess work style of graiding. Graders relieve the eye of the task of measuring, so that the eye service can be devoted to picking out or detecting defective fruit, wich no machine can dispose of. Our old country market demands our best graded fruits. Our Canadian shipments have often been spoken of as inferior as to size, or as not strictly high class. Now, as we are living in the best province in the world for high class fruit, why not have our best apples put up in the best manner of grading, as well as put up in the best package for our English or foreign markets? And by so doing we will hold our own in all competition with other countries, and bring to ourselves much credit as well as large profits. While eighteen days in Glasgow, Scotland, watching auction sales of our Canadian Apples, I never saw our red varieties that were well graded sold at a low figure; always at from 15 shillings and upwards. But our yellow and green are not so much in favor. In competition for a prize for the best 12 apples or any other class of fruit, one strong point is in favor of the lot that has been graded as to uniformity of size and color. If size is uniform throughout the package, the same price can be obtained per peck or dozen, throughout package, relieving the merchant the trouble of grading after his purchase arrives in stock. It is hard to determine what a package or barrel of ungraded apples, as to size will realize a merchant, when put up by careless packers. As a proof that grading as to size combined with quality demands attention as well as secures top prices in Glasgow, I may say that a lot graded in this manner brought me a profit of over 100 per cent. The brokers who sold them, in sending my returns said, "Your grading as to size is a phenomenal success, and if you had sent them to our house in London your profits would have been larger." Some would say putting all even sized large apples together it would be impossible to keep them tight. But my experience in shipping Cabashea apples to London is to the contrary. Very large, even sized apples were opened in that city by myself and found perfectly tight and brought the top price in the market. I admit that this class are harder to keep tight than mediums, but long years of experience can overcome this difficulty. I have shipped to Glasgow in quantities with returns of only 4 per cent slack.

In conclusion I would say, that for export, never ship apples of any sort under $2\frac{1}{2}$ inches in diameter; and apples that generally grow larger, such as Kings, Spys, Greenings, etc., grade 3 inches in diameter, and you are most certain of success, as these sizes denote superior growth and will not cost more to export than inferior sizes. We, as fruit growers, packers and shippers, must remember we are living in an age of progress. We understand how to grow fruit and the kinds to grow for profit; but I am inclined to think as to packages and grading, we will, in the near future make long strides in the right direction, which will be a boon to growers as well as shippers and packers at large. At all times let our motto be:—

We'll pack our best fruit,
In uniform size,
Never let top or bottom
Beguile or tell lies.

The SECRETARY: I have been sizing my pears this year. I sent 400 or 500 cases of Bartletts to Great Britain this year, and graded them all for size. What we call No. 1 grade was the lowest grade of pears, and they were uniform from $2\frac{1}{4}$ to $2\frac{1}{2}$ inches in diameter. That meant just 100 pears in a case; you can put no more and no less than 100 in a case, so any one buying that package would know exactly how many pears he was getting. The next grade, A No. 1, measured in diameter $2\frac{1}{2}$ to $2\frac{3}{4}$ inches. That took just eighty pears to a case. Extra A No. 1 was three inches in diameter and took just sixty pears. On our apples a similar rule was observed. No. 1, $2\frac{1}{2}$ inches, average about eighty apples; A No. 1, 3 inches, about sixty apples; and Extra A, $3\frac{1}{2}$ inches, 48. I believe it is going to be more and more an important thing to size our apples. Whether we do it with a grader or not, we must have some way of making the grade uniform.

JUDGES OF FRUITS AT FAIRS.

Mr. RACE read the Report of the Committee of Fruit Exhibit, giving a list of competent Judges at Fairs, copies of this list to be sent to the Boards of the various Fairs.

Your Committee would recommend as competent judges on fruits at the agricultural fall fairs throughout the Province of Ontario the following :—

On Apples.—T. H. Race, Mitchell ; A. Mc. D. Allan, Goderich ; G. C. Caston, Craighurst ; A. H. Pettit, Grimsby ; E Morris, Fonthill ; Dr. J. Harkness, Irena ; Henry Robertson, Morrisburg ; Harold Jones, Maitland ; H. A. Brouse, Ottawa ; Walter Dempsey, Trenton ; W. A. Whitney, Iroquois.

Pears and Plums.—A. Mc. D. Allan, Goderich ; A. M. Smith, St. Catharines ; A. H. Pettit, Grimsby ; Dr. Beadle, Toronto ; Chas. Van Duzer, Grimsby ; R. L. Huggard, Whitby ; E. C. Beman, Newcastle.

Grapes and Peaches.—M. Pettit, Winona ; W. M. Orr, Fruitland ; Alex. McNeill, Walkerville ; E. J. Woolverton, Grimsby ; W. W. Hilborn, Leamington ; A. M. Smith, St. Catharines ; Walter Forward, Iroquois ; W. A. Whitney, Iroquois.

Mr. Caston : I suggest that this report be accepted as read.

THE LITTLE PEACH.

Mr. Carpenter asked if any of the gentlemen knew anything of the new disease affecting the peaches seriously through the United States, particularly in Michigan. It is called "The Little Peach." I cannot find out any cause or any remedy. I have had a tree that had it last year similar to what is described in some of my papers in some very large orchards in Michigan. I noticed a few peaches on one tree. They ripen before they should naturally ripen, and they are very small, perfect in appearance in every respect with the exception of the kernel. I do not know whether they destroy the tree or what is wrong with it. I see by the papers they are cutting down large orchards of trees in Michigan just from this source ; and it was stated through the papers that some people supposed it to be this rosette in the peach, but it was denied. I have seen the rosette myself, and it is nothing like it.

Mr. Pettit : I would suggest that our Secretary give us any information that he may gain through the "Horticulturist." I fancy we will not be able to gain any more information here to day.

CO-OPERATION IN FRUIT SELLING.

By Mr. Alex. McNeill, Walkerville, Ont.

I do not propose to take all the time that in justice might be allowed to this subject, because there are other papers that must be heard, and I hope to reach you through the columns of the "Horticulturist," but I can assure you that this matter of co-operative selling is one that has been forced upon us, and one that must receive attention, and I hope that I at least will have the co-operation of my fellow fruit growers in this mode of selling. Co-operation is absolutely necessary in many things, but it is a good thing in almost all our fruit growing associations. It is unnecessary for me to point out the many advantages of it. In other lines of business co-operation has been found successful, and certain branches of farming have been almost created through this spirit of co-operation. Dairying, as we call it now in Ontario, would be almost an impossibility were it not for co-operation ; and that same spirit that has been so successful in connection with the production of cheese I believe can be introduced among the fruit growers and be equally successful there. Now it is an appeal for the development of this spirit of co-operation that I make here this afternoon. It is very true that to devise any system, any mechanism by which this co-operation can take place with regard to the selling of fruit, is somewhat more difficult than in other branches of agriculture ; but I am perfectly certain that with the intelligence we have represented in this profession it is not altogether impossible. I am sure that among us we can devise some scheme that will be practicable for us under our conditions. Of course it would be an easy matter for me to cite cases where co-operation has been successful among other people in the matter of selling their fruit. The peach growers in the nation to the south of us have long adopted this method in various sections of the country as a means of disposing of their productions, and it has been the universal testimony that where these co-operative associations have been worked with any degree of intelligence they have been successful. The peach growers of New Jersey and Delaware would think it almost impossible to conduct their operations now were it not for co-operation ; and I am sure we are all familiar with the great co-operative selling concerns of the fruit growers in New York State and Northern Ohio. The co-operative societies of Michigan have not been quite as successful as those of their eastern brethren, but even the Michigan men claim that co operation in selling has been an immense advantage to them. The fruit growers of California, particularly the grape grower, found that grape growing could be begun a few years ago only at a loss. Grapes are cheaper there even than they are with us, and though we are suffering now from the effects of growing grapes at half a cent a pound, they were even worse than that at California ; but due almost solely to the efforts of these societies the grape growers have forced grapes during this last year and 1897 to a very fair price—$21 a ton, I believe, was the average price in 1897, and I believe they realized quite good prices this year, almost solely through the efforts of co-operative societies. I cite these cases simply to shew that co-operation is possible with other people, and though the exact mechanism they have adopted might not suit our needs, I believe we have that within us that will enable us to devise the means that will suit us. The suggestion that I would make here this afternoon is that the different localities should be organized into associations, without any great amount of red tape or formality, but simply that the growers of a neighborhood should unite and appoint from among themselves a seller or a manager of the association, and should as largely as possible sell through this certain manager. Now that is just the plan in its bald outlines. There can be any mechanism introduced that you wish. You can incorporate if you think it necessary. It is not necessary at all, and associations of that kind are conducted in different parts of the continent without any formality except simply a meeting of the neighboring growers who ship from a certain railroad station, and who sometimes appoint a manager who is given power to sell their fruits. At other times the business is put in the hands of a committee of three or five whose business it is to meet the buyers and to arrange sales and other business of that sort ; and I believe that that can be done here, and we have concluded in our section to try this process next year, and we are willing to put our fruit in the hands of a manager. We are limiting it for next year to a special class of fruit, which are grapes, because the grape growers are not perhaps as numerous as the growers of other kinds of fruit, and they are grown in larger quantities by each individual grower. While there is an immense quantity of grapes grown in the aggregate in our section, the number of growers is comparatively few, so that the circumstances under which we co-operate are somewhat favorable. We propose to place the selling of our fruit in the hands of a certain individual under the direction, so to speak, of a committe of three of us, and all sales will be made through this manager and committee. We have drafted out a simple schedule on which we propose to have patrons—that is, those who unite with us—agree to give us the selling of this particular kind of fruit. It reads simply this way: "I hereby agree to place (naming a certain quantity of fruit) in the hands of this association for sale." The object of that is to know exactly how much we have to dispose of. We are acquainted with each other very largely, that is one of the essentials of this co-operative business. Our local associations are supposed to know the needs of each individual member, and as far as possible we unite in this matter for the sake of securing several objects : largely for securing better prices, but incidentally there will be other advantages—less competition among buyers, for one. Now in every neighborhood there are certain advantages that induce buyers to come. Buyers come to our neighborhood to buy grapes, perhaps not because we have better grapes there than anywhere else, though we claim to have, but buyers have the advantage of a number of growers of grapes in one neighborhood, and they come here to play off one grower against another. As a matter of fact I have evidence, which I submitted to my fellow growers after a transaction was over, that one of these large men from Winnipeg simply played off four or five of us in that way. He came to me and had an offer for grapes, asked me at what price I would put in my entire crop of grapes, which I estimated to amount to sixty tons; and I made him an offer of $25 a ton in 10 lb. baskets. I am rather ashamed of the price; certainly we should not have to take such a price for our fruit; but it was the best we could get, and in my judgment, considering the competition all around me, I think $25 was the highest price I dared ask. He asked me if I would not take something less than that, and when I demurred a little he said, "Well, I will see you again before I leave," and I knew exectly what the process was going to be. He was going to my neighbor, Mr. Murgatroyd, and making the same offer and telling him that Mr. McNeil was going to take $25, would not he go $24? And Mr. Murgatroyd did what I would do under the circumstances—he took $24. Then he said to Mr. Murgatroyd that he would see him before he would leave. Then he went to Mr. Bennett, another neighbor, and Bennett agreed to put them in at $23. Then he came to me and said, "I would rather have these if you can put them in at a trifle under $23;" and I said, "I will go it at $22—(laughter)—and $22 I got. Now, that is the history of an actual transaction, not a freak of my imagination. I did not see him with the physical eye travelling around to these people, but I could trace him just as distinctly as though I had been following him around, and he came to me and saw me before he left, and he got satisfaction. If I could have paid my creditors dollar for dollar he would have squeezed me down a few cents less, but I thought I could not pay dollar for dollar at anything less that I took. There were certain advantages by buying from us that he could not get from any other people. For instance, he thought he could get a carload upon short notice. The agreement was that we should ship him a carload within twenty-four hours of his telegram, so that if he telegraphed this morning for a carload, ten tons, we expected to have it start to-night for Winnipeg. If we had been together I would have said, "The selling of this is in the hands of Mr. Murgatroyd." Mr. Bennett would have done the same, and Mr. Ferry would have also sent him to Mr. Murgatroyd. If he had that kind of a deal to go through then there would not be the competition of one against the other; he could not play one off against the other in that way, ao that there will be that advantage in this co-operation. Another advantage would be the lessening of the cost of sales. There are a certain number of expenses that must be undergone by each individual man. If I am selling a certain quantity of stuff I have to have telegrams to know the state of the market each day, These telegrams do not differ essentially. One would have done for the whole or half a dozen; and there is a certain amount of correspondence, and when you sell a large quantity of fruit correspondence becomes a serious matter. Most of us have not only to conduct the correspondence, but get out into the field and hustle during the shipping time, and we cannot delegate this matter of packing fruit to anybody else, and the correspondence in selling the ordinary crop of fruit is a serious matter, which might be lessened considerably by co-operation. Then this co-operation, even in this small way, would give us much better accommodation with the railway companies in the matter of cars and so on. That is a larger subject that I need not dwell upon. We all know that even where a dozen people are gathered together and are unanimous in demanding one thing they can secure what no individual or all the individuals acting individually could secure from the railway companies and truck companies and others with whom they deal. Each locality, too, has a certain market. Now, that market can be enlarged to a certain extent, but it is just possible it may cost considerable money to enlarge the market. Those of us who have tried to extend the market for our fruits have found that it did cost money to increase the market, and this increased cost could be materially lessened even by this small co-operation of each neighborhood that I speak of. It is a little too much to expect one man to open up a new field. Take, for instance, the northern part of Ontario. Some years ago I spent considerable money and time in opening up what I thought was a new market there, and I no sooner got a profitable trade—and I think I was the first person, certainly the first in our particular neighborhood, to take advantage of a certain freight rate that gave me access to three splendid towns, and I got a freight rate really where they had always been in the habit of paying express rate—but no sooner did I get that thing and spent considerable time and money in getting arrangements completed that all my neighbors had the advantage of the whole thing without any effort on their part I think I am a generous individual in most cases, but I thought it was a little hardship in that case, and I think co-operation would have been the grand thing if nothing more than to share the expense is such matters as these. Those who have had experience of this character are deterred sometimes from making these ventures on account of the expense; but when we know that the expenses were shared by the community it would pay the community handsomely to undertake to open these new markets These are only a few advantages of co-operation. There is another very important one—it would secure greater uniformity in the packing and grading of fruit. When these co operative methods are adopted it is positively essential that there should be some understand in regard to the quality of the fruit; and the fact is, as some would say perhaps that now we grade the lower and grade down, but then the poorer fruit would be thrown out and nothing but the better class shipped; the tendency of the grading is always upwards in these co operative associations and not downwards. That I consider a very important thing. The reputation of the association as such cannot be shirked so readily as that of the individual sometimes, because the whole mechanism is right at the criticism of the public. I would like to dilate further on the advantages of co-operation, but my object this afternoon is rather to open up the discussion and bring the thing before the members of this Association and see whether we cannot stir up a sentiment in favor of further co-operation. Of course you see that my object here is to endeavor to control the fruit at the shippers' end. Now it is a pleasure for me to say that the Niagara District Stock Co., a co operative concern, has done a great deal for the fruit growers in one way or another; but they have commenced at the wrong end a little. They deal only with the sellers' end. Now, if these co-operative societies and associations could work in conjunction with that, there we have a mechanism by which we can control the fruit at the shippers' end, and it is the only possible way of preventing gluts in the market. Unless we know and have some means of finding out what to be shipped and where to be shipped to, we have no means of preventing gluts in the market; but if this Convention should take up seriously this matter of co-operation just as it has been taken up in the Dairymen's Association in connection with their cheese factories and creameries, we could make this matter so general that in a very f w years we could develop a system of selling fruit by which we could control almost completely the shipping of fruit, so that no market would be over-supplied with fruit and no market would be under supplied. Now, I am sure there is not a fruit grower but feels that is a consummation devoutedly to be wished; and I feel certain, if we can only induce the various members to think about this matter, to read what is said about co operative methods, and to so school themselves morally that they can work with their neighbors, much can be done by this Association in that direction. Old Dr. Johnston said, "There are some people that are so unclubable that it is almost impossible to work with them." Let us introduce the missionary and the Sunday-school and educate our neighbors to work co-operatively, and we have done a good thing. We can work co-operatively with success when we give it attention. I do not believe it is going to come suddenly—no good thing ever did—and I should depreciate a boom in co-operative societies of this sort, because then mistakes would be made; but let us proceed slowly, let us see how one works this year and then proceed along several years improving year by year to work steadily for this particular object. I am sure any of you who have read broadly along these lines must believe along with me that co operation must come into our farm operations before we can get the benefit of our labors. We are sure that the ground principles are right. The only thing is the mechanism by which we can secure them. If we believe the general principle is right, it is our business as members of a community, as an association, to work for them carefully but energetically; to avoid the errors that we may see each year and improve for the year to come; not to go ahead with the possible chances, with the certainty almost, of making very serious mistakes on a large scale, but to proceed cautiously and work towards the end, not discouraged by minor failures, but to proceed along the line knowing that we are right and going ahead just as fast as we possibly can without danger. I thank you for the attention you have given me, and hope that this may well receive your careful consideration. (Applause).

Mr. Gregory.—I think that has been tried pretty well in this section. Mr. Bunting is best qualified to speak on that, and I would suggest his name.

Mr. Bunting.—I can only say, that during the past few years in this vicinity we have endeavored to carry out some of the ideas that Mr. McNeill has expressed, and that we have met with considerable success, more particularly in connection with the railway people. We have succeeded, I think, in placing our goods here, in the market, in better way than before, and the returns received from the various markets where we have shipped have almost been invariably good. (Hear, hear.) There are times when reports that have come back have not been so favorable as we would have liked, but in looking at the details of the matter, we have been able to find out where the difficulty arose; and I think with Mr. McNeill, that co-operation is the true idea as far as fruit-growers are concerned. In taking up the matter in the Committee appointed this morning, it will be my duty to work this idea as far as I can, and in approaching the transportation companies in that matter, we will bring as much influence to bear as we can.

Mr. McNeill.—It is gratifying to have the first bit of experience in favor of this particular plan. I hope, in the years to come, it will be so common that we will not have to ask for experience along these lines.

NOTES ON EXPERIMENTAL SPRAYING IN 1898.

By W. M. Orr, Superintendent of Experimental Spraying, Fruitland, Ont.

One learns quickly by means of the eye, and an ocular demonstration is always the most convincing. Spraying bulletins are excellent educators, but I fear the greater portion of the bulletin is seldom read. However, let a farmer once see the work of preparing and applying the mixtures, and let him be shown the different species of injurious insects on the trees, and the best method of dealing with them—and he will remember more about it than he would if he read a bulletin a dozen times. Realizing this, the Department of Agriculture for Ontario has for the past four years conducted a series of object lessons in spraying.

This year we worked at 30 points, covering the Province from Amherstburg to Renfrew. An agent visited each point seven times, and his dates were announced by poster, postal card, and in the press. The bulletin of 1897 was revised, and given to those wishing them at the orchards, beside a great many requests were received for them by mail.

That the farmers appreciate this effort of the Department to benefit them and demonstrate to them the best methods for caring for their orchards, is shown by the fact that the attendance this year was 3,538, beside many who visited the orchards, when the agent was not there, to see the results. This is about 700 more than attended last year, and almost double the number that attended in 1896.

Although the work for 1898 has only just closed, 31 applications have been received for the work next year, including two points where the work has always been done. These latter say, that the farmers had not realized how important it was, and wished for another opportunity to see the work.

Only one solution was used, Bordeaux mixture, according to the following formula:—Copper sulphate, 4 lbs.; fresh lime, 4 lbs.; water, 40 gallons. To this in every case was added four ounces of Paris green.

On account of the law which forbids the spraying of fruit trees when in bloom, and on account of rain, many applications were lost, as the work had to be done at the date and hour named, so that the agent might reach his next point on time. However, the results in most of the orchards were satisfactory.

Allow me to give you a few of the actual results from this year's report. In estimating the percentage of perfect apples a part of the tree was picked clean, and the fruit carefully examined, every specimen which had a worm spot no matter how small, being rejected as imperfect.

In the orchard of Mr. Hugh Black, Rockwood, we had the following results:—

Snow—Sprayed, 64 per cent. clean; unsprayed, 1 per cent. clean.

Ben Davis.—Sprayed, 100 per cent. clean; unsprayed, 28 per cent.

Wagner.—Sprayed, 26 per cent. clean; unsprayed, 2 per cent. clean.

Spy.—Sprayed, 100 per cent. clean; unsprayed, 36 per cent. clean.

Greening.—Sprayed, 88 per cent. clean; unsprayed, 24 per cent. clean.

Ribston Pippin.—Sprayed, 90 per cent. clean; unsprayed, 80 per cent. clean.

Canada Red.—Sprayed, 72 per cent. clean; unsprayed, no clean fruit.

This orchard has never been sprayed before. Concerning the work in his orchard, Mr. Black writes as follows, under date of Nov. 16th, 1898: "In reference to the effect of spraying this season, I feel in justice bound to give you my impression, which is at follows: 'The effect on the foliage was plainly noticeable all season. The leaves were fresh and had that glossy appearance which indicates growth. The bark was smooth and looked like the bark of young trees, the moss and roughness on the bark almost entirely disappearing, and the trees have made more new wood than for some years past. The fruit was, on the sprayed trees, as nearly perfect as is reasonable to look for. In my experience, I never saw, even years ago, before so many enemies came to stay, so entirely good a crop of apples. I am safe in saying that in our Spys, which were sprayed, there was not one barrel of culls to 100 barrels of good fruit. I am convinced that our chances of growing apples profitably will largely be in proportion to the thoroughness with which we spray. Good cultivation, plenty of barnyard manure, and careful spraying will ensure us equally as good and abundant fruit crops as of yore. I might just add that we had in one place in the orchard, two Greening trees, well loaded, and *not a single cull apple* was found, neither worm, nor scab, nor mis-shaped. We cannot now grow potatoes without using Paris green—we must also realize that we cannot grow good fruit without spraying. The first spraying will almost entirely destroy the tent caterpillar. I hope that our Ontario fruit growers will accept the situation and spray their apples and other fruits thoroughly. Excuse the length of this letter. I am so convinced and satisfied I don't know where to stop praising it.'"

In the orchard of Mr. James Gray, Bolton, we had the following results:—

Snow.—Sprayed, 80 per cent. clean, heavy crop; unsprayed, 23 per cent. clean, about half a crop.

Fall Pippin.—Sprayed 76 per cent. clean; unsprayed, 4 per cent clean, one-half crop fallen.

Golden Russet.—Sprayed, 64 per cent. clean, this is the first clean fruit from these trees in four years.

Talman's Sweet.—Sprayed, 64 per cent. clean: unsprayed, 24 per cent. clean.

Colvert.—Sprayed, 84 per cent. clean; unsprayed, 20 per cent clean, most of the fruit is fallen.

Spy.—Sprayed, 54 per cent. clean; unsprayed, 20 per cent. clean.

Flemish Beauty Pear.—Sprayed, 90 per cent. clean; unsprayed, 10 per cent. clean.

This orchard has never been sprayed before.

On June 30th, the agent writes: "Here are four Snow trees, two sprayed and two unsprayed, equally good last Spring and at blooming, standing side by side. Now, on the sprayed trees, the foliage is beautiful and the trees are well loaded with good-sized fruit, about 75 per cent. of which is free from scab; while of the unsprayed trees, although the tent caterpillar has been gathered three times, the foliage is almost ruined, the scab is prevalent and the crop almost a failure."

In a letter written Nov. 15th, 1898, Mr. Gray says: "We noticed a marked improvement this year on Flemish Beauty Pears and Snow Apples, especially. The foliage on the sprayed trees was more luxuriant and stayed on longer in the fall. On the unsprayed tree there was almost no fruit free from scab, and very few fit for market; while on sprayed trees there might be about 90 per cent. of good fruit. Indeed all the varieties of apples sprayed showed a marked improvement when picking time came. It is our opinion that if the spraying is continued, year after year, that the fruit will be much improved, and that if this is not done very soon there will be little fruit worth gathering.

Mr. R. Govanlock's orchard at Seaforth we have the following results :

Spy—Sprayed, 70 per cent. clean, heavy crop; unsprayed, 20 per cent. clean, very light crop.

St. Lawrence—Sprayed, 80 per cent. clean ; unsprayed, 50 per cent. clean.

Snow—Sprayed, 90 per cent. clean, heavily loaded; unsprayed, heavily loaded but not a clean apple.

King—Sprayed, 75 per cent. clean; unprayed, 50 per cent. clean.

Gravenstien—Sprayed, 100 per cent. clean; no unsprayed trees.

Greening—Sprayed, 88 per cent. clean; unsprayed, 32 per cent. clean.

Flemish Beauty Pear—Sprayed, 50 per cent. clean; unsprayed, no clean fruit.

Under date of Nov. 17th, 1898, Mr. Govanlock writes as follows: "With regard to my orchard prior to spraying, I may say that the fruit was badly spotted, misshaped and full of worms, but this year after spraying there is scarcely a worm in the apples and they are far more perfect in shape. I picked five sprayed Snow trees, and they packed 25 barrels, and left scarcely anything but the bruised apples, while the unsprayed trees were worthless, good for nothing but cider. There was a marked difference on all the other varieties. I consider the sprying a direct gain to me of least $50 in my small orchard. Of course I sprayed the balance of my orchard, but not so thoroughly. I am convinced that if every one would spray their orchard for a few years we could get rid of most of the pests."

Under date of Dec. 29th, Mr. Claude McLaughlin writes: "In reply to yours with reference to the spraying of my apple trees, I would say that in the fall of 1897 I was completely discouraged with the result of my apple crop, so I made up my mind to cut out all my trees (I have about 300). In fact I had cut some of them down, when I was advised by a friend to give them one more trial and to try spraying. The following spring I was making enquires about a spraying machine, when I received a notice from Mr. Orr calling a meeting of those interested in fruit raising in this section, and stating that it was the intention of the Government to conduct spraying experiments in different parts of the Ottawa Valley. I attended the meeting, and was so much pleased with Mr. Orr's explanations that I immediately offered my orchard for the experiments. Part of the trees were sprayed and part left unsprayed. With the result of the spraying I am more than delighted. The apples of the sprayed trees were sound and large, the foliage a good rich color, and the trees made more growth than ever before in one season. In the fall of 1897 I had no apples fit for use, all were small and scabby. In the fall of 1898, on all trees sprayed, I had perfect, large and sound fruit, and although the past season was an off year I had some of my trees propped they were so loaded. On the unsprayed trees the fruit was poorer even than in 1897, and perfectly useless. I have bought the machine with which the spraying experiment was conducted, and I intend using it next season, when I expect even better results as my trees were in very bad shape from the many insects that affected them. This fall they looked clean and healthy. I am fully convinced that with good systematic spraying and ordinary care of the trees, we can raise as good apples in this section of Canada, and better than in most sections. The spraying experiment by the Government was of very great value to this section and was much appreciated by the people."

In the orchard of Messrs. Freels Bros., Niagara-on-the-Lake, we had the following results :

Baldwin—Sprayed, very heavy crop, 48 per cent. clean, 90 per cent. fit for barrelling ; unsprayed, 4 per cent. clean, very light crop.

Snow—Sprayed, 16 per cent. clean, heavy crop, about 6 barrels fit to pack ; unsprayed, no clean fruit, about half barrel to the tree.

Astrachan—Sprayed, 90 per cent. clean ; unsprayed, 30 per cent. clean, dropped very badly.

Duchess—Sprayed, 90 per cent. clean, heavy crop ; unsprayed, 30 per cent. clean, dropped badly.

Fall Pippin—Sprayed, 80 per cent. clean, good crop ; unsprayed, no clean fruit and crop very light.

Harvest—Sprayed, 80 per cent. clean ; unsprayed, no fruit fit for market.

Spy—Sprayed, 40 per cent. clean, good size and about 6 barrels on the tree fit for packing ; unsprayed, no clean fruit, and only about one barrel per tree.

Mr. Freels says : "The sprayed trees were selected in different parts of the orchard, and that he had no right to expect a larger crop from the sprayed than from the unsprayed trees, and that if all his orchard had been sprayed this year with the same results as were obtained in the experimental trees it would have been worth over $1,000 to him.

Under date of Nov. 22nd, Messrs. Freels Bros. writes : "Your letter of the 12th inst., received requesting information as to the benefit derived from the spraying of the fruit trees. In reply thereto we have to say that the spraying of the trees did great benefit to them, and the yield of fruit was much increased thereby. However, we think that the spraying this year was not a fair test, owing to the wet and rainy weather, and we are satisfied that with favorable weather, the spraying of the trees would be of incalculable benefit. Our crop this year under the most unfavorable circumstances, exhibited increased yield, and, in comparison with orchards not sprayed, our showed the benefits of spraying."

In Mr. Hugh Gourlay's orchard, at Carp, the following results were obtained :

McIntosh Red—Sprayed, 100 per cent. clean ; no fruit unsprayed. This apple spotted very badly other years.

Snow—Sprayed, 105 per cent. clean ; unsprayed, 10 per cent. clean.

Baldwin—Sprayed, 100 per cent. clean ; no unsprayed fruit.

Under date of Nov. 17th, Mr. Gourlay writes : "Your letter received asking for information about my orchard, prior to the spraying and the result of this year's spraying. Last year and other years the foliage was often spotted and not healthy looking, and the tops of the limbs were often blighted. This year the sprayed trees presented a very healthy appearance the foliage being very green and most luxuriant, the trees making just about twice the growth they did other years. The fruit other years was more or less spotted ; much of it being badly shaped from the bites of insects, more than half the Snow Apples being unfit for sale. This year the sprayed fruit was much larger and better shaped than ever before, nearly free from spots, nine-tenths of it being sold as first-class fruit. I sold all my first-class fruit at $3.00 per barrel. I attribute this all to the effects of spraying. The benefits derived from spraying are almost incredible. Some of my neighbors had their orchards striped bare by the tent caterpillar and were much pleased to see the good effects of spraying on my trees. I had not the faintest idea that spraying could produce such a marked improvement on an orchard in one season."

With a view to demonstrating that better results can be obtained where the work is properly and systematically carried on, year after year, we have for the last three years worked in Mr. Albert Pay's orchard, St. Catharines, spraying the same trees each year.

In 1896 the results were good. In 1897 Mr. Pay said that if all his orchard was as heavily loaded with as good fruit as were the trees which we had sprayed for two years, it would be worth $2,000 to him with apples at $2 per barrel. As to the results in 1898, writing under date of Nov. 25th, Mr. Pay says:

"In reply to yours of the 12th regarding spraying, I would say the row of trees sprayed by you showed a very a decided improvement over the row next it which has never been sprayed, both in foliage and fruit. This is the third season you have sprayed the same row in my orchard, and the Greenings and Northern Spys in that row have had a good crop every year and the Baldwins two good crops in three seasons. The Baldwins had a very heavy crop, in fact too many to get a good size. I picked eleven barrels off two Baldwins in the sprayed row, and not two barrels in the next row which were unsprayed. There was hardly a marketable apple on the unsprayed trees, while fully 90 per cent. of the sprayed fruit would class No. I. The Greenings and Northern Spys would be about the same. There has been a number of buyers through my orchard this fall before the apples were picked, and some saw the fruit before packing and they all spoke very highly of the stock and told me it was the cleanest and brightest fruit they had seen this year. There can be no question in my opinion as to the benefit of spraying, after the showing it made during the three years. I think, however, it should be done successfully with less than six applications. However, even with that many times, I fully believe it will pay to spray every year."

It is only fair that I should tell you of some of our failures as well as our successes. I will give you in addition to the results, extracts from the agent's note book made at the orchard on the days of spraying, so that you may be able to judge of some of the difficulties we encounter and the causes of our failure.

In Mr. R. S. Lang's orchard, Exeter:—

1st application, April 22nd.—Rained all day, so that it was impossible to work.

2nd application, May 4th.—Cloudy, followed by an all night rain.

3rd application, May 16th.—Fine. Many of the trees in bloom. Sprayed only some of the latter varieties. Bud moth and tent caterpillar bad on unsprayed trees; found only one tent on sprayed trees.

4th application, June 1st.—Fine, fall apples well set, winter apples are light. Oyster-shell bark-louse, aphis, bud-moth and tent caterpillar at work in his orchard.

5th application, June 13th.—Rained all day. Scab showing badly on Snows. Agent writes on June 13th. "I am afraid that this orchard will be a failure. I have only had one good spraying here."

6th application, June 25th.—Rain in forenoon, but cleared and afternoon was fine. Found a few green fruit worms and Tussock moths. Foliage on sprayed trees decidedly better than on unsprayed.

7th application, July 9th.—Fine. Considerable scab but not many worms among sprayed fruit.

I inspected Mr. Lang's orchard and found:—

Greening—Sprayed, 50 per cent. clean; no unsprayed trees.

Ben Davis—Sprayed, 10 per cent. clean; unsprayed 10 per cent. clean.

American Golden Russet—Sprayed, 73 per cent. clean; no unsprayed trees.

Snow—Sprayed and unsprayed about equal.

In a neighboring orchard I found American Golden Russet unsprayed 20 per cent clean and Greening unsprayed 20 per cent. clean. Mr. Lang says that he has never had any first-class fruit off this orchard. All the fruit has been scabby or wormy and not fit for packing. On Nov. 15th Mr. Lang writes, "Replying to your letter of Nov. 12th, would say:—The spraying of my orchard was a success this year in the way of destroying insects and worms There was scarcely an apple but was free from worms, something very unusual for my orchard, but as for destroying the scab the spraying was not a success this year. There was so many wet days when your operator called to spray, that that may be the cause of the scab not being checked."

We had the common insect enemies to contend with this year. They were more numerous than usual, the dry hot weather being favorable to their propagation. The tent caterpillar was reported very bad on the 23rd of April. In many sections orchards were entirely defoliated by them. At one station where no spraying was done except on the experimental plot, they stripped the trees of their foliage, although the owner of the orchards said he had gone over the trees three times and destroyed their tents. The agent reported that the sprayed trees looked like monuments of mercy in the midst of surrounding desolation. However they were controlled without difficulty on the experimental trees.

The aphis was reported bad at some points as early as April 23rd, although it was not nearly so bad as last year. I am thoroughly convinced that to secure the best results we must begin treating the aphis and tent caterpillar much earlier than we have been accustomed to do. At Fruitland we have discovered aphis on the buds as early as April 8th and tent caterpillar on April 15th.

The green fruit worm a comparatively new-comer, and but little known here, is likely to become a serious pest. Some growers report from 20 to 30 per cent. of their apples and pears ruined by it. The agent reported on June 16th that it had destroyed much fruit.

The rose-beetle was reported as doing a great deal of damage at Niagara-on-the-lake, on June 11th. The agent says they were very destructive. especially on King trees. He says there was hardly an apple without one or more, and that he had found as many as six or eight on a single small apple. They had been in this orchard three years. Prof. Saunders says that they are destructive to the leaf of the apple, plum, cherry and apricot, but here they were working on the fruit and were especially destructive on the King.

The codling moth, the oldest and most formidable enemy which the apple and pear grower has to contend with, was very numerous this year, except in a few orchards in North-eastern part of the Province, in one of which, at Carp, twenty miles above Ottawa, owned by Mr. Hugh Gourley, and comprising twenty acres, varying from ten to twenty years old, not an apple injured by the codling moth could be found. Mr. Gourley says he has never seen an apple in his orchard injured by the codling moth.

The owners of every orchard in which we worked this year, with one exception, Mr. Curwen of Goderich, report that the moth was largely controlled by spraying.

In the southern portion of the Province the moth was very numerous and continued to propagate until the first of October. Early in this month, the young worm, scarcely visible to the naked eye, could be detected just burrowing through the skin of apples that up to that time were clean. As the last spraying was done about the middle of July, these latter broods were not destroyed by it. Had the whole orchard been sprayed the latter broods would not have been so numerous, as there was nothing to prevent the moths, which had bred on the unsprayed trees, propagating on the trees in the experimental plots, after the spraying had ceased early in July.

Mr. R. A. Dewar, of Fruitland, has a black Detroit apple tree eight inches in diameter, standing near his buildings, the fruit of which has for years been badly infested with codling moths. This year he sprayed it five times with Bordeaux mixture, adding four oz. of Paris green each time. The first spraying was done before the tree blossomed, and the other four at intervals of from twelve to fourteen days, ending about the 12th of July. Up to this date not more than five per cent of the fruit was injured by a worm, we examined the tree the 1st of August and found about 75 per cent of the fruit wormy. On the 25th of August we made another examination and could not find a clean apple. Many of the apples had three or four, and in one case five, worms in an apple. No two of them had entered at the same place, neither had they burrowed into each others tunnels. There appeared to be no choice as to the place of entering the fruit. On the 15th of May a large coarse sack was bound to the trunk of the tree to trap the larvæ as they were going up or down the tree. This was examined on the first of June but no larvæ were found. It was again examined on the 11th of August, and about 200 larvæ were found, most of them in cocoons and about 50 in the chrysalis. A large number of empty cocoons from which the moth had emerged were also found. We put a number of these chrysalis into a glass vessel and in a few days the moths began to appear. In eight or ten days we had over twenty beautiful specimens of the moth. A number of eggs, which appeared like creamy spots about the size of a small pin head, were deposited on the glass. The bandage was replaced and left until the 27th of August, when it was examined and 261 larvæ, mostly in unfinished cocoons and one chrysalis were found. It was again put on and left until the 15th of November, when 191 larvæ were found, all cocoons. After a careful examination no larvæ were found on the tree at this date, except in the folds of the sack, and in the crevices of the bark under the sack. In all 703 larvæ and chrysalis of the codling moth were taken from the bandage around this tree in addition to which quite a number escaped as could be seen from the empty cocoons. On October 11th we put socks on those trees where they were examined on the 29th of November, sixteen larvæ were found on them.

It appears from the result of experimental work carried on throughout the Province that in the greater part of Ontario the codling moth can be controlled by spraying. However, in the southerly sections, particularly under the mountain between Hamilton and Niagara, they continue to do much damage after the regular spraying season is over. They are much worse directly under the mountain than they are on the lake shore two miles away or on the mountain. This is probably due to the large amount of fruit grown and the shelter afforded in that district. We propose next year, after the regular spraying has ceased, to continue the work in one or two orchards until picking time, using Paris green mixture, that we may ascertain whether the latter broods can be destroyed this way.

No doubt it would be advantageous to supplement spraying with bandages. It costs but little, either for material or labor. Full instructions for doing the work may be found in Prof. Saunders' excellent work "Insects Injurious to Fruit." From our own experience we would consider it necessary to continue the work until the middle of October. The first wormy apples reported were June 28th.

The black or dead spot on the limbs of apple trees is quite bad in some orchards and appearing more or less all over the province. Mr. McGurn's orchard at Marysville is very badly affected, several trees being killed by it. He expects that the orchard will be ruined in a few years.

It appears from results obtained in experimental work, that from 65 to 80 per cent. of perfect fruit can be secured, when spraying is regularly and properly done, and when the conditions are favorable, such as an orchard standing high and dry or on well-drained land, away from buildings or hedgerows, and the trees planted far enough apart so that the limbs do not come within ten or twelve feet of touching, that they have an abundance of sunshine and free circulation of air. It is also important that the trees be properly trimmed, all rubbish removed and the land be properly fertilized, for it is a fact that two-thirds of the orchards in Ontario are starving. With good apples at the price they have commanded this year and last year, the orchard, if properly attended to, would be the most profitable part of the farm.

We have a fertile soil, the climatic conditions are favorable and the apple attains a degree of perfection in Ontario, not exceeded in any part of the world. We have an unlimited market in Europe for first-class apples. All that is necessary is that we treat our orchards intelligently and give them the care and attention they require, thus securing annual crops and avoiding over-production alternate years, which gives inferior fruit and taxes the trees. Then there will be no more difficulty of the market being glutted by an over-production alternate years, and with careful and honest packing our success is assured.

Mr. MILLS: Were all the results that you read from trees sprayed the same number of times?

Mr. ORR: Yes, these men reported from the points where we did the work.

Dr. MILLS: You did this work that is reported on?

Mr. ORR: Yes; this is their own report of it apart from ours.

Dr. MILLS: How do you account for the great differences in the immediate neighborhood, in the same locality almost?

Mr. ORR: We can account for the difference in the results from the location of the orchards and the conditions they were in.

Mr. MILLS: Are you sure the tops of the highest trees are always reached by the rod?

Mr. ORR: We are sure sometimes that they are not. In some cases we have to do the spraying off a stoneboat. The trees were 40 feet high, and it is impossible to do the spraying in such a case.

Dr. MILLS: What is the length of the rod you used?

Mr. ORR: From 12 to 14 feet. We had trees standing close together and interlacing and needing trimming very much, and in such an orchard as that you cannot expect to do perfect work.

A Delegate: Do you spray from one side of the tree, or both?

Mr. ORR: We spray on both sides of the tree, and under it as well; you get on a waggon and drive it up and down to spray.

Mr. BRODIE: Do you not think if you used more Paris green you would have had less codling moth?

Mr. ORR: You will notice we have been very successful with the codling moth up to the date that we ceased spraying. The principal damage done by the codling moth was after the spraying had ceased.

A Delegate: That is the second brood.

Mr. ORR: I think it was one continuous brood from the 15th May to the 13th October.

Mr. CASTON: The entomologists told us some years ago that there was only one brood of them. We are finding out there are a good many, especially in the Niagara Peninsula. I can corroborate what Mr. Orr has said about the sacking of the moths. I had a little experience just there. I had a piece of sacking, and I put it in the branches of the trees, and it remained there. Sometime about the beginning of November there was a young tree of twigs that was just beginning to bear, not near a peck of apples, and there would not be as many moths in the tree as in the larger tree, but I picked it up and examined it, and it had over a dozen nice fat codling moths; and I thought, would not that be a good experiment to carry out, to take a few rags and put them in the trees and then examine them from time to time? I believe that would be one of the most successful ways of dealing with the codling moth. I do not think there is much of the Paris green gets into the calyx. I think there is apt to be chilly weather at the time the egg is deposited there, and the instinct of the insect leads it to deposit its egg in a protected place, but I do not believe our spraying will kill many in the calyx of the apple. If you find two apples lying close together on a limb you will find holes bored in from opposite directions, and where there is a leaf covering the apple you will find one or two holes under that, and this second brood is the most destructive of the whole. Another very valuable thing would be the introduction of hogs. When an apple drops, in ninety-nine cases out of a hundred there is a moth in it, and when the hog devours the apple that is the end of the moth, too. I think the hogs and the spraying would work admirably together; two or three men have told me they do. I think we may congratulate ourselves on the fact that our manufacturers in this country have produced excellent spraying machines, and that in so short a time they have been so well perfected; but I think there is room for a slight improvement, that is providing for a vertical spray to get at the insect that is on the under side, for example the aphis, because that is so destructive to the tree, and then to spray in the ordinary way, and as those insects insert their bill and suck the juice out of the leaf, Paris green is not of any use, and we have to apply something that will kill them by contact; we want something to get at them from the underside of the leaf.

Mr. Brodie: My experience agrees exactly with Mr. Caston's in regard to hogs being turned into the orchard. I turn in my cattle to eat up the refuse, and we have hardly any codling moth. The only place where we have codling moth is where we cultivate our trees. In these orchards that are old in sod, we have no codling moth whatever.

SPRAYING FOR ORCHARD PESTS.

By Dr. James Fletcher, Central Experimental Farm, Ottawa.

I heard Mr. Orr's report with a great deal of pleasure, and I believe it is a very valuable one. It is valuable because he gives us facts, and does not try to make conclusions from them; he gives us facts, which being true are scientific. I think it is a pity he was not allowed to read all the facts, giving the percentages, which would have showed fruit growers that it paid them to spray and to save crops in the best condition they could; but, of course, they know their own business best. Mr. Orr has given us this year, as he gave us last year, a report of very great value indeed, and if there were nothing else here to be discussed this afternoon, I think it would be one of the discussions that would mean more money in the pockets of the fruit growers than many other discussions which take up a great deal of time. One of the points which Mr. Orr asked about was the number of broods of codling moth in the course of a year. This is an important question, because it has been supposed that the experience of the first writers on the codling moth was going to be the experience of every experimenter or fruit grower in other parts of the country. Mr Caston speaks of what the entomologists had told us. The entomologist, he told us, said there was one brood of codling moth in a year, and they told us perfectly correctly. The writer who made the first statement, which has been copied by thousands of writers since, was a New York man who wrote with perfect accuracy about New York. A few years later, Mr. Saunders wrote about London, and he wrote perfectly correctly fifteen years ago, when he said there were two broods, practically continuous after the middle of June, of codling moth. Later still, Prof. Cook. of California, says there was three broods; and they are all perfectly correct. According to the climate this insect changes its habits. The appearance of the moth brood all during the season is only apparent and not actual. There are but two broods, and it Mr. Orr would look through his notes, or if some one else would make notes carefully next year, you will find that the first brood of the codling moth that lays the eggs appears just about the time when the young apples are formed. Mr. Caston's criticism about the egg being laid in the calyx, unfortunately is not founded on fact. The eggs are not laid in the calyx, and there is no reason why they should be. The eggs are laid any place, and unfortunately on the leaves, but the insects crawl on the apples, and the nearest channel by which they can obtain access to the interior of the fruit is through the calyx and into the pips, which they generally try to get at first, and where they do a great deal of their harm. The second brood, which appears in August and lays its eggs, which give all the after trouble, is there prolonged in the appearance of the moth. It is very much like the peach borer. The moths begin to appear after mid-summer, and keep on appearing right up till cool weather. It is all one brood; it is not a succession of bro ds. Some people say, "Why, how should eggs laid one time produce insects at another?" We cannot tell why, but we have proved it over and over again that that is the case. I know only one, name'y, the caterpillar, where the eggs were laid on the 1st or 2nd July. They pass through three or four moults before they reach maturity. Some of them pass one moult and then lay in lethargy, and more remain in lethargy until next spring. Some of these caterpillars pass two moults, and some pass three moults, and next year the insects will appear very much sooner than those that only passed one. That will give several appearances, extending a month over the time that the codling moth will appear. There are two broods of the codling moth, but as they are brought out and appear during a long period, it makes the appearance of the young caterpillars very much prolonged in time, and it is practically the fact that young caterpillars may be found any time after the 1st of August until late in the year ; but it does not matter to horticulturists and fruit growers particularly what time these caterpillars appear ; they know that there is a certain danger-time in the year that they have to protect themselves against, and if they find that fact out that is all they want. It does not matter to the horticulturist where the codling moth lays the egg—in the calyx or on the apple. They know that the caterpillar is going to get inside the fruit and do harm. It is a matter for the entomologist to find out how it gets there, and for the horticulturist to prevent it. Mr. Orr, and Mr. Pettit before him, has shown in his report that a great deal of money can be saved by spraying. Spraying pumps have been improved so that we have nothing to complain of in our times. There are two sprayers here to day—the Spramotor and the Aylmer pump—excellent pumps, as good as any man wants to use. I do not say they are better than any others, but I say that they are all that a man wants. You need not stop spraying because you have not got a good pump. You should get a good pump, and use it. You know if you spray your trees regularly, and Mr. Orr's figures will show you the fact, that you are going to save a large percentage of your fruit. I maintain it pays every man to spray his trees, it does not matter whether he has two trees or two thousand it will pay him to spray those trees so that they will give good fruit, which will give him a good return. There are orchards in some parts of the country to-day which are not sprayed where hardly a good barrel of apples can be got, and adjoining those orchards, separated only by a fence, are orchards where fruit of A1 quality can be picked and give the owners big returns. You are perfectly competent to know that by the very fact that you did not want your time taken up by all the figures Mr. Orr was prepared to read to you, because you knew that you could save from 60 to 80 per cent. of your fruit, and have it of the first quality by spraying. I say that report which Mr. Orr has given us is a very valuable one.

There is only one omission that I saw in it, and that was that he said nothing about the San Jose scale. We might infer from it that that San Jose scale was nothing to you growers up here. There is nothing more important than to prevent the introduction of the insect into the country. Your Government has put forth grand efforts to stamp it out, and as you know this Association is doing a good work in stamping it out. Mr. Orr last year drew attention to that pest and the enormity of it. It was of such importance that the Ontario Government and Federal Government undertook to pass measures, which were at first criticised, and which are now endorsed by the whole country, to stamp out this pest. I am surprised there is nothing said about it ; nor do I see anything on the programme about that insect which is doing so much damage, but which by the efforts of the Government has been brought down very materially and to a greater degree than any one hoped for last year. The efforts that have been put forth are enormous, and the results, though they do not show now, will show, if they are kept up a little longer, that an enormous good has been done to the whole country. From the fact that people have not been ruined in the country some are arguing that too much fuss was made about it. I say, gentlemen, not one word was said where a hundred ought to be said, for such a pest as that is, can only be understood by going down to the southern orchards and seeing it. Last March I saw down in the State of Maryland acres and acres of magnificent fruit trees that had been killed as dead as possible in three years simply by that one insect having been introduced—one large orchard of 28,000 trees wiped out in three years —and yet people will say that too much fuss is being made about the San Jose scale. I am thankful to say that our Government did put into execution these Acts, which were discussed so fully in both Houses, and the good effects have been enormous.

Mr. ORR: I think there was no time of the year but what we could find a young codling worm just boring into the apple.

Prof. FLETCHER: That is after the middle of June?

Mr. ORR: Yes.

Mr. A. H. PETTIT: There are a number of people here who have trunks and branches of peach trees affected with the borer, with the gum oozing out quite freely. If you will give them a little life history and remedy it would be helpful.

Dr. FLETCHER: The specimen on the wood that has been brought, and which when an attack is present is indicated by a large mass of gum that is produced and oozes, is a very small beetle, one of the bark borers, which only bores into the bark and not into the wood. The best remedy is the Saunders wash with a little soda ash put into it—soft soap made thin enough to use with a large brush, and washing soda and water, then add to that carbolic acid sufficient to get a strong odor. It has been used by Mr. Karl Fisher, of Queenston, with great success. Put the first wash on in March, after that two applications will be sufficient. One in March and the other about the end of May.

Dr. SAUNDERS. I wish to offer my word to what has been said of appreciation of this good work which Mr. Orr has been doing. I do not think there is any line of work which the Ontario Government has taken up which is likely to produce more permanent and lasting result than this work of spraying our fruit trees. The value of the apple crop in Ontario depends very much on the cleanness of the fruit and its quality, and we cannot have clean fruit now-a-days of good quality unless we adopt some regular system of spraying. Fungous enemies and insect enemies are multiplying to that extent that it is no use to look for good results as a rule unless the farmer and fruit grower will take the pains to meet these enemies by which he is surrounded. I know you occasionally meet with fruit growers who say, "I do not believe in spraying; I have got just as good apples as my neighbor, and I have not sprayed, and he has." There may be exceptional cases of that kind. There are, no doubt; because these people speak the truth. But there is no rule that has not exceptions, and these exceptions can be explained in every case without reflecting on the value of spraying. I was very much struck this autumn when visiting the Industrial Exhibition with the excellent demonstration which Mr. Orr made there on the value of spraying. I think there is nothing appeals to the mind of the ordinary and intelligent observer so strongly as a practical demonstration by object lessons, and I think Mr. Orr hit on a capital method of bringing together a large number of samples from different orchards where these experiments had been conducted, and showing fair representative fruit from sprayed and unsprayed trees. Sometimes when we get up to talk about these things at meetings, or talk about them to farmers individually, they think we are allowing our imagination to run away with our judgment, and putting things in too strong colors; but when they have the fruit put actually before them they can judge themselves of the results and the methods used; and I think it was an admirable method of demonstrating the value of this most successful work. I think it cannot be commended too highly, and it has evidently fallen into good hands and been carried out very thoroughly. (Applause).

Prof. MACOUN (Experimental Farm, Ottawa): I listened with very great pleasure to Mr. Orr's reports, and I would like to add what results we have had this year at the Ottawa farm. In the Ottawa District we have not been very much troubled with scab; in fact it is very rare that I have seen a case of it this year. Our spraying for scab did not improve the position to any great extent, but on spraying for codling moth, I observed that our early apples up to the Duchess were almost free from codling moth. From that time to the fall and winter apples were badly affected with codling moth. We sprayed our orchard five times this year; but I have come to the conclusion that if we are to rid the orchard of codling moth, if we are to have clean fruit, that we must spray the winter apples later on in the season. It is impossible of course to spray some apples that ripen earlier, to spray them late on account of their color, but for winter apples I believe it would pay us to spray late in the season. I had an excellent opportunity this season of observing the good effects of spraying in Montreal. While there I had the pleasure of visiting my friend Mr. Brodie's orchard, and saw there the immense advantage which he had over his neighbors. Mr. Brodie has carefully sprayed his orchard for several years. His trees are in a far healthier condition than his neighbor's, and this year he tells me he produced 1,500 barrels of apples. Now, I saw the trees of his neighbor, and I saw there was scarcely any fruit on them, and Mr. Brodie tells me that they were none of them worth picking; in fact the man had nothing in his orchard. I think this example alone will show fruit growers how important it is to spray their trees thoroughly.

Mr. Pattison: Some years ago, having some leisure about the 13th August, and noticing that the codling moth, the second brood, was working badly, I took the trouble to thoroughly spray the orchard with Paris green at that date. I am sorry to say that I found as far as I could see that it did no good whatever. I could not ascertain that I had benefitted in the slightest degree from it, and I am afraid that spraying at that time of year we do not seem to get at the insect sufficiently to do it any serious damage.

Mr. Huggard: I have a small orchard, about 80 apple trees, that I have sprayed some six or seven years. These last two seasons our first spraying was before the buds came out, and I consider is as important a spraying as there is the whole year for the black spots. Out of 130 barrels that we just shipped recently we did not have one bushel of wormy apples. I attribute the whole thing to careful and intelligent spraying at the right time.

Mr. Tweddle: I had some experience this year as well as years before in spraying, not only in my own orchard but in that of other parties, and I must agree with Mr. Orr that it was of a great deal of value. I was so unfortunate that I had to take to the road in selling spraying pumps. In my work I had a great deal of opposition from people whom I tried to sell to, and it occurred to me that I would try to take some means of convincing them from a financial standpoint that these things could be accomplished; so I arranged with a neighbor to spray his orchard and pick the crop for one-half. He thought it was a good idea; as he said "If you do not make anything I will not have to pay you, and it won't cost me much; if you make anything I will make something." So he told me if I would spray his summer apples, Astrachan and Duchess, for nothing, give them a couple of applications, he would give me one-half of the balance. The orchard consisted of two parts of 10 acres each, both the same aged trees, about the same cultivation and the same kind of soil and everything alike as near as I could tell. The trees were not pruned sufficiently, or as thoroughly as I would have done. The arrangement was made about the 7th May, and I sent a rig down to work right away; we put on what we could. Some of the trees bloomed before we got over it. In all we gave it four applications; the last one was about the last of July. I think we finished on the 30th July, and when we picked the apples some of them had the Bordeaux mixture on them. We used more Paris green and lime; we used six ounces of Paris green, forty gallons of water, and six lbs. of lime. When I finished on the 30th July the apples on both orchards, as far as size was concerned, seemed about alike, and in one orchard there seemed to be about as much crop as the other. I never went back to the orchard till about the middle of September, and I went into the nearest one first, and I was surprised to see the amount of fruit and the size and condition of them. I said to myself, "Why, here is a bonanza for me as well as for the owner," and I felt very well pleased. When I went over to the other orchard, where I expected to see three times as much fruit, I was very much disappointed in the quality and condition both in the variety and fruit. I could not understand; I sprayed both orchards alike, and they looked to me just alike as near as I could tell, and cultivated alike; but I found that the first orchard had been quite well manured with ashes and some barnyard manure, while the other had been pretty badly neglected in that way. From that orchard—and it was the off year—I took about 225 or 250 barrels, and the other orchard, instead of having three times as many, there were only 150 barrels of first-class fruit—hardly first-class; we called it XX No. 1 and the other XXX. In the orchard which was not manured we took off about two carloads of peaches and one carload of Duchess, and one carload of the other, in all about forty-six tons. In the other orchard we took off about 480 barrels. That does not seem a large number of No. 1 fruit, but the unmanured orchard rendered a very small proportion of saleable apples; there is where we had the loss. I may safely say that had that orchard been manured it would have yielded a thousand dollars more this year than it did. We shook down about fifteen tons of crop that were too small for sale, and my share of that orchard was $680, and it cost me about $275 or $280 for the spraying and packing and picking up of this fruit, cullage, etc., which left me just about $480 clear for the operation. I think this is a practical illustration that might do as much as any other illustration. There is nothing political about it. I got money out of it, and am very well satisfied. (Applause and laughter).

R. W. SHEPHERD (Montreal): The fruit growers in the Province of Quebec who have tested spraying thoroughly are I think all quite unanimous that spraying must be kept up and that it pays well to spray. In connection with my export business of apples in cases, I have to purchase at outside places; I grow apples in different sections of the Province. I may say first of all that Fameuse is our leading apple in the Province of Quebec. You call it the Snow. It attains to great perfection in the Province of Quebec, and is our leading apple. It is by a long way the first and most profitable apple. It is also perhaps the most affected by the spot of any apple; therefore in our Province it is an absolute necessity for us orchard men to continue spraying, and to spray well, and we must not neglect it. In connection with my export business of Fameuse apples in cases, I have to visit the different sections of the country in order to buy the fruit to fill my cases in the different orchards, and in one section of the Province I visited one orchard where a man of great experience had about 500 barrels of Fameuse. After going through his orchard I said to him, "I don't think you will be able to fill one of my cases out of your whole orchard." He says, "No, I don't think I will; not good enough, not clean enough." I went to his neighbor on the next farm and he had sprayed his orchard the last three or four years and sprayed pretty thoroughly. I went through his Fameuse orchard and found very good fruit. He filled fifty cases. Further on a man who sprayed carefully filled 100 cases; and it was only in the orchards that had been sprayed that I could get good enough Fameuse for my business. My own experience is that unless the spraying is kept up and thoroughly done every year the orchard men in the Province of Quebec may as well give up growing Fameuse; and I think Mr. Brodie will bear me out in that, that in his section his orchard is in fine condition. His neighbors mostly French Canadians, have not bothered themselves about spraying, and they are cutting down their orchards. They found that Fameuse has become unprofitable, and the result is they don't want to learn I suppose, and they are going to some other kind of cultivation. That is the experience I had this year; in the orchards that were not sprayed I could not get good enough fruit for my business, in fact I had to give up buying fruit because I could not get good enough in the sections where the spraying was not done.

Mr. CARPENTER: I would like to know if Mr. Orr has experimented in some other directions of spraying than apples? Many of us are interested in growing pears and plums and peaches and no apples. Is there the same good done in spraying of peach orchards?

Dr. SAUNDERS: I may say in that exhibit in Toronto to which I referred, Mr. Orr exhibited some samples of the Flemish Beauty pears which had been sprayed, and some which had been gathered without spraying, and the one lot that had not been sprayed were badly cracked and diseased while the others were healthy. I have no doubt Mr. Orr has carried on experiments of other varieties of pears besides Flemish Beauty.

Mr. CARPENTER: Does the Government confine it to apples alone, Mr. Orr

Mr. ORR: Apples alone is our regular business. Of course I have been spraying all my fruits for the last 13 years at home; that is experience apart from what I am doing in my regular work.

Mr. CARPENTER: Would it not be a good idea for the Government to give us a little benefit of the operation of spraying other fruit trees?

Mr. ORR: Your crops are so regular and you make so much money out of them that your case is not demanding much sympathy from the Government. (Laughter.) If time would permit I could tell you something of my experience at home, but I hardly feel like taking up time when there are other papers on the programmes. I purpose giving my experience in spraying peaches in an article in the *Horticulturist.*

Mr. COLE (St. Catharines): There has been nothing said here to-day about the spraying of grapes. We all agree with Mr. Orr that it is very essential for fruit growers to spray their orchards. About six or seven years ago my vineyard—about 50 or 60 ton vineyard—was badly injured with black rot, something new to us in this section of the country; but we were advised to spray, and we did so next year with a great deal of benefit. My vineyard was hurt so badly that it took a great deal of time to repair it for the market, and then my crops were not in a very good condition; but I sprayed thoroughly that season, and out of 54 tons I am satisfied I did not have 500 pounds of culls, and I attribute the whole thing to the spraying. Since that we spray our vineyards thoroughly, which we feel it is a necessity to do in this vicinity in order that we may get first-class crops. It is as essential to spray our vineyards as it is apples.

Mr. ORR: The instructions for spraying apple trees apply to all other fruits. The necessity of spraying apples particularly is because we go over the whole Province, in sections where they have never seen the work done. You spray pear, peach, vineyards exactly in the same way and with the same material as apples. I will tell you what I did with my peach trees. I had heard that experimenters were spraying with a preparation of lime in the fall and winter to keep the buds back in the spring. They calculated by having the trees white that it would not attract the sun, and delay the blooming period a week or ten days. Last December I sprayed my peach trees thoroughly with preparation of lime alone, and in February and March they looked as white as snow. In the latter part of April and May, we sprayed the same trees with Bordeaux mixture. We just sprayed 100 trees with lime, and in the spring we sprayed all the orchard. The Bordeaux mixture I think was too strong for the narrow leaves or willow leaf peaches; after the spring came in they dropped the foliage and the crop, but all the rest of my peaches bore a good crop. I think when the trees were dormant that the Bordeaux mixture the regular strength did not injure them, but after the growth commenced I think it injured the wood so that they dropped their foliage. However, they got a new foliage and had a good crop of foliage later on, but they dropped their fruit. That was simply a few narrow leaf varieties. Where the broad leaf varieties took the material there was no harm done. I do not know of any peaches grown apart from what I had, and I attribute it all to spraying, preventing curling of the leaf which in my own case took the last leaf off the trees that were not sprayed.

A DELEGATE: What about the effects of the lime?

Mr. ORR: I was away from home, and I cannot tell you accurately as to that. Where they have been testing it for two years they claim they can hold buds back for a week or ten days.

Mr. PATTISON: Do you use any Paris green on peaches?

Mr. ORR: No.

Mr. PATTISON: What strength do you use if for plums?

Mr. ORR: I use the regular Bordeaux mixture, adding 4 ounces of Paris green to each 40 gallons of water for plums.

Mr. CASTON: There is one difficulty I have known in spraying with Paris green; if you stop with half a barrel of mixture and go to dinner, that Paris green goes to the bottom and I do not think there is an agitator made that would bring it up again if you do not use something else besides the agitator; and then when you come near the bottom you will have a very strong mixture. I would like to know Mr. Orr's experience as to that. When the Paris green mixes with the lime in the pump it forms a mass that you cannot get at with any ordinary agitator.

Mr. ORR: We never allow our appetites to drive us away with half a barrel of spraying (laughter); but if such a thing should happen I would not take the slightest hesitation in going right on with the agitators.

Dr. FLETCHER: There is this trouble, as Mr. Caston says, and even in spraying with all care it is well to wash your barrel out or stir it up with a broom after about three fillings. You can do it with a corn broom very well. In reply to the question as to spraying Paris green in the mixture, that is a very important one. I have never found it necessary to use any greater strength than one pound in 200 gallons, and have found excellent results with that. Mr. Brodie asked if it would not be better to have a stronger mixture than Mr. Orr uses. I would say it would be very dangerous to have it ever stronger than that. I think it was a lack of patience. Paris green is a slow killing poison, and it takes about two days to get the results.

Mr. BRODIE: In the meantime they eat up the whole of the potatoes. Laughter. I have heard from one of our Montreal fruit exporters that one of his farmers consigneed apples to him sprayed with raw petroleum and water and Paris green. Have you heard of such a mixture for preventing the apple scab, the fungi on the apple?

Dr. FLETCHER: Yes, there has been a recommendation made during the last two years in the United States to use pure coal oil. At the present date, both in the States of Maryland and in New Jersey where it has been tried very carefully there are a great many injured trees from the application of that remedy. There is a special pump made by which the water and the coal oil are vaporized, broken up into very fine particles by the same machine. If anything gets out of order you are apt to do a great deal of injury, and hence they have not become very popular. The other remedy for the San Jose scale was to spray with pure coal oil on a bright day with a very fine nozzle. Anyone that has seen any spraying at all knows that if you have not fine weather the nozzle gets out of order very easily. It is better to use a weak solution and repeat it than to use a strong one and take the risk of losing all.

A DELEGATE: Tell us the solution for the San Jose Scale?

Prof. FLETCHER: Two experiments in the United States have shown that the only remedy that has given what we may call even good results is this pure coal oil, which is too dangerous for anyone to adopt, and the other is caustic potash or whale oil soap as strong as two pints to one gallon of water, which is a very expensive application.

SHOULD ONTARIO BE REPRESENTED AT THE PARIS EXPOSITION

Mr. McNEILL: I am convinced that this Province should be represented at the Paris Exposition of 1900. It is on the back of the programme, and should be attended to at this session, as to-night is not a favorable opportunity, and I take the opportunity of making a motion in regard to it and offering a few remarks. I am sure it needs no words of mine to convince the people here that it would be to the advantage of everybody concerned that there should be a representative at the Paris Exposition; not that we care particularly for our trade with the French people, but that we care with our reputation with the world, and the world will be there. Therefore I take for granted that every person in this hall to night would be glad if the Government would have a representative at this exposition. I therefore move:—"That the Provincial Government be requested to make an exhibit at the Paris Exposition of 1900." It is put very briefly, and I presume that the Secretary will transmit this to the proper channels, and that the proper means will be taken to make the opinion of this Association effective. I am perfectly certain too, that we are very anxious that our fruit exhibit should be creditable to us. We have a wonderful country here which has been misrepresented, and of late years much has been done, and successfully done, to combat the old ideas in reference to Canada, and the man who is put there to represent us will have a great deal to do with how this country appears before the world. I would therefore add to this motion, "that this Association recommend that William Orr be in charge as a representative of the fruit men in Ontario." I do this because of his long experience in fruit growing, because of his success in connection with the Chicago Exposition as far as he had charge of any part of it, and because of the experience that he has got throughout the province in connection with these spraying experiments. He has, perhaps more than any other man that I could name at the present time a knowledge of the exact resources of the Province in this line. I am sure you will all agree with me that no man is more worthy to represent us creditably there than the gentleman I have mentioned.

Mr. A. H. Pettit: Allow me to second that resolution.

The President: I do not think we have time for any general discussion unless there is any objection to this resolution, so I will just put it without discussion.

The resolution put and carried unanimously.

THE FRUIT GROWER OF THE FUTURE.

By E. Morden, Niagara Falls, Ont.

The fruit grower of the present is very often a failure. Very often he lacks scholastic training; very often he knows little of the sciences that underlie his particular industry. He lacks practical knowledge; he lacks mechanical dexterity; his soil is often unsuitable; his location as respects markets is often wrong.

Often he is a city man, a business or professional man, a mechanic or a "transmogrified," slip shod farmer. Fruit growers must compete with men who are favorably situated.

The coming Fruit grower to succeed must be fully equipped. He will not be an ignorant man; he will have a fair understanding of the laws of nature that are operating all around him. He will therefore study the sciences which underlie his business; he will know of the elements and their combinations as found in the soil, the atmophere and the plants. He will be familiar with effects of heat, light and electricty. He will have a knowledge of insects of fungoid growths; he will understand the insecticides and fungicides; the whys and wherefores in their use will not be mysteries to him.

He will actively aid legislative measures for stamping out insects and diseases; he will not stupidly refuse to destroy trees affected with peach yellows or other diseases because he has inherited some past theory from his grandmother. His wife will doubtless know why milk sours and thickens and cream rises; why the bread or cake rises. through fermentation or the carbolic acid gas liberated from the carbonate of an alkali. She will know all about fermentation; the sweetest of women should know how to make vinegar.

The coming fruit grower will have an accurate knowledge of fruits, their varieties culture and management. The coming fruitgrower will know how to handle his trees and do his work; he will possess mechanical dexterity in his own particular line—very few, even of farmers, can handle a hoe properly; he will see that the right thing is done in the right way and at the right season. He will not be a grower of weeds.

The coming fruit grower will not dabble much into other kinds of business, for although the general farmer has many advantages over other men, he cannot well be a general farmer and a general fruit grower. He may, however, successfully grow one or two kinds of fruit. A poor farmer does not make a good fruitgrower.

The coming fruit grower will operate with a suitable soil. He can buy good land far cheaper than he can make it. A hard clay, a poor sand, or a swamp, will be dear at any price.

The coming fruit grower will locate near to markets or shipping points. The farmer from away back, who expects to team berries for many miles and compete with a fully equipped fruit grower located near the city or town, courts disaster.

The coming fruit grower will plant varieties that will yield large crops suitable to the demands of consumers. Let us hope that the coming consumer will be educated to consider quality in making his purchases. To get the required varieties the grower will deal directly with responsible nursery men. He will when the fruit is produced hold that responsible nursery man to strict account for wrong fruit trees or plants furnished to him. The discouragements of present growers along this line should suffice for several generations.

The fruit itself will be reformed. The poorer samples will not cluster in the lower portions of the packages while their fairer friends are pushed up to the top. By some method of inspection or rejection the coming fruit will be what it seems.

The fruit commission-man will be reformed or extirpated. Growers cannot much longer produce fruit to increase the joys of express companies and commission men. The beautiful fruit which it has taken a lot of pickers' hours to prepare in good shape for transport is now shamefully and hopelessly bruised by express men in a few moments. Cheaper, better and more varied means of transportation we must have. When the future trolleys permeate our country in all directions reaching many villages and country places, fruit will be better distributed. How many farmers in the clay portions of Lincoln and Welland are supplied with peaches and many other fruits that are almost or altogether going to waste in the fruit growing sections.

We do not now reach the large home market in our own counties. In many of our counties there is no large production of the fruits generally. Their townspeople pay a pretty good price for the well bruised result of the express man's energy, while we pay him a high price for bruising it.

In the rural sections of much of Ontario where at least during the summer months fruit should constantly appear on the tables it is rarely seen. When the future farmer lives up to his best interests in this connection there will be a marvellous expansion of the home market. The commission man ought to become a direct buyer. In time his agents will meet the fruit growers at the stations and buy directly. Near the large American cities this system is in vogue. Growers there have had their fill of the commission business. We have had our fill. Emptiness is perhaps the proper word. The other fellows have been filled at our expense.

The coming fruit grower will recognize four principal points of the compass. The present one knows only three—east, west and north. He has not learned that there is a south which shelters millions of trained fruit eaters who, after their own season has passed, must get fruit from the north. The idea that southern fruit may find a northern demand is already well understood. The idea that later northern fruit may find a southern demand has not penetrated the cranium of the Canadian fruit grower. It will do so in time. From July 1st, 1893, until late in 1897, Canadian small fruit entered the United States free of duty. In the year 1896 nearly $36,000 worth of small fruit entered Buffalo. I have not the figures for Detroit and Niagara Falls, but I know that immense quantities were entered at those points. Buffalo and Detroit by what we should call a lucky chance are placed contiguous to the two principal fruit growing centres of Ontario. This southward current of Ontario fruit was increasing in volume at a rapid rate. With a free entry it would soon have counted many thousands and would have penetrated further and further south. Who would have been hurt by this state of affairs? Not the American fruit consumer; not even the American fruit grower, because his season of fruit production would be past. The Canadian fruit grower was liable to suffer; he would have been called upon to carry around a load of money which just now would be a queer experience. He would have perspired freely in producing fruit for those who wanted it now he perspires in his efforts to sell fruit to those who don't want it.

The effect of throwing back upon fully supplied local markets the $36,000 worth of small fruit that found an outlet at Buffalo is of course disastrous to us. What were our Canadian fruit growers doing during the fourteen years of free entry into the United States? Clamoring for the exclusion of American fruits, and succeeding in their efforts

Competing with the Americans in their own markets and asserting that we could not compete with them here. At last our long-suffering neighbors gave us a dose of our medicine and it was not good to take. When we come to the larger fruits we find that many of the western states will never produce them largely. We can produce them. Our winter apples are of good quality. They keep well. Our nearest and surest market is to the west and south. Why should we refuse to occupy the markets that call for our fruit? Why refuse to accept ordinary fruits from the south which mostly arrive when we have none. We have all along given a free entry to the fruits of the extreme south. These, arriving at all seasons, have done us much more harm than has resulted or would result from the influx of the more northern fruits. Housekeepers who can secure a cheap supply of oranges and bananas do not, in most cases, *can* our summer fruits.

The coming fruit grower will not only enjoy free markets abroad, but will have a free market at home. He will not be fined ten cents for feeding his fellow-countrymen who happen to live in towns or cities. Just now in Ontario we find that hay, grain, dressed hogs, lumber, laths, shingles, wool, and under certain circumstances, butter, eggs and poultry, are exempted from the operation of the market fee tax. Thus it will be seen that the general farmer is exempted while the fruit and vegetable grower is still taxed. This unjustifiable discrimination against fruit growing should be remedied speedily. The future fruit grower will pay his own municipal taxes, but will not be taxed by the town which he visits in order to sell his fruit. The future fruit eater will not erect barriers to prevent himself from getting fruit to the very best advantage.

The fruit grower, in pursuit of his customers, meets with too many barriers without contending with Legislative barriers.

The President: Before closing the meeting there is a paper I would like to have read by Mr. William Armstrong of Queenston.

Mr. Burrell: That is an important subject particularly to this district, because in spite of the talk of over production last year the peach industry is about the most important in this district, and 75 per cent. of the whole of the peaches that we produce were simply second grade peaches; so we do not overproduce the good fruit, and this question of training and pruning properly to get good fruit is a very important subject to this section, and I feel that we should get that at once and properly explained by Mr. Armstrong in ten minutes.

The President: I have hurried through the programme with the view of giving Mr. Armstrong a place.

Mr. Armstrong then proceeded to show his method of pruning peach, using samples of trees which he had brought in for the purpose. In the absence of illustrations it is impossible to report his method.

HOUSE PLANTS.

By Wm. Gammage, London.

Fashions come and fashions go, but the fashion of cultivating plants and flowers is pre-historic. It is ever on the increase, for as man's grosser wants are supplied, new necessities arise which must be satisfied, and what we considered luxuries a few years ago are the necessities of to-day. The production of flowering plants is a recognized industry of the country. A vast amount of capital is invested in it, and large numbers are employed in the production of nature's beauties. Plants and flowers are now as much of a necessity to the complete furnishing of the modern home as are some of the more useful articles. Nothing lends elegance to its surroundings or to the complete furnishing of a room like a perfect specimen of the palm family; and the ease with which they are grown and cared for has not been generally known. Now that the public are becoming more acquainted with the case of their culture, the demand has increased until it requires thousands annually to supply the demand, where a few years ago dozens were ample. Nor is the demand confined to the Palm alone for house decorating, but Ferns, Ficus, Dracaena, Pandanus, Aspidistra, etc., each have their admirers. Failure or success in growing house plants depends almost wholly upon the person in attendance; situation, soil, water and pots are secondary considerations, but to be successful the peculiar requirements of each species must be studied, and even varieties of one species. In the ordinary living room the hot, dry atmosphere is certain death to most plants; therefore the cooler rooms should be selected. Do not attempt to grow flowering plants in a room where much gas is burned, that is if you want them to bloom; the amount of sulphur in the gas will cause the bloom to either drop before developing or develop an off color or a deformed flower. Gas has no effect worth mentioning on such plants as Palms, Ficus (rubber tree), Aspidistra, etc. Their only requirement is a sufficient and constant amount of care in giving light, air and water.

In the care of decorative plants, such as the above mentioned, avoid the use of commercial fertilizers, and that erroneous but widely practiced fad of dipping the plants with castor oil. The injudicious use of fertilizers has killed more valuable plants than it has ever been the means of benefiting. The use of castor oil, too, although not so quick in its action, is sure death to the subject. In my experience as a commercial florist I have found that when plants require feeding there is nothing like animal manures, and even with this mild form of stimulant too much care cannot be exercised in its use. When mineral or commercial fertilizers are used the time of application depends on the ingredients; if they contain nitrogen as the main manurial substance, they must be applied during the growing season, as plants assimilate this substance immediataly; if phosphoric acid or potash is the main ingredient, then it should be applied before needed, or in other words should be incorporated with the soil in the compost heap. As plants take this form up slowly it is likely to remain in the soil until the roots take action upon them and make them soluble. It is a well known fact that all plants take their food in the form of solution, and almost exclusively direct from the soil by their roots. Nitrogenous manures are needed only to induce free growth of wood and foliage, the phosphates and potash give substance to the wood and color to the flower. In the preparation of the soil for decorative plants I would recommend the following as a compost: 50 per cent. clay loam sod, 20 per cent. jadoo fibre, 20 per cent. leaf mould, 10 per cent. well rotted cow manure. This mixture will answer for almost all varieties of palms, ferns, soft and hard wood decorative plants. For flowering plants, such as begonias, cyclamen, primuli, etc., a light rich, fibrous soil is required. As a rule, hard wooded plants require a heavier soil; also geraniums, fuchsias, cinerarias, and all varieties of lilium, do better in a rich, heavy soil. Care should always be exercised to see that the soil is taken from some high and dry land; a rich pasture or unbroken ground always being preferable. The more fibre your soil contains the less liable it is to sour, and the sooner your plants take hold of it.

Light, air, and water are indispensable to plants, as to man. Avoid the too frequent habit of crowding or huddling a lot of plants together, and thus producing the poor, puny, drawn, long-leggy plants that we see. Better to have a few, and have them sturdy, robust, and well matured. Give all the fresh air possible. Once a week is not too often to give them a total immersion, or to wash all the foliage. Perhaps the most important of all in the cultivation of plants is the knowledge of how and when to water; it is a knowledge that can be gained only by experience. It is one of the greatest difficulties we have to contend with in greenhouse work, to get men who thoroughly understand the art of watering. It is always safe to be on the dry side, for once the soil is soured by over-watering the growth is immediately checked, and will not again start, until chemical action has again taken place in the soil. Care must also be taken to see that the pots are not too large for the plants; this is a common error, one that we meet with every day. A customer will come to the conclusion that a plant needs repotting, and immediately acts on the impulse of the moment, going out into the garden and taking the first convenient soil; next a pot is selected two, or three, or perhaps four, sizes larger than the one from which the plant is to be removed; no drainage is provided, but the already sickly plant is put into the large pot with the poor and too often sour soil, and then watered and watered; then because it does not grow it is given stimulant in the way of liquid manure, whereas most likely the only thing that the plant required was to remove some of the soil, put it back into the same pot with fresh soil, and water sparingly until such times as it had made a new growth.

Bulbs for house culture give excellent satisfaction, commencing with Roman Hyacinths and paper white Narcissi, a succession of showy bloom can be had from early November until the spring. No special preparation of soil is required; they do equally well in any kind of soil, or any situation. After being brought from the cellar they require an abundance of water and a moderate temperature to produce the best results.

Mr. WHYTE: What proportion of jadoo do you use?

Mr. GAMMAGE: Twenty per cent.

Mr. WOOLVERTON: Is it easily got?

Mr. GAMMAGE: Yes, from almost any seed house. It is sold at about three cents a pound, or $27 or $28 a ton. It has the appearance of peat. It undergoes some chemical process. It is imported from England. Speaking of watering plants Mr. Gammage said: Most people imagine that when a plant is potted in a large pot it needs plenty of water. That is not the case. After re-potting give it a thorough watering and allow it to dry sufficiently so that the roots will begin to work in it. If it is watered till the soil is soured the organic acid that is in the roots does not have power to make sufficient nutriment to take it up. People after watering plants think the soil is not rich enough and they go and give it liquid manure. This will almost always kill the plant.

Mr. BRODIE: Do you also attempt to use the bone meal as a fertilizer?

Mr. GAMMAGE: It depends on what you are going to use it for. We use tons of it every year, but we mix it with our soil for months before we begin to use it.

Mr. WHITNEY: In potting lilies do you place sand around the bulb?

Mr. GAMMAGE: Not necessarily. We use a proportion of sand in the soil, enough to cut it so that you can feel the sand.

Prof. HUTT: Mention the best dozen plants you consider most suitable for house collection.

Mr. GAMMAGE: In the way of decorative plants, the Palms, Ficus (rubber tree), Pandanus, Grevillea, etc. Here is one that will stand rough treatment in any situation whatever—the Aspidistra. The Begonia gives a good deal of satisfaction. Coming on at this time of the year we have the Cyclamen, and the Calla lilies. Nearly all the varieties of ferns are hardy; Pteris tremula is probably the best.

Mr. WHYTE: You shook the flowers of the begonia to show the injury done by gas light; was all that damage done since the flower came into this room?

Mr. GAMMAGE: Yes.

Mr. WHYTE: Was it not on account of the uneven temperature of the greenhouse?

Mr. GAMMAGE: No: take one of these begonias and put it into a room where there is a wood stove, and it will last for weeks and weeks without dropping either a leaf or a flower, but place it in a room where a gas or coal stove is burning, and oftentimes two hours will do it.

HARDY PERENNIALS SUITABLE FOR CULTIVATION IN ONTARIO.

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

Flowers and fruit are so nearly akin that I think it is only right there should be one or more papers in connection with the Fruit Growers' Association on flowers. They are the most important, because if you had no flowers you could not have fruit. In travelling through Eastern Ontario and the Province of Quebec I noticed that our farmers have very few trees, shrubs or flowers growing on their farms. In olden times they began to clear away their woods, not thinking that the time would come when they would be glad of a few trees that they were so pleased to get rid of at that time. The result is that to-day in a great number of cases you will find that the farmhouse stands alone in a field without a tree for shade during the summer months, and with perhaps scarcely a flower to gladden the hearts of the wife and children and perhaps the householder himself. Now, I think this should not be, and it will be my aim always, whenever I have the opportunity, to impress upon farmers and fruit growers of the country how important it is to have some flowers in their place, and those of the best sort; so that I am going to bring before you this evening what I consider are the best hardy plants for this Province.

The plant which grows from the seed, flowers, produces fruit and dies the same year; or, in other words, an annual, does not possess, I think, the same charm as that which we have watched and cared for, perhaps for five years, and which, as time goes by, increases in size and beauty. Think of the old garden in which your younger days were spent, and there will come up in your mind's eye some favorite flowers and plants which had their places in some particular spot and which year by year appeared to gladden your heart and make your garden gay.

Many of the flowers which held a prominent place in the gardens of our forefathers are not to be surpassed to-day, but there are many more available since foreign countries have been opened up for exploration by our botanists and florists, and enthusiastic workers have produced others by selection and hybridization, until now we have a large and varied store of beautiful and many colored flowers. From this large number we can select those which please our fancy best and which are the most satisfactory.

It has been the aim at the Central Experimental Farm, Ottawa, to test as many species and varieties of perennials as possible, in order that the hardiest and best kinds would become known and be recommended to the farmers and horticulturists throughout Canada. The perennial border there is now more than half a mile long. It is on the east side of an Arbor Vitae hedge, and is twelve feet wide. There are three rows of plants—the latter being three feet apart each way. In this border there were living this autumn almost 1,200 different species and varieties of perennials. Notes are taken during the summer on the time of flowering, growth, color and other characteristics of the flowers, and the most promising sorts marked. In my report for 1897 a list was published of 100 of the best species and varieties that had up to that time been tested. A select twenty-five of these were marked with an asterisk for the convenience of those who had small gardens. There is reason to believe that this list has already proved of considerable value to intending planters.

The snow has barely left our fields and gardens when the Spreading Pasque flower (*Anemone patens*) throws up its flower stocks, at the ends of which are those large, deep, purple blossoms, which in the month of April help to relieve the otherwise dull appearance of the perennial border. Following this, in about two weeks, is the little Ox-eye (*Adonis vernalis*) which, with its large lemon-coloured flowers and finely cut foliage, is very attractive at this early season of the year. The Polemoniums or species of Jacob's Ladder, closely follow and are all profuse bloomers with flowers of various and delicate shades of blue. They flower in the following order:

Polemonium humile pulchellum, *P. Richardsoni* and *P. reptans*. *Polemonium coeruleum*, or true Jacob's Ladder, does not bloom until the second week of June. All of these should be in every collection of 100 perennials.

The earliest white flower of note is the White Alyssum (*Arabis alpina*), which blooms in the first week of May. Were this to bloom later, it would be overlooked by lovelier flowers, but in the early spring its pure white blossoms are very attractive.

The most charming and graceful, perhaps, of all the early spring flowers, are the Barrenworts or Epimediums. Of these, the best are *Epimedium rubrum*, *E. pinnatum* (*sulfureum*) and *E. macranthum*. The brilliant coloring of *E. rubrum* and the bright yellow of *E. pinnatum* make a fine contrast. The leaves of these pretty plants are also very ornamental.

Most of our best composite flowers bloom in the summer and autumn, but the Leopard's bane is an exception. During the second week of May the Caucasian Leopard's bane (*Doronicum caucasicum*) begins to bloom. Its yellow flowers are very attractive at that early season of the year. Following this is *Doronicum plantagineum excelsum*, which is taller than the last and has still larger flowers and is the better of the two.

The Iceland Poppy (*Papaver nudicaule*) is now becoming more generally grown. Its yellow, white, or orange flowers are very pretty. Other chief points of merit are earliness and continuity of bloom, as the flowers appear early in the spring, continue through early summer, and, after a short rest, open again in the autumn. The Oriental Poppy, which is not in bloom until about three weeks later, is, I presume, well known to you all. Its immense scarlet flowers of great brilliancy make it a very effective plant.

Among the most showy of the spring flowers and the most attractive of those that bloom in the summer and early autumn are the Phloxes. The Moss pink (*Phlox Subulata Syn. P. setacea*) is one of the old-fashioned perennials which is still used for bedding or borders. Its deep pink flowers are very effective during the month of May. Other good early flowering sorts are: *Phlox amoena* and *Phlox reptans*. *Phlox ovata*, which begins to bloom in the first week of June, is very desirable. The flowers are of a lovely shade of pink and keep open for a long period. Those perhaps which are most grown are the varieties of *Phlox decussata*, usually known as the Hybrid Perennial Phlox. There are now so many named varieties of this Phlox that it is not difficult to find some which are satisfactory.

The old-fashioned but still popular flower, the Bleeding Heart (*Dicentra spectabilis*), is very showy during the latter half of May. It begins to bloom about the middle of the month and remains in flower for more than four weeks.

All the Columbines are lovely flowers, but there are a select few which are deserving of special note. The first to bloom of these is the Russian Columbine (*Aquilegia oxysepala*), distributed some years ago by the Ontario Fruit Growers' Association under the name of *Aquilegia Buergeriana*, which it was supposed to be at that time. The flowers are large, deep purplish blue with yellow and blue centres. Following this are *A. glandulosa*, deep blue with white centre; *A. Stuarti*, deep blue with white centre, which is often a biennial, and *A. Canadensis*, our native wild Columbine. Toward the end of May, *A. coerulea*, one of the most delicately shaded and graceful species, is in bloom. The season of the Columbines is extended considerably by *Aquilegia chrysantha*, which does not bloom until about the fourth week of June. This is a magnificent species, attaining a height of four feet. The flowers are bright lemon yellow and very showy. There is a white-flowered variety of this which is also very fine.

With the opening of the pretty little dwarf Iris, (*Iris pumila*) during the third week of May, there begins a succession of lovely and many coloured species and varieties which go a long way to make our gardens attractive during the summer. Closely following *Iris pumila* is another dwarf species, *Iris Chamaeiris*, which is bright yellow with brown marking. The Siberian Iris with its numerous varieties now follows, and although these are not so graceful or pretty as some of the other sorts, they have their place in the rear of the border, for they attain a height of from three to four feet. During the first week of June, *Iris flavescens*, a beautiful yellow species with brown markings, begins to bloom, and following this are those wonderful and varied forms of *Iris germanica*, *I. neglecta*, *I. pallida*, *I. squalens*, and *I. variegata*, which rival the finest orchids in delicacy of colouring and grace of form. The Oris root (*Iris florentina*), which blooms about the same time, is a very handsome species. The flowers are large. pale blue or lavender, and sometimes white, and have a delicate perfume. This is one of of the most desirable species. Following these and beginning to bloom when they are almost gone, is the Golden Iris (*Iris aurea*). This is undoubtedly one of the most handsome species grown. The flowers are large and of a deep rich yellow color. These with a height of from 3 to 4 feet, give it a stateliness and beauty unsurpassed by any other yet tested at Ottawa.

The Japanese Irises, which are giving good satisfaction in a diversity of soils at the Experimental Farm, have an entirely different form from any of those previously mentioned. They have not the grace of many of the other species and varieties, but their colouring is exquisite, and they bloom during the month of July, when other Irises have disappeared.

The Globe-flowers, or Trollius, which remind one of a buttercup, but which are larger and richer in colouring, begin to bloom during the third week of May and are the among the best of spring flowers. *Trollius Europæus*, *T. giganteus*, and *T. Ledebourii* are three of the best.

Time will not permit me to speak of other spring flowers, such as the Evergreen Candytuft, *Iberis sempervirens*, the Prophet Flower (*Arnebia echioides*), the Li y of the Valley (*Convallaria majalis*), and others.

During the first week of June the Spiraeas begin to bloom and keep up a succession of white, cream and pink flowers until well on in the summer. The best of these bloom in the following order: *Spiræa Filipendula* fl. pl., *S. astilboides*, *S. palmata elegans*, *S. Ulmaris*, and *S. Venusta*. Of these, *S. Filipendula* flore pleno and *S. Venusta* are deserving of special mention. The former has pure white double flowers and is about 2 feet tall; the latter, has deep pink flowers and is 4 feet or more in height.

During the first week of June the bright scarlet flowers of *Heuchera sanguinea* begin to appear, and this charming and graceful plant continues to bloom until late in the autumn.

Most of the hardy perennial pinks have comparatively small flowers, but in some of the named varieties of *Dianthus Plumarius* flore pleno there are flowers which are almost equal to the best carnations. Mrs. Sinkins is one of these. The flowers of this variety are large, double white and highly perfumed. It is quite hardy and should be in every collection.

The Hemerocallis, or Day Lillies, contribute largely to the appearance of the perennial border during the summer months; the best of these are: *Hemerocallis Dumortierii*, *H. minor* and *H flava*, which bloom in the order given. A new variety from Japan, *H. aurantiaca major*, promises to be a good introduction.

It is in June and July that most of the lilies are at their best, and there are so many varieties of these beautiful flowers that it is necessary to limit oneself to the very best. *Lilium canadense*, *L. tenuifolium*, *L. elegans*, *L. tigrinum*, *L. superbum*, *L. auratum* and *L. speciosum* make a succession of bloom from June until September.

There are several species of Coreopsis which enliven the flower border from the latter part of June until autumn. Of these the most satisfactory tested at the Experimental farm is *C. lanceolata*, the flowers of which are large and deep yellow. *C. grandiflora* is very fine, but has not proved perfectly hardy at the Experimental Farm. There is a variety of this Golden Glory which has been lately introduced, which we have not yet tested. *C. delphinifolia* is quite different from the two preceding species, the flowers having dark centres.

The Gaillardias are among the most satisfactory flowers as they continue to bloom for such a long time. Beginning about the third week of June, there is a continuity of bloom until late autumn. The flowers of *G. aristata grandiflora* are very large and of fine colouring, the petals being of a deep yellow more or less tinged with orange, and orange at the base. Some of the named varieties of this are still better, such as Superba and Perfection.

Other fine flowers which begin to bloom in June are : *Achillea Ptarmica flore pleno, Anthemis tinctoria kelwayi, Clematis recta. Dictamnus albus, Linum perenne, Oenothera Missouriensis,* and the hybrid Potentillas.

Most of the Campanulas begin to bloom in July. Of these, some of the best are : *Campanula carpatica, C. Persicifolia,* and *C. latifolia macrantha.* The Platycodons, which are closely related to the Campanulas, are very desirable plants with large, deep blue, striped or white bell-shaped flowers. They are all varieties of *P. grandiflora.* The beautiful Cashmerian Larkspur (*Delphinium cashmirianum*) is deserving of special mention. It begins to bloom about the first week of July, and its bright blue flowers continue to be seen until autumn. There is a pale blue form of this which is also fine. These Larkspurs only attain a height of from one and a half to two feèt.

No garden is complete without a few pæonies. There have been such great improvements in these flowers of late years that the intending planter should make enquiries before buying, so as to get the very best varieties.

Perhaps no plant of recent introduction has become so popular, and deservedly so, as *Rudbeckia laciniata,* Golden Glow. Introduced only four years ago, this plant has now become almost as common as many of the old varieties. Unlike most plants of great merit, it multiplies rapidly, and it has thus been possible to supply all demands for it. It begins to bloom about the latter half of July and continues until late in the autumn. The flowers are large, very double and of a bright lemon-yellow colour, almost equalling a chrysanthemum of the same size and colour. It is a profuse bloomer and attains a height of from six to eight feet.

Some other fine flowers which begin to bloom in July, and which there is not time to take up individually, are : *Aconitum Napellus. Erigeron speciosus, Gypsophila paniculata, Helenium autumnale, Lychnii chalcedonica fl. pl., Rudbeckia maxima, Heliopsis pitcheriana, Scabiosa caucasica* and *Statice latifolia.*

During the months of August, September and especially October, the Michaelmas Daisies, or wild asters, help to extend the season of perennials. These flowers are now so common in our woods and waysides that they are not valued as they should be, but when brought into the garden they become most attractive during the autumn months. The best of our Canadian asters is probably *Aster Novae-Angliae roseus.* The flowers of which are bright pink. Several species and varieties which were obtained outside of Canada, and which are of the most exquisite shades of purple, pink, white and lilac, are : *Aster Amellus bessarabius, A. alpinus, A. Newry seedling, A. laeviagatus. A. undulatus, A. turbinellus,* the latter blooming until late in October.

There are a few other late blooming plants worthy of note, namely : *Aconitum Fischeri* (*autumnale*), *Funkia subcordata* (*grandiflora*), *Helianthus doronicoides, Helianthus laetiflorus,* and *Hibiscus moscheutos.*

Though perennials thrive best when given good soil and good cultivation, a large number of them will also succed with very little attention, and it is this fact which makes them valuable to the busy man, the lazy man, and the man who only grows them because he thinks it is the proper thing to have some flowers about his place. Once established, many perennials will hold their ground, though often shamefully neglected.

Mr. Gammage : I suppose the varieties you have mentioned are all perfectly hardy at Ottawa ?

Mr. Macoun : Yes. The great secret of preserving some perennials is to give them a good mulch of straw in the autumn when winter sets in. They can be got in the United States, or be got still cheaper by sending to Holland for them, and anyone wishing to get any of those can secure from me the names of firms in Europe or the United States who will supply them. First of all I would recommend you to apply to our Canadian nurserymen. Dr. Saunders reminds me that the seed can be had of a great many of them in the United States and in Europe.

REPORT ON HORTICULTURAL SOCIETIES FOR 1898.

The number of affiliated societies in operation as reported at the annual meeting of the Fruit Growers' Association of Ontario in December last was twenty-seven, with a total membership of 2,076. I now find from the list as published in the last Annual Report that the number of societies for the year 1898 is given as thirty-six, with a total membership of 2,610. Omitting from this list Burlington society where the membership is not given, and the Paris society, for sufficient cause, the true number of societies for 1898 is thirty-four and the membership 2,551. My work this year, which is now about concluded, will I venture to hope add several new societies to the list for 1899, which, if a corresponding aggregate is maintained, will make the membership from these societies something over 3,000 for the year 1899.

As the yearly aggregate and the yearly average of membership of each of the affiliated societies will be an increasingly interesting item for comparison with future years, I add the following comprehensive table commencing with the year 1895, which should be continued, or added to, for many a year to come :

Year.	No. of societies in affiliation.	Aggregate of membership.	Average per annum for each society.
1895	11	798	72.5
1896	17	1,197	70.4
1897	27	2,076	77.0
1898	34	2,551	75.0

I wish also to call the attention of the Board to the desirability of having a skeleton draft of by laws suitable for the guidance of the horticultural societies prepared as quickly as possible, and that a copy with the necessary instructions for their adoption be sent to each society.

Most of these societies are doing excellent service for our country and are deserving of every encouragement and assistance that can be given by the Fruit Growers' Association of Ontario.

Thos. Beall.

In accordance with this suggestion, the directors afterward appointed Mr. Beall and the secretary a committee to draft the by-laws. (See page 54.)

REPORT OF COMMITTEE ON FRUITS ON EXHIBITION.

We, your committee, find on exhibition the following fruits :

Shown by T. R. Merritt, St. Catharines : Two varieties of Rogers, Niagara and Vergennes grapes in a good state of preservation and of fine quality ; fine samples of Columbia, Clairgeau and Lawrence pears ; Rhode Island Greening, Rox. Russett, Ben Davis, Baldwin and Fall Pippin apples , also a fine display of hot-house plants, including two specimens of Australian ferns.

A. M. Smith, St Catharines, has fine samples of Duchess d' Angouleme, Anjou, Lawrence, Josephine de Malines pears ; Champion quinces and Sutton Beauty apples, the latter a new claimant for public favor.

E H. Wartman, Kingston, shows thirteen varieties of apples grown by Jas. Russell, of Wolfe Island, namely, Cayuga Red Streak, Colvert, Blenheim Orange, Cabashea, R. I. Greening, Tolman Sweet, Baldwin, Gilliflower, Snow, Seek-no-Further, Grimes Golden, all of excellent quality.

Robert Thompson, Grantham: Extra fine samples of Pomme grise and Baldwin apples.

Mr. Thomas Beall, Lindsay, shows fine Hulbert, Snow, Lawver, Ontario, Swazie Pomme grise, Ben Davis, Baldwin, Red Cathead, Nodhead and a Snow apple that appeared to be a relative ef the Duchess, but late and larger, of good quality, and evidently worth propagating.

Martin Burrell, St. Catharines, shows fine Vandevere apples, Lawrence and Duchess de Bordeaux pears, also a specimen of native of Japan chestnuts, showing a marked difference in size.

W. M. Orr, Fruitland, shows an excellent sample of Vergennes grapes, also Kieffer, Duchess and Clairgeau pears of the finest quality.

Jas Scarff, Woodstock, has Talman Sweet, Bellflower, Baldwin, Wagner, Spitzenberg, King, Spy, Blenheim Orange, Russett, Snow, Cabashea, R I. Greening apples; also fine samples of Duchess and Clairgeau pears.

The Experimental Farm, Ottawa, shows twenty-two varieties of hardy apples, most of them of Russian origin and particularly adapted to northern sections.

R. L. Huggard, Whitby, has eight varieties of apples and twenty-two of pears, most of them of fair quality.

Hugh Gourley, Oarp, Ont., shows a fine collection of apples for that northern latitude, consisting of Winter St. Lawrence, McIntosh Red, Colvert, Canada Baldwin, Snow, Wolf River, and four varieties, names unknown, but of fine appearance, and several seedlings of Snow very similar to their parents.

There are also fine plants from the green-houses of Mr. L. D. Dunn, St. Catharines, and an orange tree in fruit from James Dunlop & Son, St. Catharines, also three plants from Mr. Groom, grocer, St. Catharines.

There was also shown a sample of Hawthorn jelly, exhibited by Mr. F. G. H. Patterson, Grimsby.

A. M Smith.

A. H. Pettit.

IN MEMORIAM.

Moved by Thos. Beall, seconded by M. Burrell,—"That we, the members of the Fruit Growers' Association, desire to place on record our sense of the loss the Association has sustained by the death of Mr. James Lockie, of Waterloo, and of Mr. Richard Trotter, of Owen Sound. Mr. Lockie, as President of the Waterloo Horticultural Society, did much to develop the growth and usefulness of that organization, and by his knowledge and enthusiasm contributed largely to the promotion of a healthy interest in horticulture generally.

"The late Mr. Trotter accomplished much useful work in the direction of organizing and testing varieties of fruit. He was also the leading spirit in organizing the Owen Sound Horticultural Society.

"We desire not only to testify to the sense of our own loss, but to express a very sincere sympathy with the relatives of these two highly-esteemed members of our Association"

LIST OF AFFILIATED HORTICULTURAL SOCIETIES.

Name.	President.	Secretary.	No. of members, 1898.
Arnprior	Claude McLachlin	G. E. Neilson	55
Belleville	W. C. Reid	W. J. Diamond	66
Brampton	A. Barber	Henry Roberts	115
Brockville	Samuel Reynolds	Geo. A. McMullen	85
Burlington	A. W. Peart	W. F. W. Fisher	....
Campbellford	J. B. Ferris	E. A. Bog	56
Carleton Place	A. H. Edwards	J. A. Goth	57
Cardinal	Wm. Beddie	E. E. Gilbert	58
Chatham	W. D. A. Ross	G. E. Massey	80
Cobourg	J. D. Hayden	H. J. Snelgrove	91
Durham	Chris. Frith	Wm. Gorsline	97
Grimsby	Mrs. E. J. Palmer	E. H. Read	51
Hagersville	Wm. Harrison	S. W. Howard	57
Hamilton	A. Alexander	J. M. Dickson	115
Iroquois	W. A. Whitney	A. E. Overell	65
Kemptville	Angus Buchanan	T. K. Allen	55
Kincardine	T. W. Perry	Joseph Barker	99
Leamington	J. D. Fraser	E. E. Adams	51
Lindsay	Alex. Cathro	F. J. Frampton	113
Meaford	O. Boden	A. McK. Cameron	71
Midland	Frank Cook	Miss M. Tully	56
Millbrook	George Sootheran	W. S. Given	56
Napanee	Mrs. W. H. Wilkison	James E. Herring	59
Niagara Falls South	W. P. Lyon	†T. J. Robertson	75
Oakville	T. C. Hageman	W. W. Paterson	128
Orangeville	John McLaren	Wm. Judge	75
Owen Sound	Ven. Arch. Mulholland	D. R. Dobie	57
Paris	A. G. H. McCormick	Gordon J. Smith	55
Picton	J. R Brown	W. T. Ross	75
Port Colborne	W. W. Kinsley	A. E. Augustine	52
Port Dover	James Symington	W. J. Carpenter	74
Port Hope	H. H. Burnham	A. W. Pringle	131
Sarnia	Hon. Alex. Vidal	T. J. Gordon	67
Seaforth	Wm. Ballantyne	F. G. Neelin	79
Simcoe	H. H. Groff	Henry Johnson	77
Smith's Falls	J. S. McCallum	W. M. Keith	110
St. Catharines	Judge E. J. Senkler	W. C. McCalla	59
Stirling	Mrs. Jas. Boldrick	David Sager	53
Thornbury	*J. G. Mitchell	*Miss H. Henman	53
Trenton	W. S. Jacques	S. J. Young	52
Waterloo	A. Weidenhammer	J. W. Winkler	167
Woodstock	D. W. Karn	J. S. Scarff	98
Windsor	Stephen Lusted	J. R. Martin	68

* Clarksburg P. O. † Niagara Falls P. O.

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FIFTH ANNUAL REPORT

OF THE

FRUIT EXPERIMENT STATIONS

OF

ONTARIO,

UNDER THE JOINT CONTROL OF THE

ONTARIO AGRICULTURAL COLLEGE, GUELPH

AND THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO

1898.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO:)

PRINTED BY ORDER OF THE

LEGISLATIVE ASSEMBLY OF ONTARIO

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1899

FIFTH ANNUAL REPORT

OF THE

ONTARIO FRUIT EXPERIMENT STATIONS

1898.

To the Honorable John Dryden, Minister of Agriculture for Ontario:

SIR,—We beg to submit to you the Fifth Annual Report of the Ontario Fruit Experiment Stations. You will notice the gradually increasing value of the reports of our experimenters as the various fruits come into bearing. We also submit to you the first compilation of work to date on "Fruits of Ontario," a volume which in the course of years is intended to contain reliable information and exact description of all fruits that are of interest to Ontario fruit growers.

We have the honor to be, Sir,

Your obedient servants,

JAS. MILLS,
Chairman.

L. WOOLVERTON,
Secretary.

BOARD OF CONTROL, 1899.

REPRESENTING THE COLLEGE.

James Mills, M.A., LL.D., Guelph .... President.
H. L. Hutt, B.S.A., Guelph .... Professor of Horticulture

REPRESENTING THE FRUIT GROWERS' ASSOCIATION FOR 1899.

A. M. Smith .... St. Catharines.
Alexander McNeill .... Walkerville.
W. E. Wellington .... Toronto.
L. Woolverton, M.A., Secretary .... Grimsby.

EXECUTIVE COMMITTEE.

Chairman—James Mills, M.A., LL.D.
Secretary—L. Woolverton, M.A.
Official Visitor—Prof. H. L. Hutt, B.S.A.

THE ONTARIO FRUIT EXPERIMENT STATIONS.

Name.	*Specialty.*	*Experimenter.*
1. Southwestern	Peaches	W. H. Hilborn, Leamington, Ont.
2. Niagara	Tender Fruits	Martin Burrell, St. Catharines, Ont.
3. Wentworth	Grapes	Murray Pettit, Winona, Ont.
Burlington	Blackberries and Currants	A. W. Peart, Freeman, Ont.
5. Lake Huron	Raspberries and Commercial Apples	A. E Sherrington, Walkerton, Ont.
6. Georgian Bay	Plums	John G. Mitchell, Clarksburg, Ont.
7. Simcoe	Hardy Apples and Hardy Cherries	G. C. Caston, Craighurst, Ont.
8. East Central	Pears and Commercial Apples	R. L. Huggard Whitby, Ont.
9. Bay of Quinte	Apples	W. H. Dempsey, Trenton, Ont.
10. St. Lawrence	Hardy Pears. Hardy Plums.	Harold Jones, Maitland, Ont.
11. Strawberry sub-station		E. B. Stevenson, Guelph.
12. Gooseberry sub-station		Stanley Spillett, Nantyr.
13. Cherry station and general collection of fruits or descriptive work.	Cherries	L. Woolverton, Grimsby.

FRUITS OF ONTARIO,

DESCRIBED AND ILLUSTRATED BY

L. WOOLVERTON, M.A.,

SECRETARY OF THE ONTARIO FRUIT EXPERIMENT STATIONS.

1898.

FRUITS OF ONTARIO.

DESCRIBED AND ILLUSTRATED BY MR. L. WOOLVERTON, SECRETARY OF THE ONTARIO FRUIT EXPERIMENT STATIONS.

1898.

Fruit growing has become so important an industry in the Province of Ontario, that it deserves every encouragement at the hands of the Department of Agriculture. The Canadian farmer who contemplates growing fruit asks for information on two points in particular, viz., (1) What fruits shall I plant, and (2) how shall I cultivate them? The latter of these questions it is the province of the Ontario Fruit Growers' Association to answer through the Canadian Horticulturist and the Annual Report, while the former question is one that can be solved only by years of patient experimental work by our fruit experiment stations.

Of equal importance is some means of identifying all varieties now grown in our Province, and of knowing with some degree of exactness the size, color, general appearance and real value of these varieties aside from the catalogues of the nurserymen. To meet this latter need, the Secretary, with the advice and approval of the Board of Control, has begun the work of illustrating and describing the fruits of Ontario, and in this work he desires to acknowledge the valuable aid of the various fruit experimenters, and in particular the work of Mr. E. B. Stevenson, Freeman, Ontario, in describing strawberries. The illustrations are all new and original, having been engraved from photographs made the exact size of the fruit samples, except where otherwise specified, and in this way there will in time be made accessible to the Ontario fruit growers a complete guide to all the fruit grown in the Province. Such a work necessarily must be slow and tedious, but it is all important that it should be characterized by scientific accuracy, and the writer invites notes or criticism from pomologists generally.

NOTE.—In the following pages an attempt has been made to use the words instead of figures to describe quality and value according to the following scales :—

Quality.—1, very poor ; 2-3, poor ; 4-5, fair ; 6-7, good ; 8-9, very good ; 10, first class.

Market Value.—1-3, 4th rate ; 4-6, 3rd rate ; 7-8, 2nd rate ; 9-10, 1st rate.

APPLES.

ALEXANDER. (*Emperor Alexander.*)

ALEXANDER.

ORIGIN, introduced into England from Russia in 1817.

TREE, hardy, spreading, vigorous, fairly productive; bears early.

FRUIT, very large size; form, round, ovate, conical; skin, greenish yellow, russet dots, streaked or splashed with red; stem, $\frac{3}{4}$ inch long, set in a deep cavity; calyx, large, nearly closed, set in a deep, even basin.

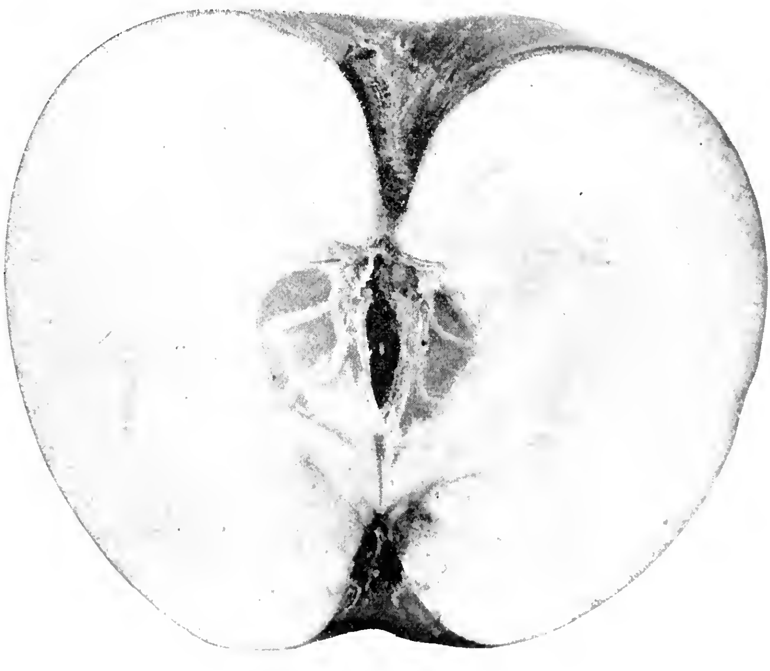
FLESH, yellowish white, crisp, not very fine, moderately juicy; flavor, subacid, pleasant.

SEASON, September to November.

QUALITY, dessert, third class; cooking, first class.

VALUE, home market, first class; too tender for foreign shipments except in cold storage.

ADAPTATION. Quite general, the tree being hardy.



SECTION OF ALEXANDER.

BALDWIN. *(Steele's Red Winter.)*

The Baldwin originated in the State of Massachusetts and was for many years the most popular winter apple for either home or foreign markets. The average yield each alternate year was about eight barrels per tree, and in some instances much larger. Large orchards of this variety were in consequence planted in the apple growing counties of middle and southern Ontario, but unfortunately for many years now these orchards have been almost barren, and many of them are being dug out as worthless. The cause may be poverty of soil, the lack of pollen of other varieties to fertilize the blossoms, or the prevalence of apple scab. If it is the latter, it may be overcome with the Bordeaux mixture; if lack of potent pollen, by grafting in other varieties here and there through the orchard.

BALDWIN.

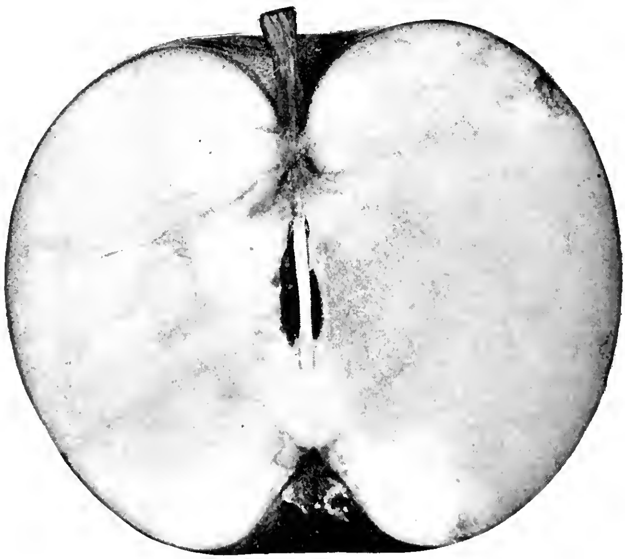
TREE, upright, spreading, vigorous grower, formerly very productive.

FRUIT, large, roundish, ovate; skin yellow, shaded and splashed with crimson and red, dotted with some russet dots; stem heavy, three-quarters of an inch long, in a broad cavity; calyx, closed, in a deep plaited basin.

FLESH, yellowish white, tender, sub-acid; quality, second class.

SEASON of use, January to March.

ADAPTATION. Not very hardy at Simcoe station or in North Ontario county; further south and along the borders of the lakes this apple may be grown to perfection, if the scab can be kept off the trees.



SECTION OF BALDWIN.

BEN DAVIS.

One of the most popular market apples in the southwestern and western states because of its great productiveness, hardiness, good color and its keeping and shipping qualities. Highly valued in some commercial orchards in Canada, but condemned by some growers on account of its inferior quality.

BEN DAVIS.

At the World's Fair in 1893, some of the finest apples shown by Iowa, British Columbia and Oregon were the Ben Davis. It is a profitable market apple.

SECTION OF BEN DAVIS.

ORIGIN, brought from North Carolina to Kentucky with a lot of other seedling apples by Mr. Ben Davis. Scions taken from Kentucky to Southern Illinois about 1820.

TREE, spreading, fairly vigorous and very productive.

FRUIT, medium to large, roundish, truncated conical, unequal; color, yellow, striped and splashed with red, having scattered areole dots; stem, slender, one to one and a half inches long in a deep cavity; calyx, erect, partly closed in a deep, wide basin.

FLESH, white, tender, mild, sub-acid.

QUALITY, dessert, poor: cooking, fairly good: home market, good; foreign market, very good.

SEASON, January to May. (Bay of Quinte station.)

ADAPTATION. Succeeds remarkably well at the Georgian Bay and Bay of Quinte stations.

CABASHEA. (*Twenty Ounce Pippin*).

SECTION OF CABASHEA.

Not worth planting in Ontario. Through confusing its name with that of the Cayuga Red Streak, often called Twenty Ounce, this apple has been widely planted in our Province. The tree is unproductive and the fruit, though large and fine in appearance, drops early and is poor in quality. Twenty trees, at Maplehurst, twenty years planted, yielded about ten barrels of apples in 1895, the best so far.

ORIGIN, unknown.

TREE, vigorous, spreading, unproductive.

FRUIT, large, 3x4 inch, roundish, oblate, slightly conical; skin, yellowish green, shaded with dull red on the sunny side; stem, ⅜ of an inch long, stout, in a wide cavity of moderate depth; calyx open in a wide shallow basin; core medium.

FLESH, white, firm, coarse, sub-acid, only fair for cooking, useless for dessert.

SEASON, October to December. At Bay of Quinte station, season given from December to February.

CABASHEA.

Tested twenty years, at Maplehurst, Grimsby.

CANADA RED.

(*Baltimore of Downing.*)

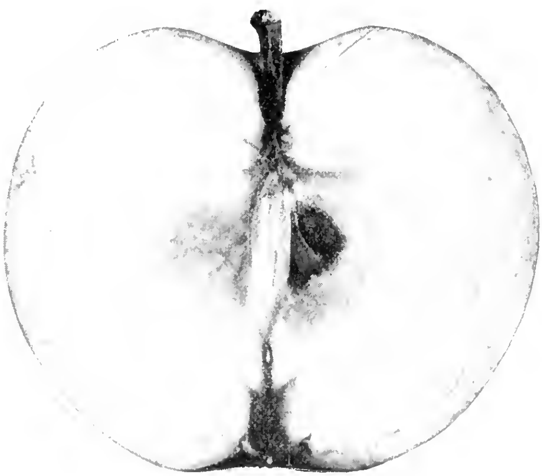
This apple is grown quite widely in Ontario under the name of Canada Red, and is valued as a profitable commercial variety, especially where Baldwin, Spy and Ontario do not succeed ; for although only medium in size, it yields abundantly and the fruit is deeply colored, regular, clean and firm. There is an old variety of this name, which is now little grown, if at all, in Canada and which, though somewhat similar, is inferior to this variety, and consequently is undeserving of description.

CANADA RED.

ORIGIN. Unknown.

TREE. Vigorous, hardy and very productive.

FRUIT. Medium, roundish, slightly conical, regular ; color, greenish yellow, almost covered with red, sometimes splashed or slightly striped with darker red, having numerous large prominent greenish areole dots which are smaller towards the apex ; stem, half an inch long in a small, deep, and often russeted cavity ; calyx small, closed in a shallow slightly corrugated basin.



SECTION OF CANADA RED.

FLESH, greenish white, fine grained, firm, moderately juicy ; flavor, fair, mild, sub-acid.

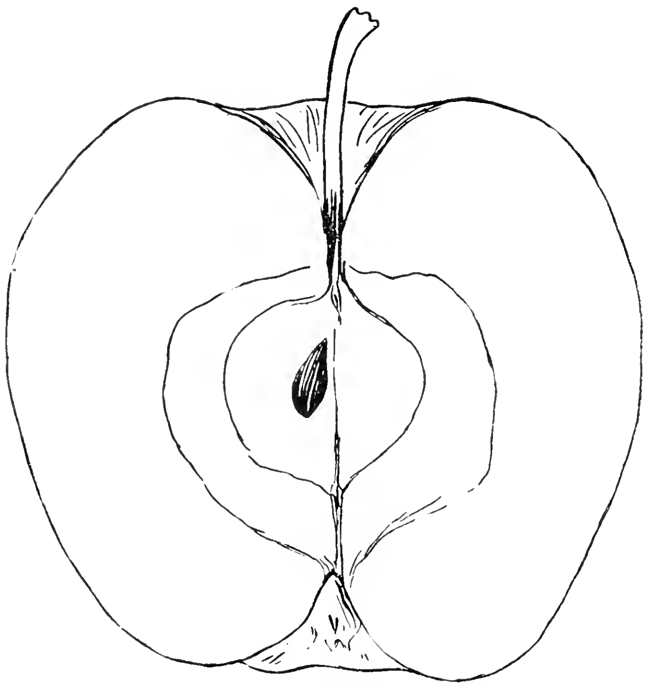
SEASON. December to May.

QUALITY, dessert, medium ; cooking, medium ; home market good ; foreign market very good.

ADAPTATION. Reported hardy as far north as our St. Lawrence station near Prescott ; succeeds at Peterboro' and throughout all middle and southern Ontario.

CRANBERRY PIPPIN.

An apple that is worthy of being planted in southern Ontario as a fancy variety for export. Though the quality is ordinary and not suitable for dessert, its extreme beauty when opened in mid-winter, its large and even size, usual freedom from blemishes and the productiveness of the tree every alternate year, make it a desirable variety.



SECTION OF CRANBERRY PIPPIN.

At Maplehurst, Grimsby, in 1895, fifty trees of this variety, about twenty years planted, yielded 200 barrels of high grade apples, and in 1893, when other varieties were almost worthless, nearly the same quantity. Sometimes, however, this variety is subject to warts and knot which mar its beauty.

ORIGIN, accidental on a farm, near Hudson River, N. Y.

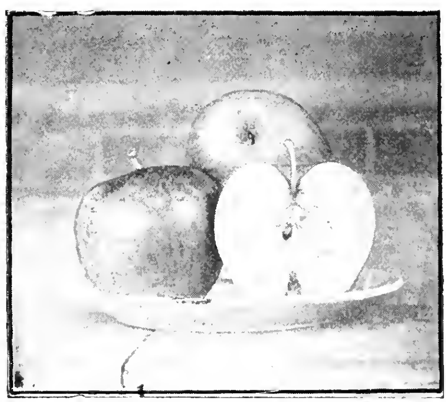
TREE, very vigorous, healthy, spreading, productive.

FRUIT, medium to large, roundish, oblate; skin, smooth, yellow shaded and striped with two shades of red; stem, slender, one one-eighth inches long in a deep cavity; calyx closed in a wide, wrinkled basin.

FLESH, white, firm, crisp, moderately juicy, sub-acid.

QUALITY, fair.

SEASON, November to February.

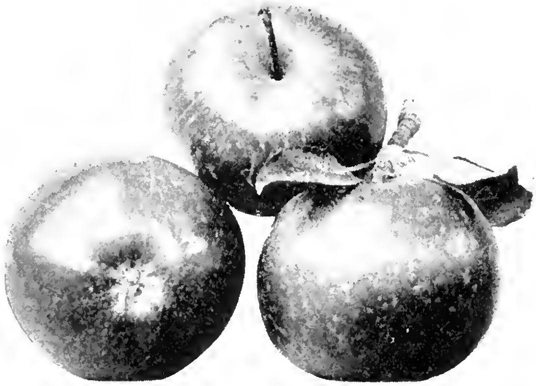


CRANBERRY PIPPIN. (Reduced.)

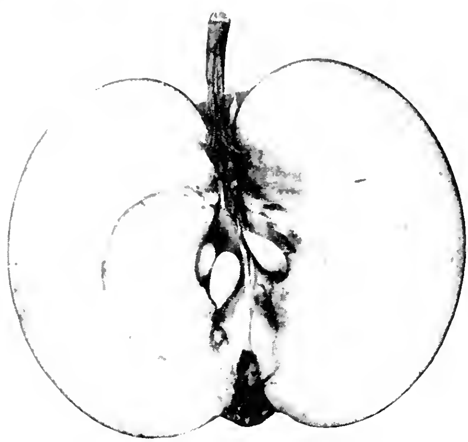
ADAPTATION. Southern portions of the Province, especially along the shores of the lakes

EARLY HARVEST.

The best apple of its season both for dessert and cooking, but of late years rendered worthless in Ontario by scab, which not only spoils its appearance but lessens its size and injures its flavor. The Early Harvest and Fall Pippin are the two apples which seem to be least able to resist this terrible fungus, and which most favor its spread. Unless therefore this fungus is checked by spraying with the Bordeaux mixture, this apple must soon be left out of the list of desirable varieties.



EARLY HARVEST. (Reduced.)



SECTION OF EARLY HARVEST.

ORIGIN, United States.

TREE, only medium in vigor, never attaining a large size, old trees averaging from one-half to two-thirds the size of Greening trees of the same age; upright and spreading; productive, considering the size of the tree and the fruit; yield of full grown trees averages about four barrels every alternate year.

FRUIT, medium round, oblate; skin, smooth, bright straw color when ripe, with a few faint dots; stem, short, one-half to three-quarters of an inch, in a medium cavity, often russeted; calyx closed in a shallow, sometimes slightly plaited basin.

FLESH, white, fine grained, juicy, crisp, tender; flavor, rich, sprightly, pleasant sub-acid.

SEASON, first week in August; in 1896, the last half of July.

Quality, dessert, best; cooking medium; home market, very good; foreign market useless.

ADAPTATION. Thrives well on sandy loam in the Niagara district.

FAMEUSE.

(Snow, Pomme de Neige).

The most highly valued of all table apples, and but for one fault the Fameuse would be the most profitable of all to grow for profit, especially in the latitude of Montreal, where it attains its highest perfection. The fault is that it is quite subject to the apple scab, so that in some places the fruit is entirely worthless.

FAMEUSE.

ORIGIN, Province of Quebec, probably from seeds brought from France; it is often called Snow, from the color of its flesh, and its proper name signifies a famous apple.

TREE, moderately vigorous, moderately productive; hardy.

FRUIT, medium size, roundish; skin, light green, striped and shaded with two shades of red, often nearly covered with deep red; stalk, slender, half an inch long, in a small deep cavity; calyx small, segments often recurved, set in a shallow, slightly plaited basin.

FLESH, snow white; texture, tender, very fine grained, breaking, juicy, aromatic.

QUALITY, dessert, first-class: cooking, poor.

VALUE, first-class for all markets, when perfect in form and free from spots.

SEASON, October to December

ADAPTATION. General in Ontario.

SECTION OF FAMEUSE.

GIDEON.

A very pretty apple, of about same season as Duchess, and less desirable, because it is

inclined to rot at the core; it is also less highly colored. These faults will prevent its being popular as an export apple.

ORIGIN, by Peter M. Gideon, Excelsior, Minn., U.S.; of same parentage as Wealthy.

TREE, vigorous, hardy, holds fruit well, productive.

FRUIT, large, 3 inches by $3\frac{1}{2}$ wide, round or slightly conical; skin, white, with bright red cheek shaded with deeper red splashes; dots, white, obscure; cavity, broad, deep, regular or slightly corrugated; stalk, 1 inch, slender; calyx half closed, in a small, corrugated basin.

FLESH, white, flaky, tender, almost melting, yet crisp, fine, juicy, and of good flavor.

SEASON, September to November.

QUALITY, dessert poor, cooking fair.

VALUE, for home market, first; foreign, fourth rate.

ADAPTATION. Succeeds well on north shore of Lake Huron, in Algoma, and in Northeastern Ontario; trees loaded with fruit were found near Thessalon in 1898.

GREENING.

One of the staple varieties for profit in Ontario orchards. No one variety, except the Baldwin, was more widely planted in our Province previous to 1875, but since that time it has been liable to scab some seasons, especially in cases where proper spraying is neglected. Its color is against it in foreign markets, and yet, as it becomes known, the demand for it increases. It has a tendency to drop early, especially south of Lake Ontario, and, therefore, needs to be gathered in good season, about the first of October, as a rule. Remarkable instances of productiveness have been reported. One large tree at Maplehurst, Grimsby, nearly one hundred years planted, yielded twenty barrels one season, and fifteen barrels another.

GREENING.

ORIGIN, Rhode Island.

TREE, very vigorous, spreading, a crooked grower, fairly hardy, very productive, succeeds well on a great variety of soils.

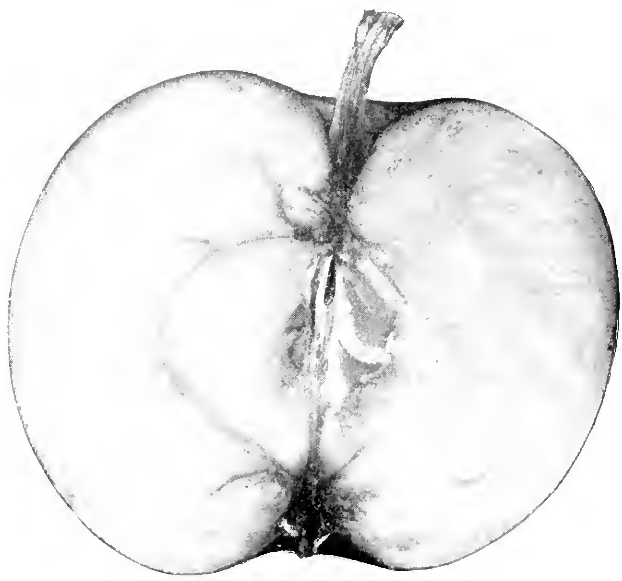
FRUIT, large, roundish, sometimes a little flattened, regular, unless overgrown; color, green, becoming lighter as it ripens, often showing a blush when well exposed to the sun; dots light gray, areole, numerous toward the apex; stem, seven-eighths of an inch long in a smooth, narrow cavity; calyx partly closed in a nearly smooth shallow basin.

FLESH, white, with a greenish tint, yellowing as it matures; texture, fine grained, crisp, juicy; flavor, rich, slightly aromatic, pleasant, sub-acid.

SEASON, December to Februry.

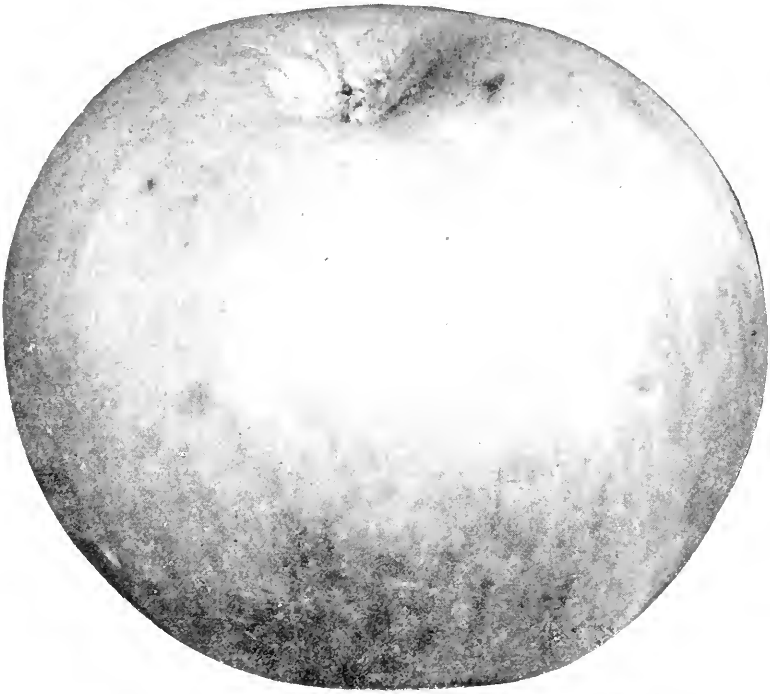
QUALITY, dessert, medium; oking, best; home and foreign markets, good.

ADAPTATION. Succeeds everywhere, except in northern sections.



SECTION OF GREENING

KENTISH FILLBASKET.



An old English variety of great beauty of appearance and enormous size, often exceeding four inches in diameter. It is not, however, much grown in the commercial orchards of Ontario, being a fall apple, ill adapted to export, unless by cold storage, and of very ordinary quality.

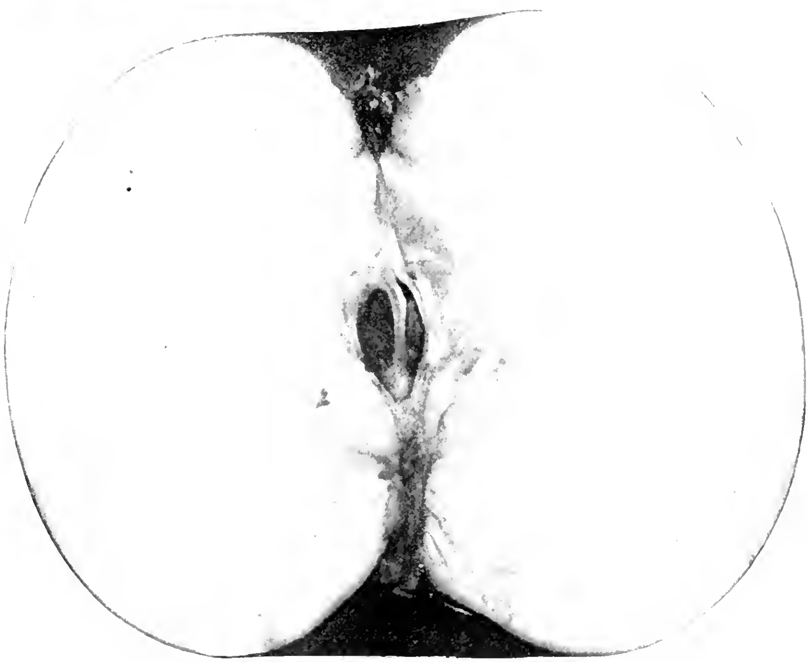
ORIGIN, England; tree, vigorous, fairly productive, semi-hardy.

FRUIT, very large, three by four inches, globular, slightly ribbed; color, smooth, shiny, light green or pale yellow, sometimes almost white, and on sunny side splashed and striped with bright red; stem, stout, short, $\frac{1}{4}$ inch, set in a large cavity: calyx closed, set in a large plaited basin.

FLESH, fine, grained, tender and juicy; flavor, mild, sub-acid.

SEASON, October to December.

QUALITY, poor for dessert, good for cooking, good for home market, and poor for foreign market.

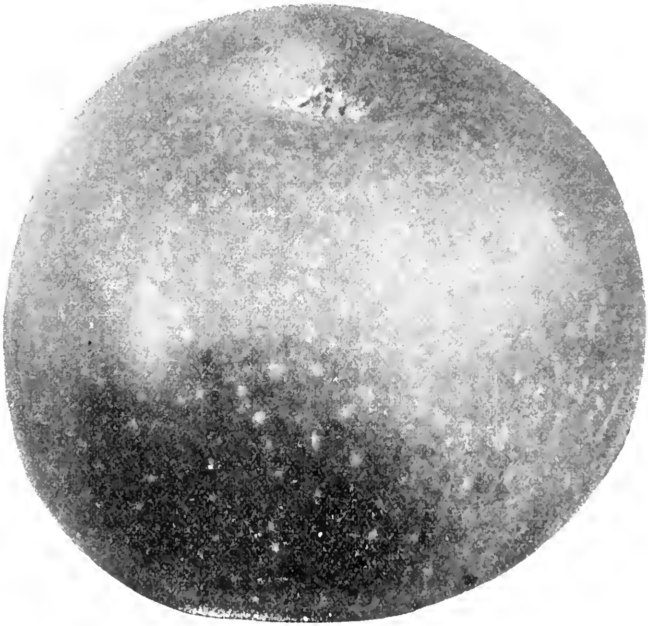


KENTISH FILLBASKET.

ADAPTATION. North shore Lake Ontario and Erie, east shore Lake Huron. The sample photographed was grown at our Bay of Quinte station in 1896.

KING. (*King of Tompkin's County.*)

Said to have originated in New Jersey. On account of its excellent quality for cooking, its peculiarly rich aromatic flavor, its beautiful appearance and large size, this apple is taking the highest place in the great apple markets of the world. Unfortunately the tree is a poor bearer, and consequently unprofitable as an orchard variety, unless under exceptional circumstances. Top-grafted on Talman Sweet, it is said to be more productive. For home use it is excelled by no apple.



KING.

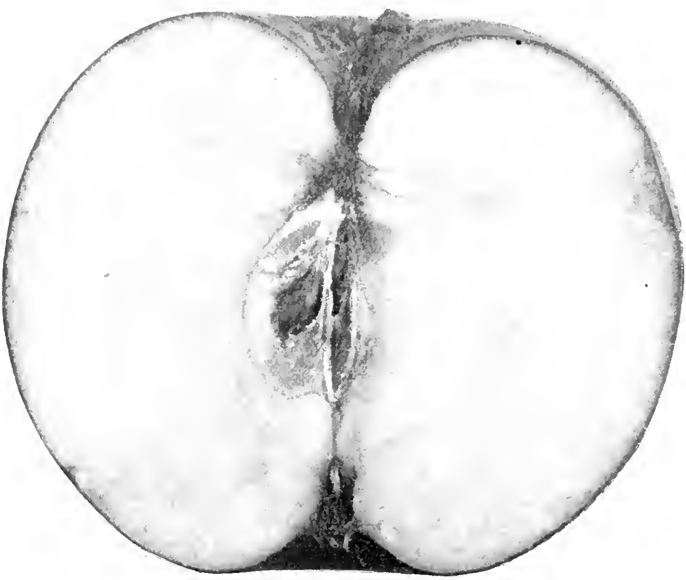
TREE, a vigorous grower, of spreading habit, but not long-lived.

FRUIT, large, roundish, uneven; skin, yellowish, shading off from red to dark crimson; stem, short and stout, inserted in a wide, deep, somewhat irregular cavity; calyx closed in a broad, shallow, slightly corrugated basin.

FLESH, yellowish, white, crisp and juicy, moderately firm; flavor rich, agreeable, aromatic; quality first-class.

SEASON, October to February in Southern Ontario; reported at the Simcoe station October to March for Northern Ontario.

ADAPTATION. Not hardy at Simcoe station unless top grafted on Talman Sweet, or some other hardy stock, and, therefore, it is not recommended for general planting in northern sections.



SECTION OF KING

LADY.

(In France, Api.)

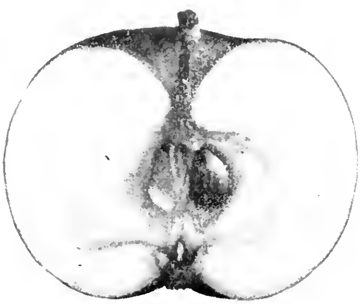
A beautiful little apple for the amateur's collection, and very highly valued where known for a dessert apple, having a pleasant flavor and great beauty. In Europe the apple is known as Api, but in America it has became known as the Lady apple. Some say it was so called because from its small size and beautiful color, it seemed just suited to a lady's mouth.

ORIGIN, France.

LADY.

TREE, upright habit and bears fruit in clusters, vigorous, only fairly hardy and productive.

FRUIT, very small, flat oblate. Color, green turning to yellow, half covered with a rich red cheek, and many tiny dots which are more numerous toward the apex. Stem, slender, half an inch long, set in a deep regular cavity. Calyx closed in a small wrinkled basin.



SECTION OF LADY.

FLESH, greenish white, fine grained, crisp and juicy ; flavor, pleasant.

SEASON, December to May.

QUALITY, dessert, best ; cooking, too small to be of any value ; market, high value in special markets.

ADAPTATION. Successfully grown as far north as the Bay of Quinte station.

MANN.

The Mann apple is not very highly recommended for extended orchard planting in Ontario, because of its rather unattractive green color in shipping season in October. The tree has the merit of being a productive variety and an early bearer, but the fruit is inclined to drop early, and to be small, when not thinned

Mann

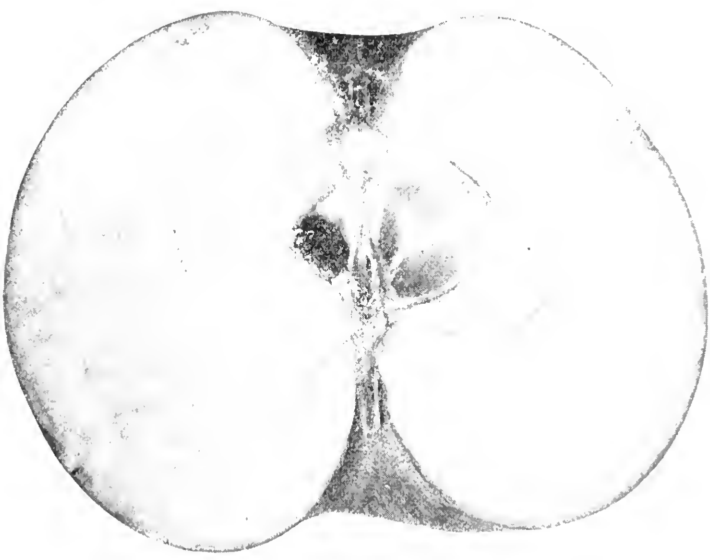
ORIGIN, New York State, a chance seedling.

TREE, hardy, vigorous, spreading, with slender branches; an early and regular bearer, inclined to overload.

FRUIT, of large size when thinned and well cultivated, $2\frac{3}{4} \times 3\frac{3}{4}$ inches; form, roundish, oblate, regular; skin, dull green, yellowing at maturity, nearly covered with light green dots; stalk half an inch long in a large slightly russeted cavity; calyx closed in a large plaited basin.

FLESH, yellowish, moderately firm, juicy, agreeable, sub-acid.

SEASON, January to April.



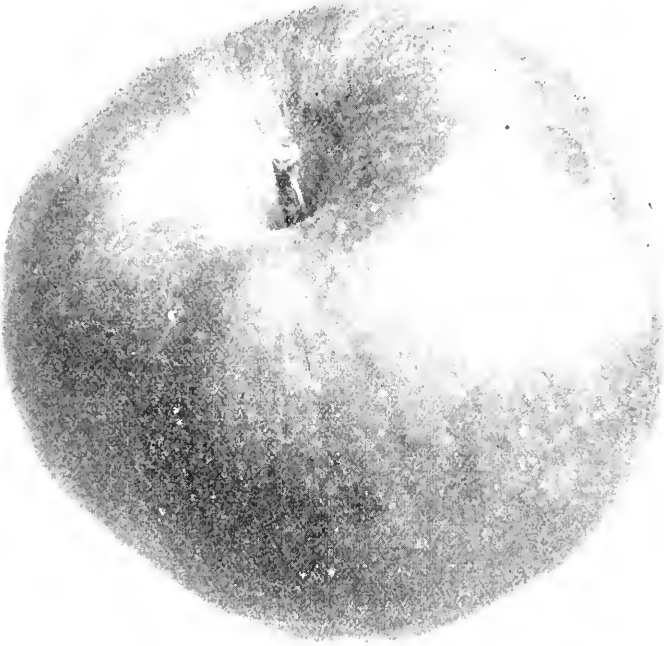
SECTION OF MANN.

QUALITY, dessert poor; cooking good.

VALUE. Good for home or foreign market, but its color is not favorable for best prices

ONTARIO.

This is a native of Ontario, as its name indicates, having been raised by crossing Wagener and Spy by the late Charles Arnold of Paris, Ontario. Its early and abundant bearing, the good quality and even size of the fruit, are the reasons why it is rapidly gaining in favor as an export variety. It has been tested in a commercial way for some years at our Bay of Quinte station, where it is counted one of the best for profit.



ONTARIO.

ORIGIN, Province of Ontario.

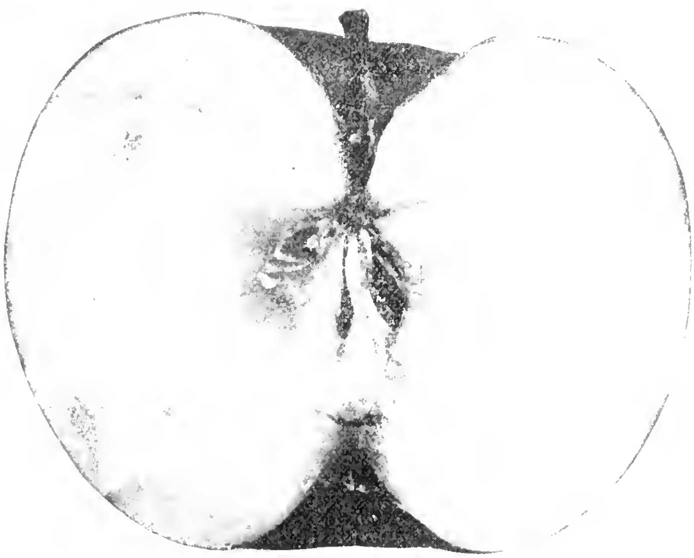
TREE, fairly hardy, moderately vigorous, somewhat spreading, very productive, an early bearer.

FRUIT, large, $2\frac{1}{2}$ x $3\frac{1}{2}$ inches, oblate, slightly ribbed, sides unequal; skin yellowish, nearly covered with bright red, with a few scattered small white dots with blush bloom; stem, seven-eighths of an inch long, in a deep, russeted uneven cavity; calyx closed in a moderately deep, corrugated basin.

FLESH, white with green tint, yellowing slightly as it ripens; texture, fine grained, tender, juicy; flavor, mild, sub-acid, sprightly, aromatic.

SEASON, January to April.

QUALITY, very good for all purposes.

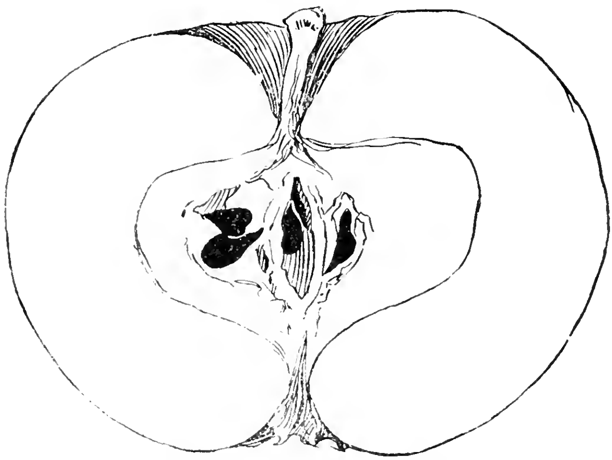


SECTION OF ONTARIO

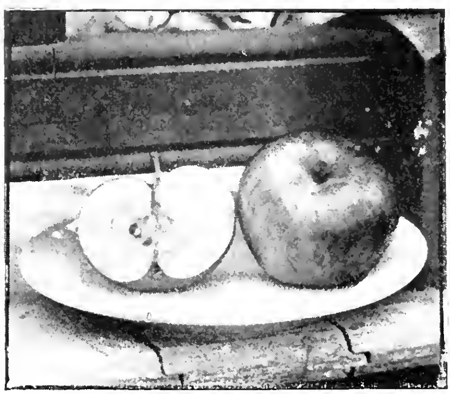
ADAPTATION. Southern Ontario to north shore of Lake Ontario. Succeeds remarkably well at Bay of Quinte station.

RED ASTRACHAN.

Imported from Sweden to England in 1816, and widely planted in Southern Ontario for a summer market apple. Scarce another apple of its season equals it in beauty of appearance, for, in addition to its rich crimson color, it is often covered with a pale white bloom. Selected fancy grades of this apple are usually in good demand in our home markets, but sometimes there is a surplus, and prices even for Astrachans are very low. Promising for export in cold storage.



SECTION OF RED ASTRACHAN.



RED ASTRACHAN (Reduced).

TREE, upright ; very vigorous ; begins bearing early ; very productive.

FRUIT, medium to large, round, narrowing towards apex ; skin, deep crimson when exposed to sun, yellowish-green in shade, often covered with a thin, whitish bloom ; stem, stout, three-quarter inch long, in a deep narrow cavity ; calyx closed in a shallow, somewhat irregular basin.

FLESH, white, crisp, juicy, tender, becoming mealy when over-ripe ; acid, almost too tart to be counted first-class for either dessert or cooking ; quality, second class.

SEASON, 1st to 20th August.

ADAPTATION. In Niagara district perfectly hardy and productive. Two trees in 1895 at Maplehurst averaged ten barrels each. Not considered profitable at Simcoe station. Not very hardy in northern parts of Ontario county.

ROXBURY RUSSET.

(Boston Russet.)

One of the staple export varieties in many parts of southern Ontario, because of its long keeping qualities. It resists scab well, but is subject to the codling moth, unless well sprayed, and is inclined to drop early from the trees, resembling the Greening in this respect.

ROXBURY RUSSET.

ORIGIN, Massachusetts.

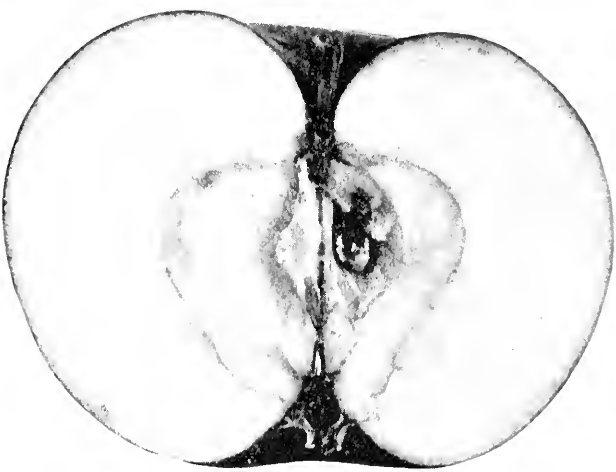
TREE, fairly vigorous, spreading like Greening, but flatter in form of top.

FRUIT, medium, roundish, oblate, sides not equal; skin tough, green, nearly covered with russet, and having a brownish red cheek when fully exposed to the sun; stem, half to three-quarters of an inch long in a medium sized, regular cavity; calyx closed in round medium sized basin.

FLESH, yellowish white, almost coarse grained, moderately juicy; flavor, mild, sub-acid, pleasant.

SEASON, January to June.

QUALITY, dessert, fair; cooking, good; home and foreign markets, good.



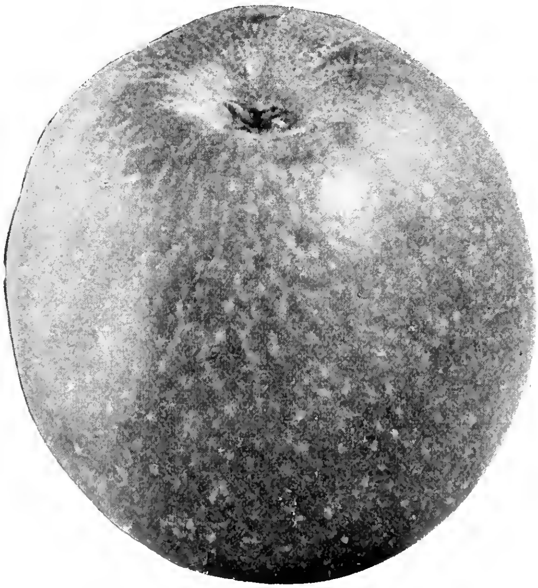
SECTION OF ROXBURY RUSSET.

ADAPTATION. Long tested in the Niagara district and found to be well adapted to it. As hardy as the Greening.

SPITZENBURGH.

(*Esopus Spitzenburgh.*)

One of the finest dessert apples for late winter use, and widely planted by early settlers throughout southern Ontario. It has proved to be unprofitable as a commercial apple, because the tree is liable to disease, and yields small crops in consequence.



SPITZENBURGH.

SEASON, December to March.

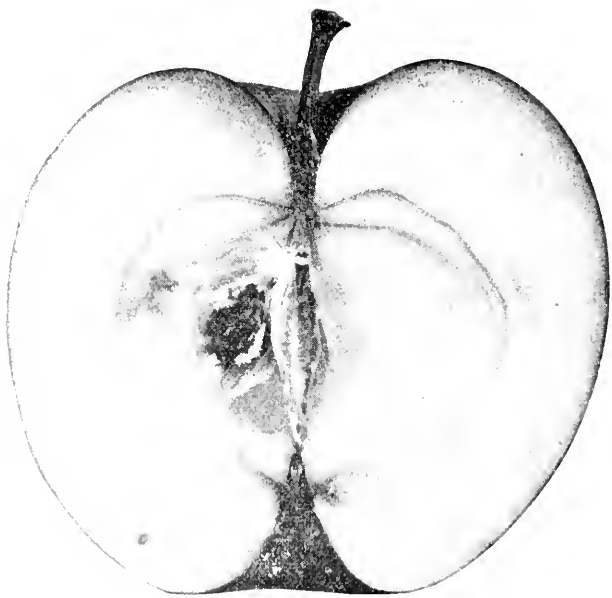
QUALITY, first class for all purposes.

ORIGIN, Esopus, on the Hudson river.

TREE, lacking in vigor, often showing dead or feeble wood; upright, spreading, with drooping limbs when in bearing; fairly hardy.

FRUIT, size, medium to large, oblong, slightly conical: skin, straw color in shade, but usually nearly covered with bright red, and dark red in sun, with a few stripes, and many obscure gray dots; stalk, seven-eighths of an inch long in a narrow deep cavity; calyx, nearly closed, set in a narrow basin of medium depth, slightly corrugated.

FLESH, yellowish white; texture, crisp, juicy, breaking; flavor, brisk, rich, delicious.

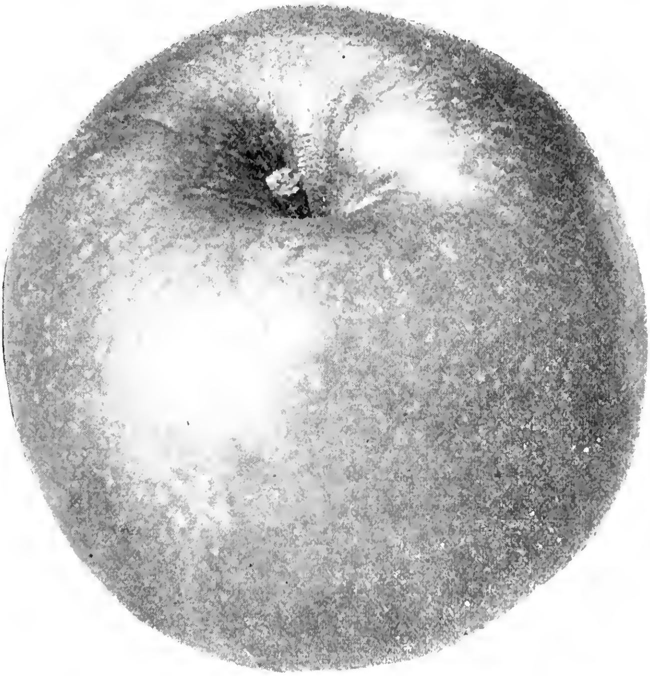


SECTION OF SPITZENBURGH.

ADAPTATION. Succeeds well on sandy loam in southern Ontario.

SPY. (*Northern Spy.*)

The Spy stands in the very first rank of Canadian apples, whether for home or foreign markets. Originating in New York State on the line with the southern portion of the Province of Ontario, it succeeds here to perfection. Its beauty of coloring, half shaded by its delicate bloom, and its great excellence of quality for all purp oses, justly claim for it its wide popularity. In Chicago, Canadian Spys are more sought for than any other variety, but, owing to tenderness of skin, which shows the slightest bruise, it is less popular for export to Great Britain than some other varieties. The tree is late in coming into bearing, often being fifteen years planted before yielding a crop, and this renders the variety somewhat unpopular with planters. Probably for fancy packages, selected Spys would be among the best.



Spy.

Origin, near Rochester, N.Y.

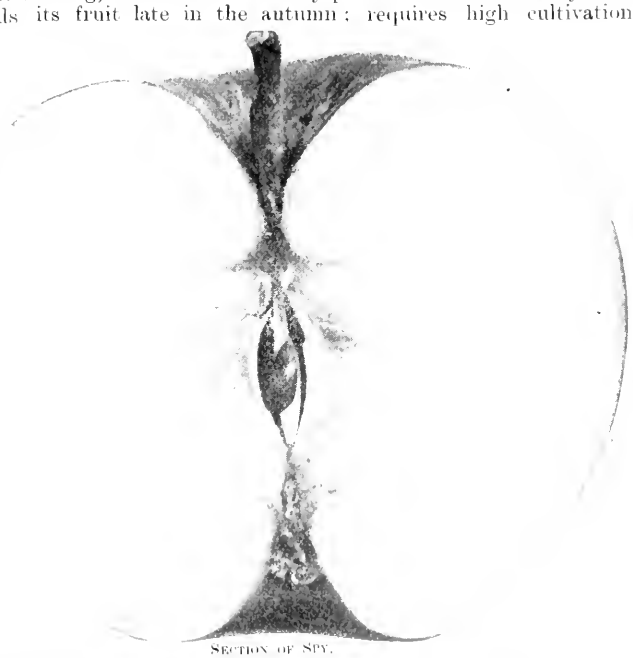
Tree, upright and spreading in habit; fruit spurs on interior boughs very vigorous, late in coming into bearing, but afterwards fairly productive in alternate years; blossoms late in spring and holds its fruit late in the autumn; requires high cultivation and good fertility.

Fruit, large to very large; form, roundish, slightly conical; skin, thin, light green, or pale yellow, sprinkled with light pink, striped and shaded with pinkish red, and thinly covered with thin whitish bloom; stalk slender, three-quarters of an inch long, in a wide, deep, sometimes russeted cavity; calyx, small, closed, in a narrow, moderately deep, abrupt, irregular basin.

Flesh, white, finegrained, crisp, tender, juicy; flavor, rich, sprightly, subacid, fragrant.

Season, January to May.

Quality, dessert and cooking, first class; home market, first-class; a little tender for distant shipments.



Section of Spy.

Adaptation. Sandy or clay loams in southern and middle Ontario; found tender at Simcoe Experiment Station and at the St. Lawrence Experiment Station.

SWAZIE POMME GRISE.

(*Pomme grise d'or.*)

There is no choicer winter dessert apple for the months of December and January than the Swazie Pomme Grise, especially when kept in a cool, dark cellar, as that its crisp texture and excellent flavor may be preserved. Unfortunately, It is not very productive, and, consequently,

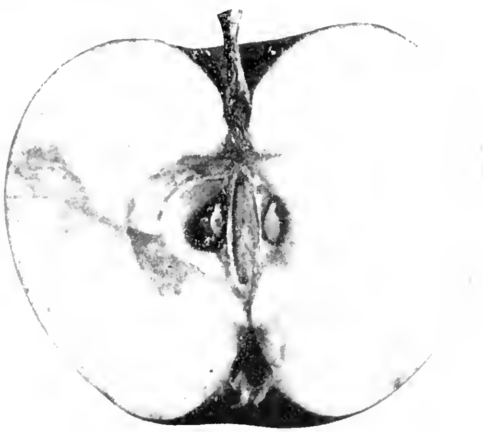
SWAZIE POMME GRISE.

not profitable. One large tree at Maplehurst, seventy-five years planted, yielded only an aver age of four barrels each alternate year. It is well worthy of a place in the amateur collection.

ORIGIN, probably with Col. Swazie, near Niagara.

TREE, upright, fairly vigorous and not very productive.

FRUIT, small, round, oblate conical ; color, deep yellow, well colored with cinnamon russet and many whitish dots ; stem, three quarters of an inch long, set in a deep cavity ; calyx, closed n a moderately deep, slightly corrugated basin.



SECTION OF SWAZIE.

FLESH, white, fine grained, tender, crisp, juicy ; flavor, aromatic mild sub-acid, pleasant.

SEASON, December to March.

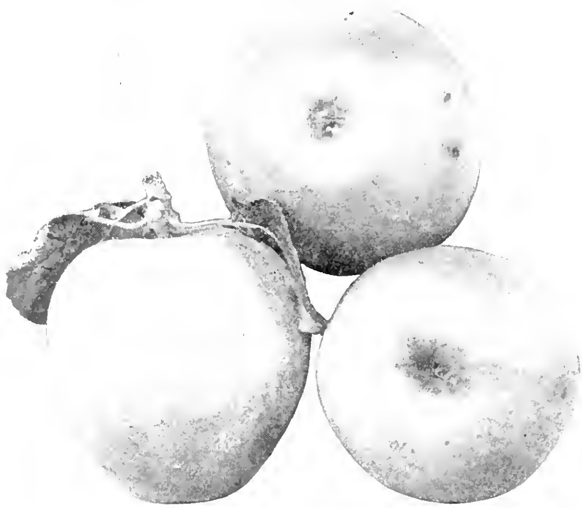
QUALITY, dessert, first class ; cooking, third class ; value for home market, poor ; value for foreign market, poor.

ADAPTATION. Succeeds in southern Ontario, especially in the Niagara district.

SWEET BOUGH.

(Large Yellow Bough of Downing.)

An excellent dessert apple, ripening about the same season as the Early Harvest ; not subject to scab, and a favorite with those who prefer a sweet to a sour apple. Not profitable to grow for market, but it deserves a place in every collection for home use. Baked whole it is delicious, eaten with cream.



Sweet Bough. (Reduced.)

Origin, United States.

Tree, of medium vigor, never attaining a large size, and, therefore, even with a full crop, not very productive. Bears full every alternate year ; head, compact.

Fruit, large, ovate, conical ; skin smooth, greenish yellow ; stem one inch long, in a narrow, deep, regular cavity ; calyx open, in a shallow, irregular basin.

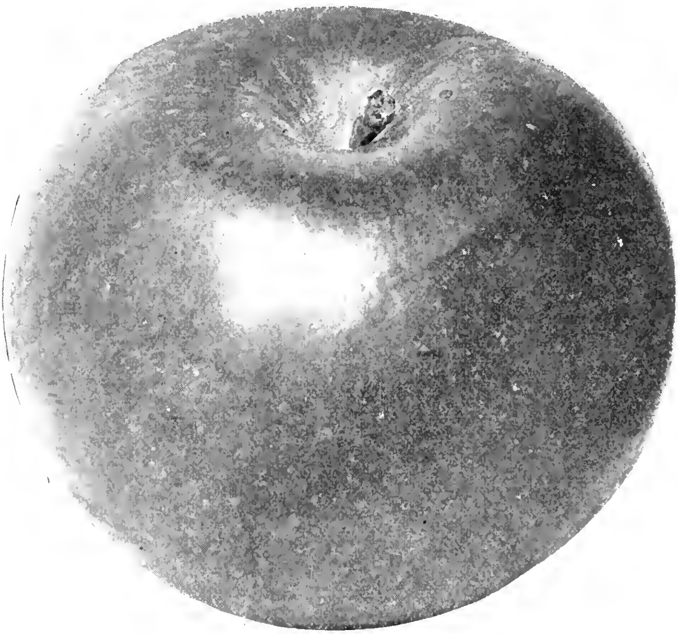
Flesh, white, fine grained, tender and juicy ; flavor moderately sweet, rich and agreeable.

Season, July 25 to August 10.

Quality, dessert very good ; cooking poor, except for roasting.
Value, home market, poor to good, foreign market, useless.
Adaptation, succeeds well in Niagara district.

WEALTHY.

This beautiful apple was distributed among the members of the Ontario Fruit Growers' Association in 1882 for trial, and has won for itself a good reputation in every part of the Province as a dessert apple of excellent quality, while in the northern portions it is especially desirable on account of its hardiness. Mr. A. A. Wright, of Renfrew, says the tree endures 40° below zero without injury, and he advises planting this variety freely at the north. Mr. R. W. Shepherd, of Montreal, has grown it in that vicinity for years with success for export.



WEALTHY.

ORIGIN, St. Paul, Minnesota. By Peter Gideon.

TREE, vigorous, very hardy, over productive.

FRUIT, medium, roundish, oblate, regular ; skin, smooth, greenish ground, changing to pale yellow, rich red cheek, with stripes and splashes of red in the sun, sometimes nearly covered with crimson ; stem, one-half to three-quarters of an inch long in a deep, regular cavity ; calyx, nearly closed in a deep, abrupt basin.

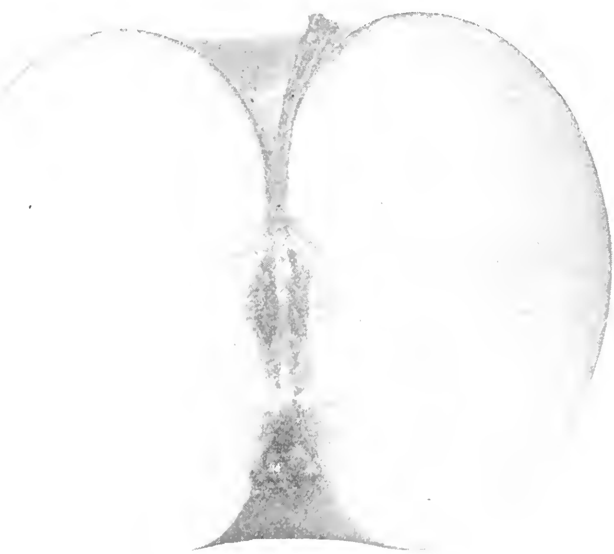
FLESH, white, fine grained, tender, juicy, sprightly, pleasant subacid.

SEASON, early winter.

QUALITY, dessert, very good ; cooking, good.

VALUE, for home market, very good ; for foreign market, very good.

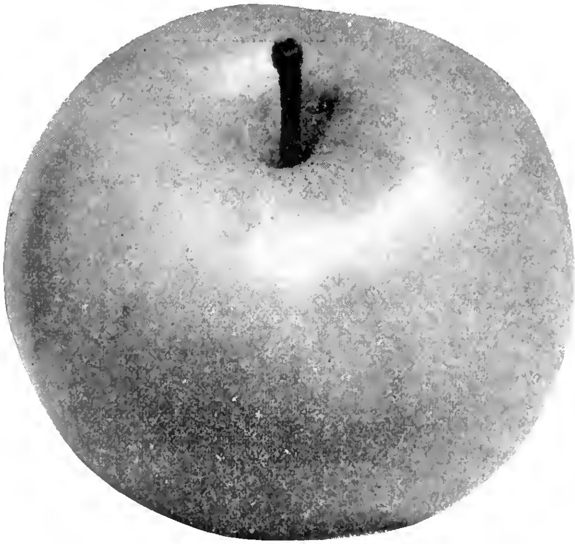
ADAPTATION. Succeeds at Simcoe, Bay of Quinte, St. Lawrence and Niagara stations, also at Ottawa and Montreal



SECTION OF WEALTHY.

YELLOW TRANSPARENT.

An apple which may prove a substitute for the well-known Early Harvest, which is so subject to apple scab. This variety seems to be proof against fusicladium, both in leaf and fruit.



YELLOW TRANSPARENT.

ORIGIN, St. Petersburg, Russia. Imported by the U. S. Department of Agriculture in 1870.

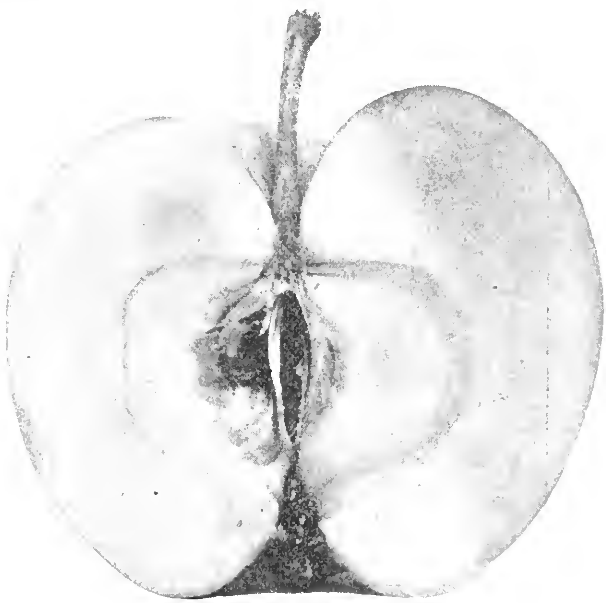
TREE, hardy, vigorous, upright, annual bearer, productive, began bearing at four years at Craighurst station.

FRUIT, above medium, roundish, oblate, inclined to be conical ; skin, clear white, yellowish white when very mature ; dots, light green, obscure ; stalk, medium, in large cavity ; calyx closed in medium, slightly corrugated basin ; fruit hangs well on the tree.

FLESH, white ; firm till very ripe, then tender ; quality, second class.

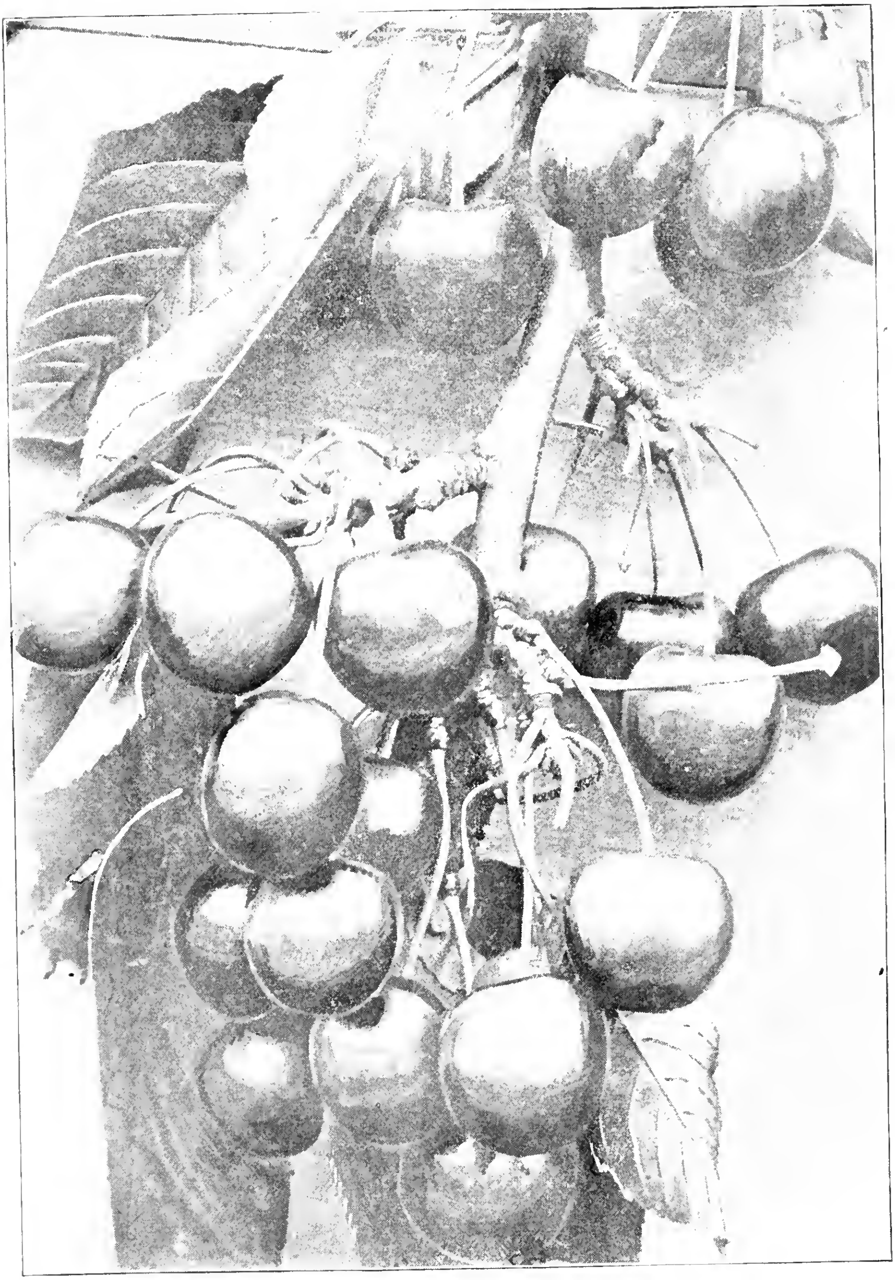
SEASON, August 1st to 15th.

ADAPTATION. Tested at Maplehurst, Grimsby ; at Simcoe station, distributed widely by Ontario Fruit Growers' Association in 1886, and succeeds everywhere.



YELLOW TRANSPARENT. (Section.)

CHERRIES.



YELLOW SPANISH—FRUITING BRANCH IN 1896.

CHERRIES.

Classification.

In describing the cherries the following general classification is followed, though for convenience the varieties are arranged in alphabetical order. In some cases it is impossible to place a variety because of the crossing of one variety with another, which renders the classification almost useless.

I. Prunus Cerasus (Sour Cherry Class).

(a) *Kentish*—Pale red with uncolored juice.

(b) *Morellos*—Dark red fruits, with dark colored juice.

II. Prunus Avium (Sweet Cherry Class).

(a) *Mazzards*—European seedling cherries, of vigorous habit.

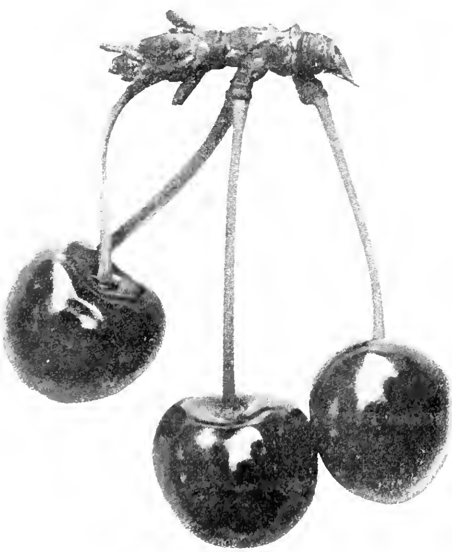
(b) *Hearts*—With soft-fleshed, heart-shaped fruit.

(c) *Bigarreaus*—Hard-fleshed, mostly light colored skin, and heart-shaped.

(d) *Dukes*—Tree of upright, vigorous growth, leaves fastigiate, fruit mostly acid or sub-acid.

BLACK EAGLE.

A very excellent dessert cherry, well deserving a place in the home garden, but not sufficiently productive to be recommended for the commercial orchard. The average annual yield of large trees at Maplehurst is from twenty-five to thirty quarts. The fruit is usually in scattered clusters, and often borne singly, making the gathering expensive. In England this variety is more productive than in Canada.



Black Eagle. (Reduced).

Origin, England, 1810, by Miss E. Knight, of Downton Castle, from Bigarreau and May Duke.

Tree, second rate in vigor, of a round spreading habit, third rate in productiveness; group Bigarreau.

Fruit, medium to large, averaging about $\frac{13}{16}$ long by $\frac{15}{16}$ of an inch wide; form, obtuse heart-shaped, almost roundish oblate; skin, dark red, becoming almost black; stalk, slender, $1\frac{1}{2}$ to $1\frac{3}{4}$ inches long in a medium cavity; suture obsolete; stone, small.

Flesh, dark purple; texture, tender and juicy; flavor very sweet, rich and delicious.

Season, July 8th to 15th (1897).

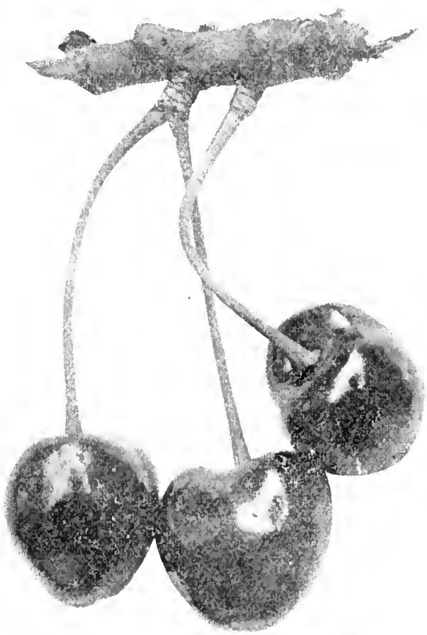
Quality, first-class for dessert.

Value, first-rate for near markets; second rate for distant markets because it soon decays.

BLACK TARTARIAN.

Of all our black cherries, this is one of the choicest, whether for market or for dessert on the home table. Of large size and delicious flavor, it is relished by all cherry lovers, and, being somewhat soft fleshed, it is very subject to the ravages of birds. On this account it is often necessary to harvest and ship it a little on the green side. It is not so productive as some others, but it makes up for this by bringing a higher price.

ORIGIN, Russia and Western Asia, introduced into England in 1796, and thence to America.



BLACK TARTARIAN.

TREE, erect, vigorous, attaining large size, fairly productive.

FRUIT, very large, $\frac{7}{8}$x1 inch, heart-shaped, of somewhat irregular outline ; stem, $1\frac{3}{4}$ inches long ; skin, bright purplish black.

FLESH, dark purple, tender and juicy ; flavor, rich and delicious.

SEASON, June 22nd to 30th.

QUALITY, dessert, first class.

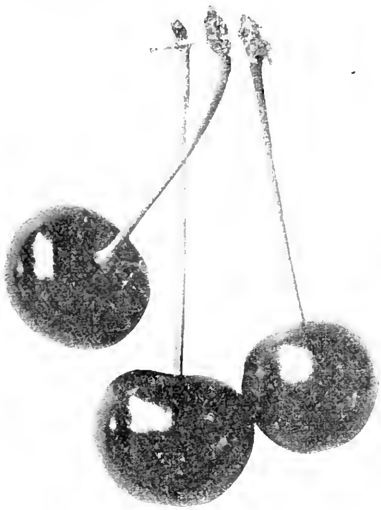
VALUE, market, first-rate.

ADAPTATION, South of Lake Ontario, and in sheltered places a little further north.

BELLE DE CHOISY.

(*Ambree grosse "LeRoy."*)

The most delicious of all dessert cherries, and one that should be planted in every amateur's garden, but of no value in the commercial cherry orchard, because not productive, and the tree is often short lived.



Belle de Choisy.

Origin, Choisy, near Paris, 1760.

Tree, Duke, upright, foliage dark, hardy, not very productive.

Fruit, medium to large, $\frac{3}{4}$ x $\frac{3}{4}$, obtuse heart-shaped; skin, transparent, showing the structure of the flesh and the cells of juice within; color, bright cornelian red in sun, pale red to amber in shade; stem, slender, two inches long; suture marked by a delicate line.

Flesh, very pale red, texture, soft, juicy; flavor, sweet, very delicious.

Season, June 24th to July 1st.

Quality, dessert, first-class.

Value, market, fair.

Adaptation, Southern Ontario.

CLEVELAND.

One of the finest Bigarreau cherries for dessert purposes, being of high quality and not too firm in texture. A good variety for commercial orchards, because of its high color and earliness of season, but not yet fully tested in this Province.

Origin, by Prof. Kirtland, Cleveland, Ohio.

Tree, vigorous, of stout spreading habit, productive, fruited after three years planting at Maplehurst.

Fruit, large, $\frac{7}{8}$x$\frac{15}{16}$ of an inch; form, heart-shaped, sides unequal; color, bright red moroon, on yellowish ground, dark rich red in the sun; stem, stout, $1\frac{1}{2}$ inches long in a broad, uneven cavity; suture, broad, half way round.

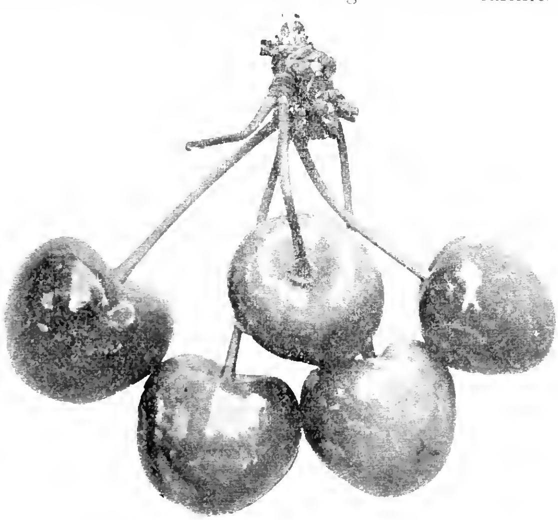
Flesh, light cream in color; texture, almost tender, juicy, sweet, rich and delicious.

Quality, first-class for table.

Value, home market, first-rate; distant market, first-rate.

Season, June 15th to 25th.

Adapatation. Southern Ontario.



[Cleveland.

COE.

(*Coe's Transparent*).

A good variety for the home garden, but altogether too tender to be popular for the Commercial orchard.

ORIGIN, in Connecticut, with Curtis Coe, of Middleton.

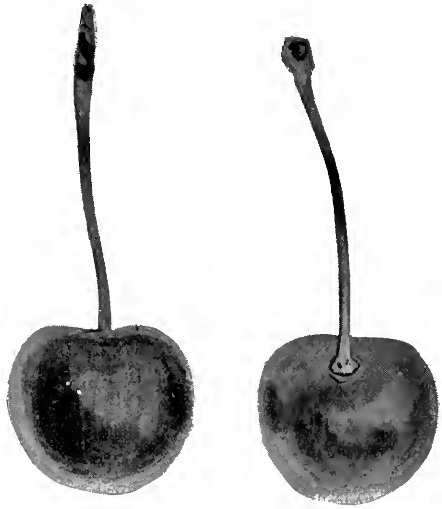
TREE, healthy, fairly vigorous, with round spreading head, third rate in productiveness; group, Heart.

FRUIT, medium to large, about one inch long by one inch broad, round and regular in form; skin, thin, bright shiny amber, nearly covered with rich cornelian, marked with peculiar mottled blotches; stalk one and a half to two inches long set in a medium wide cavity; suture obscure.

FLESH, very pale yellowish tint: texture very soft and tender, juicy: flavor sweet and very good if not left hanging too long.

SEASON, July 7th to 14th (1897).

QUALITY, good for dessert.



COE'S TRANSPARENT.

VALUE, second rate for home market, fourth rate for distant market.

ADAPTATION, south of Lake Ontario.

KOSLOV-MORELLO.

Fifty trees, small seedling trees, of this cherry were sent to the Secretary of the Ontario Fruit Growers' Association by Jaroslav Niemetz, of Winnitza, Podolie, Russia, in 1889, and by him distributed among the directors.

KOSLOV-MORELLO.

Some of these trees were planted at Maplehurst, and, although still only bushes, they bore quite freely in 1897. Mr. Niemetz claims that it will endure almost any degree of cold, and that it begins bearing at the age of four or five years from the pit, which he claims is the best method of propagating it (see C. Hort., 1869, p. 218). They might well be grown in rows, 5 or 6 feet apart, just as we grow raspberries and currants. The fruit closely resembles that of the Morello (English).

TREE, bush form, very slow grower, slender; hardy; very productive; Morello.

FRUIT, fairly large, round, pointed at apex, dark red, turning black at maturity; stalk $1\frac{1}{2}$ inches long in a slight depression; suture, barely traceable.

FLESH, red, turning dark red at maturity; texture, tender, juicy, acid, becoming milder as it hangs.

QUALITY, good for cooking.

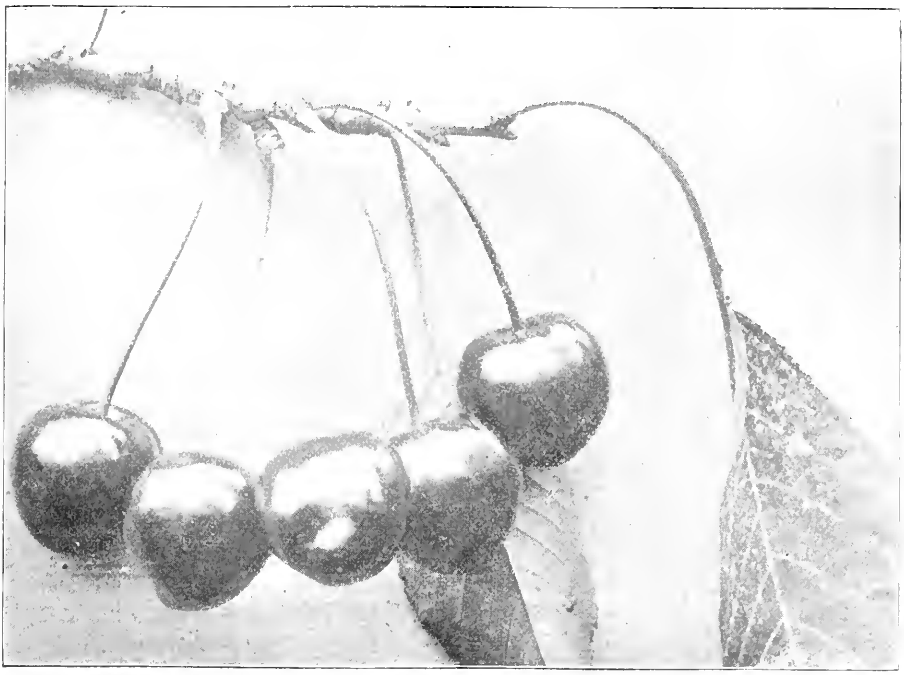
SEASON, July 20th to August 20th.

ADAPTATION, the northern limit of cherry culture.

EARLY PURPLE.

(Early Purple Guigne.)

The earliest cherry is the Early Purple, a foreign variety known in France as the Early Purple Guigne. The tree is a vigorous, upright grower, and becomes quite productive as the tree acquires age. A tree at Grimsby, about thirty years planted, yielded in 1896, 144 quarts. They were harvested on the 11th of June, and sold in the wholesale market at an average of twelve cents per quart. This is the tree's best record, for usually the birds destroy the fruit before it matures, and if gathered as soon as colored red, it is little more than "skin and bones." The last few days of growth it fills out wonderfully, and becomes almost a so-called "black cherry." The branch which we photographed was taken from the tree above referred to and shows the habit of fruiting.



EARLY PURPLE.

TREE, upright, vigorous, healthy, productive when full grown.

FRUIT, medium size, roundish heart-shaped; skin dark red to purple; stem two inches long in a shallow cavity; suture obscure.

FLESH, red to purple; texture tender, juicy; flavor sweet and pleasant.

SEASON, June 13th to 25th, south of Lake Ontario.

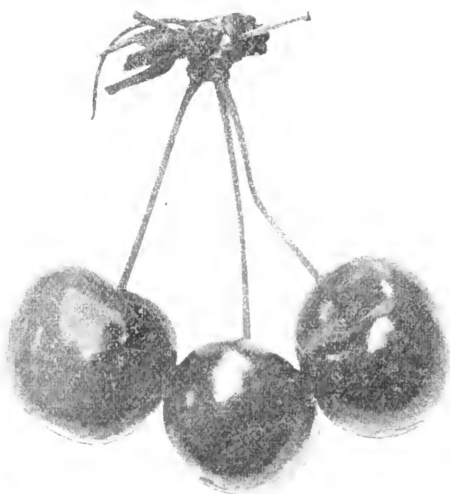
QUALITY, dessert, good.

VALUE, market, 2nd rate.

ADAPTATION. Grown at Grimsby for thirty years and quite hardy; fairly hardy in Maine and Michigan; recommended for trial north of Lake Ontario.

GOVERNOR WOOD.

This variety has proved itself a most satisfactory cherry for both dessert and market purposes. It is a very productive variety, and, though somewhat tender in flesh, is not nearly so subject to ravages by birds as Early Purple or Black Tartarian. Originated by Prof. Kirtland of Cleveland, Ohio, U.S.A.



GOVERNOR WOOD.

TREE, upright, spreading, healthy, vigorous and hardy wherever the peach succeeds.

FRUIT, medium to large, roundish-heartshaped ; skin, light, yellow, shaded with light to deep red ; stem 1½ inches long in a broad deep cavity ; suture, distinct on one side.

FLESH, yellowish, tender, juicy, sweet, aromatic and delicious.

SEASON, June 16th to June 25th.

QUALITY, dessert, 1st rate ; home market, very good ; distant market, good.

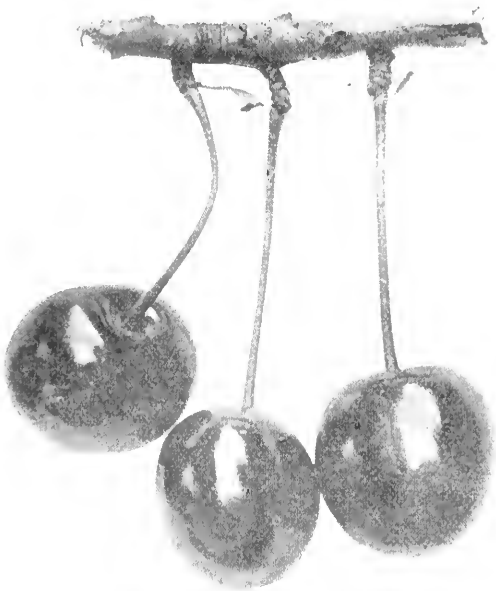
VALUE, market, 1st to 2nd rate.

ADAPTATION. Wherever the peach succeeds.

HORTENSE.

(Reine Hortense.)

One of the finest flavored of cooking cherries, and one which deserves the first place in the home garden. It is not as productive as the May Duke, but from its habit of fruiting singly is less subject to rot than that excellent variety.



HORTENSE.

ORIGIN, France, in 1832, by M. Larose, Neuilly ; first fruited in 1838.

TREE, of Duke habit, a vigorous and handsome grower and fairly productive ; Duke.

FRUIT, large to very large, roundish, elongated, sides slightly compressed ; skin, thin, light, shining red mottled with darker red, becoming richer in color the longer it hangs ; stock, slender, about two inches long.

FLESH, creamy yellow, nettled, very tender, juicy, ; flavor, slightly sub-acid, excellent.

SEASON, July 10th to 15th in 1897.

QUALITY, first-class for cooking.

VALUE, 1st to 2nd rate for market.

ADAPTATION, succeeds perfectly south of Lake Ontario.

KNIGHT.

(Knight's Early Black).

A delicious early, black cherry, ripening about a week in advance of Black Tartarian. It is a regular and even bearer, the average yield being from seventyfive to 100 quarts per annum. The fruit is borne singly or, occasionally, in pairs, and therefore is not gathered as rapidly as those varieties which grow in clusters. It is one of the most valuable dessert cherries, but not as productive as the Tartarian.

ORIGIN, England, by T. A. Knight, in 1810, from Bigarreau crossed with May Duke.

TREE, healthy, fairly vigorous, with spreading head, second rate in productiveness ; Heart.

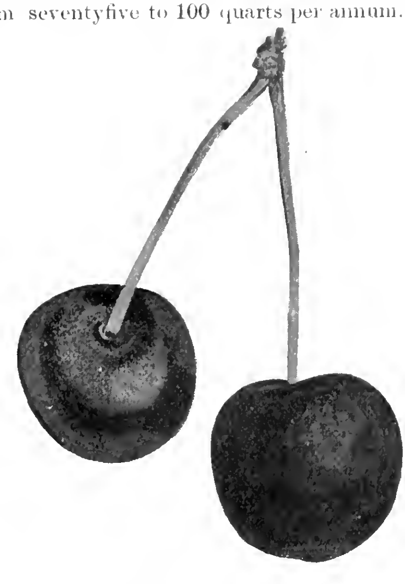
FRUIT, medium to large, obtuse, heart-shaped, uneven ; skin, dark red or purple, becoming almost black if allowed to hang ; stalk two inches long in a rather large cavity.

FLESH, dark red to purple ; texture, tender and juicy, but firmer than Tartarian ; flavor, sweet, rich and delicious ; stone, small.

SEASON, July 1st to 6th (1897).

QUALITY, first-class for all purposes.

VALUE, for market, first-rate.

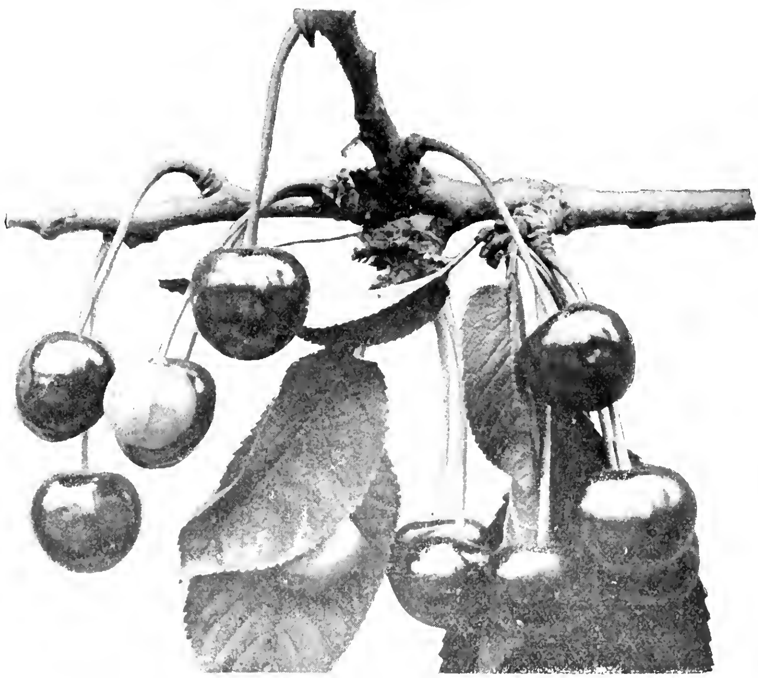


KNIGHT'S EARLY BLACK.

MAZZARD.

Black Mazzard (Downing), Merisier (Leroy), Corone (Hogg).

The common English black cherry, which is indigenous to the continent of Europe, and has now become naturalized in North America, is the original species from which the excellent heart cherries have originated. Seedlings of this class of cherries are grown extensively by nurserymen as stock upon which to propagate the finer varieties, as standards.



MAZZARD.

The fruit of these seedlings varies considerably, often being small and rather bitter in flavor, and consequently of no value for market ; but occasionally we find one large enough to be worth cultivating, and of fairly good quality.

ORIGIN, Europe.

TREE, very vigorous and healthy, often reaching thirty feet in height and spreading over an area as many feet in diameter ; Heart.

FRUIT, small, heart-shaped, or round, a little flattened ; suture evident on one side ; skin, shiny black, thin ; stalk, inch and a half to two inches long.

FLESH, soft, melting, juicy, often somewhat bitter.

SEASON, July 10th to 25th.

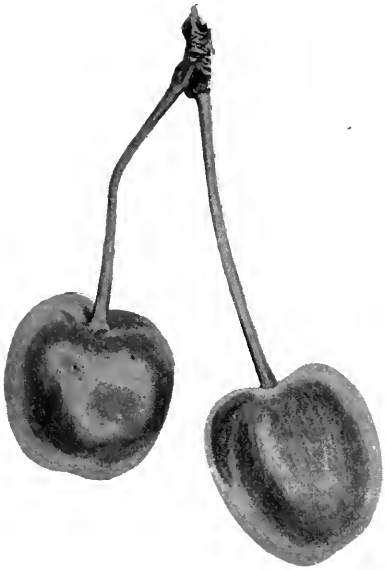
QUALITY, very poor for dessert, poor for cooking.

VALUE, fourth rate for all purposes.

ADAPTATION, southern part of the Province.

MEZEL. (*Monstreuse de Mezel*, Bigarreau of Mezel.)

One of the finest of the late black cherries, of large size and great productiveness. Though a Bigarreau it has not the fault of its class of being especially subject to rot; it is not so black in color as the Elkhorn, but dark enough a red to be classed with the black cherries.



MEZEL.

ORIGIN, Mezel, France; first introduced in 1846.

TREE, upright, spreading, a very vigorous grower; one tree at Maplehurst forty years planted was thirty feet in height in 1897, and covered an area about the same number of feet in diameter; first rate in hardiness and in productiveness; group, Bigarreau.

FRUIT, very large, fifteen-sixteenths of an inch long by one inch in width; obtuse heart shaped, slightly flattened, with a clearly-defined suture on one side, ending in a slight nipple; skin, dark red at first, changing to dark purple at maturity; stalk, two inches long, slender, set in good sized cavity.

FLESH, firm, juicy, breaking; flavor, sweet, good.

SEASON, July 12th to 20th (1897).

QUALITY, for dessert, first class.

VALUE, for market, first rate.

MORELLO. (*English Morello.*)

An old reliable variety for cooking purposes, known in England for nearly three hundred years, and deserving of wider cultivation in Ontario. Downing thinks the name Morello is from *Morus*, the Mulberry, from the dark purple color of its juice, which resembles that of the mulberry; a profitable market variety.

TREE, habit, spreading, slender; hardy and very productive; vigor, medium; Morello.

FRUIT, fairly large, roundish, nearly heart shaped, somewhat flattened on one side, with a slightly traceable suture.

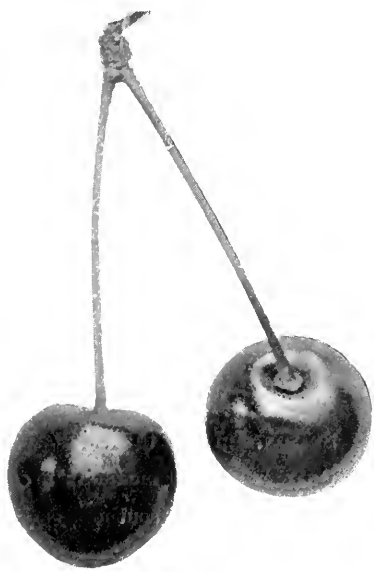
SKIN, red, turning dark red or purple towards maturity; stalk about $1\frac{3}{4}$ inches long, inserted in a shallow cavity; stone small, slightly cling.

FLESH, very dark red, texture, tender, juicy, acid, becoming more subacid and agreeable the more it matures.

SEASON, July 20 to August 10, in 1897.

QUALITY, dessert, very poor; cooking, first class.

VALUE, home market, second rate.

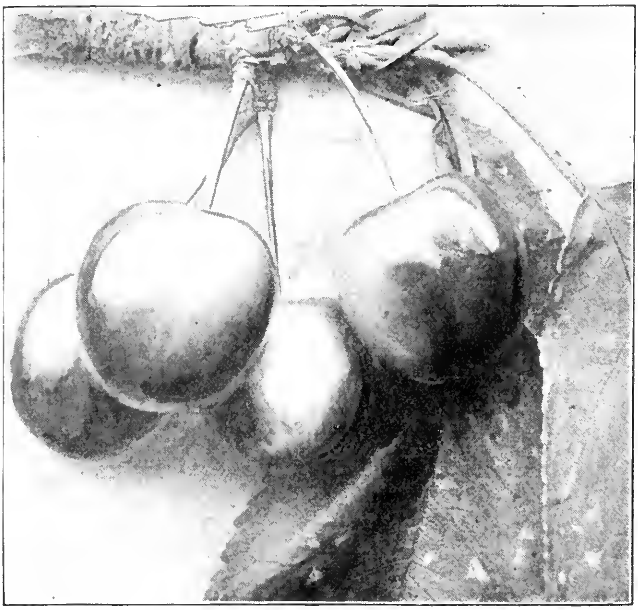


MORELLO.

NAPOLEON.

Napoleon Bigarreau, Royal Anne of California.

A valuable variety of foreign origin. Perhaps the most productive variety known, yielding fruit of the very largest size which is in good demand and, therefore, one of the most desirable varieties for the commercial orchard. It has one serious fault, namely, it is very subject to the rot, especially in wet seasons, and sometimes the whole crop of this variety is ruined by it.



NAPOLEON.

TREE, upright, spreading, vigorous, hardy on the south shore of Lake Ontario. Very productive.

FRUIT, very large, oblong heart shaped ; skin, yellow ground, light in shade, rich red cheek in the sun, sometimes mottled ; stem, $1\frac{1}{8}$ inches long ; suture plainly traceable.

FLESH, yellowish white, very firm, meaty, fairly juicy, good flavor, much esteemed for canning because it looks well in the jars and bears cooking well.

SEASON, July 8th to 16th.

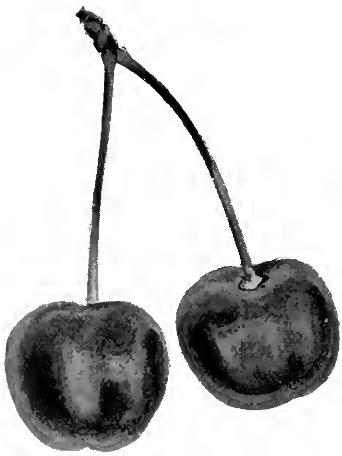
QUALITY, dessert medium ; market, very good to best.

ADAPTATION, the southern part of the Province of Ontario.

MAY DUKE.

(*Early Duke, Royal Hative.*)

The staple variety of cooking cherry in its season, both for home use and market. The great productiveness, health and vigor of the tree, the mild acid of the fruit ripening over a considerable season, all tend to make this a favorite variety in all cherry-growing districts. The fruit is rather tender for distant shipments.



MAY DUKE

ORIGIN, Médoc, a Province in France, from whence the name is said to be a corruption.

TREE, upright, of fastigiate head, a habit especially noticeable in young trees; vigorous, hardy, and productive; Duke.

FRUIT, roundish, obtuse, heart-shaped, with traceable suture, and distinct indentation to apex; grows in clusters; skin, bright red turning darker at full maturity; stalk 1½ to 2 inches long; stone small.

FLESH, red, tender, very juicy; flavor, sub-acid, and very good.

SEASON, June 12th to 20th (1897).

QUALITY, good for dessert; first class for cooking.

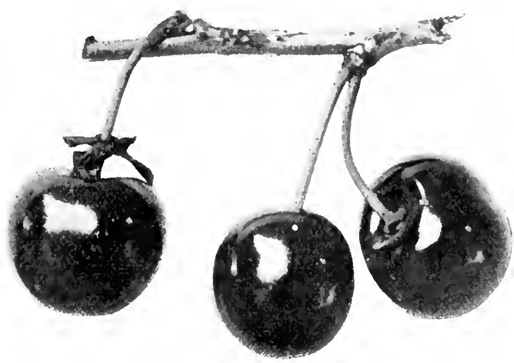
OLIVET.

From tests in the experimental orchard, we judge the Olivet to be a valuable variety for the home garden. The tree is a fine grower, and the fruit large and attractive, with a mild acid flavor, while in season it immediately succeeds the Reine Hortense.

TREE, of French origin, usually classed with the Dukes, fairly vigorous; hardy; productiveness, second rate.

FRUIT, large, $\frac{3}{4}$ by $\frac{7}{8}$, obtuse heart-shaped, almost round; color, dark rich carmine; stem, 1 to 1¼ inches, in a broad cavity, often in pairs.

FLESH, reddish; texture, soft, melting, very juicy; juice stains red; flavor, very mild, pleasant acid.



OLIVET.

QUALITY, dessert, fair; cooking very good to first-class.

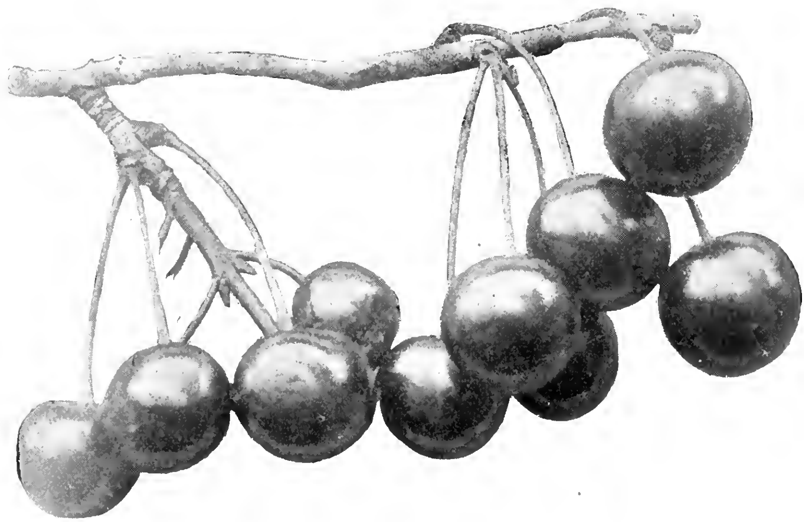
VALUE, not yet determined in Ontario.

SEASON, June 24th to July 10th.

OSTHEIM.

(*Griotte d'Ostheim.*)

This and the Vladimir were distributed throughout the Province of Ontario a few years ago by the Fruit Growers' Association. The Vladimir is of little or no use, but the Ostheim is a fair size, productive enough to be profitable, and good for all purposes. Its hardiness should make it a special favorite in the colder sections, to succeed the Montmorency.



OSTHEIM.

ORIGIN, South of Spain, brought to Germany early in the 18th century, and cultivated near Ostheim, in Saxe-Weimar, whence its name.

TREE, third rate in vigor, almost a dwarf, first in hardiness, and second rate in productiveness ; Morello.

FRUIT, medium, about $\frac{9}{10}$ x $\frac{13}{16}$ of an inch in length and breadth. The variety must vary, since Dr. Hogg describes it as large, and LeRoy describes the stalk two inches long set in a pronounced cavity. Round, slightly depressed at the side ; color, very dark purple, almost black when ripe ; stalk, one and three-eighths inches, in ones and twos ; suture not traceable ; pit, small, cling.

FLESH, very dark purple, tender, juicy, almost sweet when ripe, agreeable.

SEASON, July 18th to 30th, or even longer, improving in flavor the longer it hangs.

QUALITY, poor for dessert ; fair for cooking.

VALUE, for market, third rate.

ADAPTATION, quite general ; found fruiting freely in St. Joseph's Island, Algoma, in 1898.

VLADIMIR.

A Russian variety from Vladimir district, distributed by the Ontario Fruit Growers Association in 1887. It has been growing for these ten years at Maplehurst, and reckoned unprofitable. The fruit is very scattered, smaller than the ordinary seedling Mazzard, and very subject to curculio. It is not to be compared in value with the Ostheim which is of the same season or a trifle later.


VLADIMIR.

TREE, slow, weak grower ; rather a bush than a tree ; unproductive ; Morello.

FRUIT, small, round ; skin dark purple, almost black at maturity ; stalk 1⅝ inch long, in very shallow cavity ; stone very small.

FLESH, tender, purple, colored juice ; texture, melting, juicy ; flavor slightly sub-acid, fair.

SEASON, July 15th to 25th (1897).

QUALITY, very poor.

VALUE, fourth rate for either home use or market.

ADAPTATION, general.

WINDSOR.

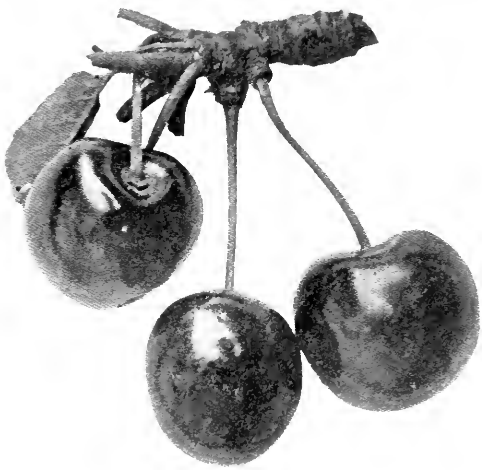
A valuable late cherry for either home use or market, its firm flesh making it a better shipper than most dark colored cherries. Indeed, from the middle to the end of July, when this cherry is at its best, there is no other to compete with it, the Elkhorn being just over. The tree is not an early bearer, and the fruit is subject to the curculio, but otherwise the Windsor stands among the very best.

ORIGIN, by James Dougall, Windsor, Ontario.

TREE, a vigorous, upright, symmetrical grower, healthy, very hardy and productive.

FRUIT, large, $\frac{15}{16}$ inch long by 1 inch wide ; form, round, obtuse, heart shaped : color, dark red turning darker as it hangs ; stem, 1½ inches long, set in a moderately deep cavity ; in twos and threes ; suture, obscure.

Flesh, yellowish, with reddish tint ; texture firm, moderately juicy ; flavor, rich and sweet.


WINDSOR.

SEASON, July 10th to 20th.

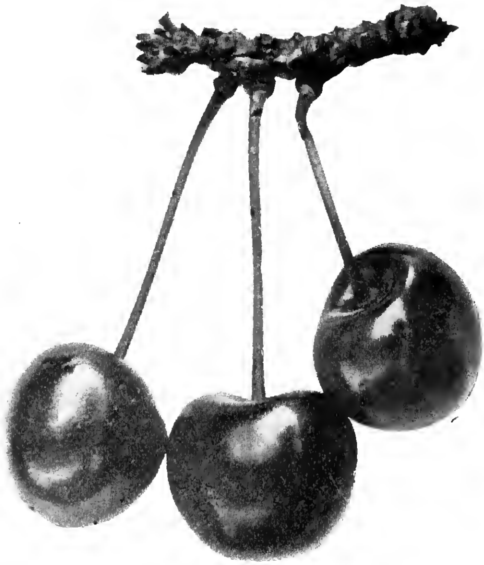
QUALITY, dessert, good ; cooking, good.

VALUE, first-rate for all markets.

ADAPTATION, farther north than most Bigarreau cherries.

YELLOW SPANISH.

Of all the Bigarreau cherries this is one of the finest, both on account of its great size and its delicious flavor. The tree grows to a very large size, surpasssing in this respect any other cultivated variety with which we are acquainted. It does not average very productive, because the fruit often blasts and drops, or is destroyed by Monilia. When, however, it does mature a good crop, the yield is enormous.



YELLOW SPANISH.

The variety is of European origin, and was introduced into the United States in 1800.

TREE, very vigorous, of large growth, spreading, productive.

FRUIT, very large and of a beautiful waxy lustre; form, round, obtuse, heart-shaped; skin, clear amber, nearly covered with red when exposed to the sun: stem, stout, $1\frac{1}{2}$ inches long in a wide cavity: suture, traceable.

FLESH, pale yellow; texture firm, juicy, breaking; flavor, sweet, delicious when well ripened.

SEASON, June 25th to 30th in 1896.

QUALITY, dessert very good.

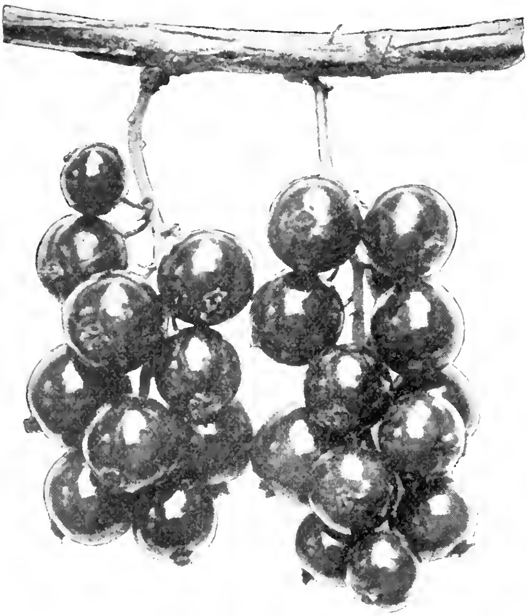
MARKET VALUE. First-class.

ADAPTATION. Succeeds in peach sections, on well drained sandy soil.

CURRANTS.

CHERRY.

(*Red Imperial, Fertile d'Angers—" LeRoy."*



CHERRY.

The principal red currant grown in Southern Ontario for commercial purposes. Its large size, fine color and earliness, combine to make it the most satisfactory of all varieties for market, and many acres have been set out for this purpose. When well cultivated and well pruned back, a plantation of Cherry currants will continue very productive for at least twelve or fifteen years.

ORIGIN, Europe.

PLANT, vigorous, a stout stocky grower ; productive ; begins bearing the second year after planting ; foliage thick, dark green.

BUNCH, usually short, but sometimes long and tapering ; average length, two inches.

BERRY, very large, globuler, ½ inch in diameter ; bright red in color ; acid.

SEASON, June 25th to July 25th.

QUALITY, fair.

VALUE, first-class for market and for jellies.

ADAPTATION, general, but succeeds better on clay loam than upon light sand.

FAY.

A variety that has been much advertised as superior to the Cherry, but, as a matter of fact, is very similar in fruit and in productiveness.

ORIGIN, New York State.

BUSH, vigorous, but sprawling, and somewhat subject to the borer where the shoots are not frequently renewed.

BUNCH, moderately close, loose toward the base; length 2 to $3\frac{1}{2}$ inches.

BERRY, very large, globular, $\frac{1}{2}$ inch in diameter; bright red; juice, sub-acid.

SEASON, June 25th to July 25th.

QUALITY, good.

VALUE, first-class for market.

ADAPTATION, General.

FAY.

HOLLAND.

HOLLAND.

White Holland, Long Bunched Holland.

The best bunched and the most showy of the white currants.

BUSH, vigorous, healthy and quite productive.

BUNCH, four to five inches in length; loose at base of racemes, close toward apex.

BERRY, $\frac{3}{8}$ inch long by $\frac{1}{2}$ inch broad; globular; skin, thick, white; flavor mild acid.

SEASON, July 10th to 30th.

MIDDLESEX.

(Saunders' No. 12.

Among a collection of seedling black currants sent to Maplehurst by Dr. Saunders of Ottawa in 1896, we notice one which gives promise of greater productiveness than the others. Not only are the berries a good size, but, what is of greater importance with a black currant, the branches are full and hang pretty closely along the branch. If this variety continues its good qualities, we shall propagate it as being of sufficient importance to be distributed among our experimenters for farther test.

ORIGIN, Dr. Saunders, Ottawa, Canada.

BUSH, very vigorous, healthy, very productive for three successive years, viz., 1896, 1897, 1898.

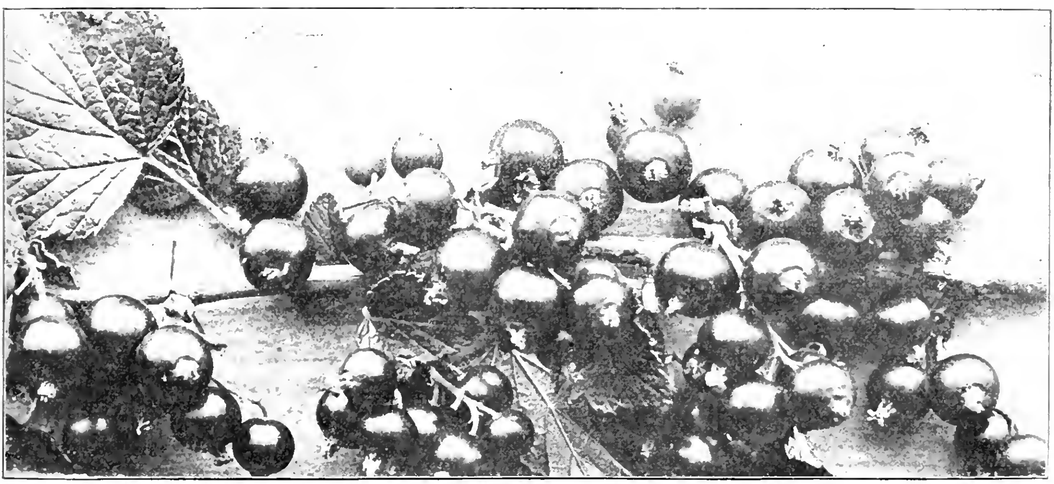
BUNCHES, about $1\frac{1}{4}$ inches in length, compact.

BERRY, round, about half an inch in either diameter; skin, jet black, thick; flavor, good.

SEASON, July 8th to 16th, or later in Southern Ontario.

VALUE, first-class for cooking and market.

ADAPTATION, general.

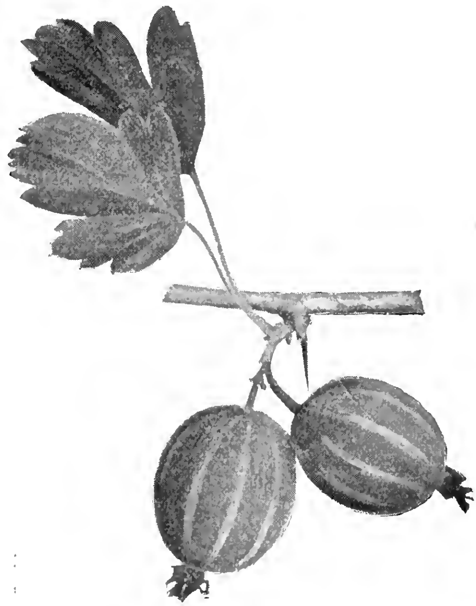


MIDDLESEX. (Slightly reduced).

GOOSEBERRIES.

DOWNING

This has been the most popular gooseberry of American origin for some years (1897) unless we except the Pearl, a variety of Canadian origin, very similar in size and appearance. It is very widely known and planted all over the continent of North America. It is not subject to mildew, and succeeds splendidly everywhere.



Downing. (Slightly reduced.)

Origin, with Chas. Downing, Newburgh, N.Y., a seedling of Houghton.

Plant, healthy, first-rate in health and vigor and productiveness ; an upright grower.

Fruit, size, medium, $\frac{3}{4}$ inch by $\frac{3}{4}$ broad, sometimes reaching $\frac{7}{8}$x$\frac{13}{16}$, when allowed to hang, not too heavily loaded ; form, round, often somewhat narrowed toward apex ; skin, smooth, transparent green with distinct light green ribs, and a thin whitish bloom.

Flesh, light green, tender, sweet and good.

Season of maturity, July 18th to 25th (1897.)

Value, for market, third-rate.

PEARL.

The Pearl gooseberry has been widely planted in the commercial gardens of Canada and the United States. It is certainly a magnificent cropper, but it is very difficult indeed to distinguish the berry from the Downing, except that it averages a trifle larger.

PEARL.

ORIGIN, London, Ontario, with Mr. Saunders, a cross between Houghton and Red Warrington.

PLANT, healthy, not subject to mildew; upright, spreading; first-rate in vigor and in productiveness.

FRUIT, medium, measuring 1 inch long by 1 inch in breadth; round, often narrowed toward the apex; skin, smooth, transparent green, with thin whitish bloom and light green ribs.

FLESH, light green, tender, sweet and good.

SEASON of maturity, July 18th to 26th, (1897).

VALUE, market very much the same as Downing.

ADAPTATION, nearly every part of Ontario.

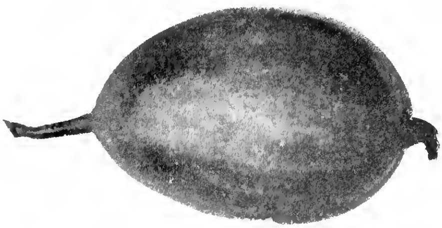
NOTE.—The sample branch of Pearl from which our engraving was taken was grown by Mr. Thos. Beall of Lindsay, in July, 1898. The same engraving may stand for both Pearl and Downing, with the exception that the latter variety is a trifle smaller in size. Mr. Beall writes under date of September 22, 1898: "The Pearl averages larger size; I have them growing side by side here at Lindsay. It is much more productive. I can find no difference in flavor until near or at maturity, at which time the Downing loses its flavor and becomes quite insipid, while the Pearl retains its good qualities to the end. The two varieties are so nearly alike that I think it almost impossible to distinguish individual berries; yet, when in quantities—say basketfulls—the varieties are easily distinguished. The Pearl is larger, brighter in color, and, if well grown, a larger proportion of the Pearl berries will be somewhat elongated and decidedly pointed at the calyx end.

ENGLISH GOOSEBERRIES.

There are very few English varieties of gooseberries which are successful in Canada, chiefly on account of the mildew, which the American seedlings are much better able to resist.

Mr. A. Morton of Brampton has been testing these English gooseberries for many years, and has sent us samples, with notes, and from these we condense the following descriptions, with photographs.

CATHARINA.



CATHARINA.

An excellent table berry, highly recommended for family use by Mr. A. Morton of Brampton.

BUSH, medium size, vigorous, spreading, makes slender wood, fairly productive.

BERRY, large, long, yellow ; skin, a little hairy ; flavor, first-rate.

ADAPTATION, grown successfully for some years at Brampton.

CROWN BOB.

A profitable gooseberry.

BUSH, inclined to overbear, and thus exhaust its vitality ; drooping in habit.

BERRY, oblong, very large, especially if thinned before it is full grown ; skin, thin, hairy ; color, red : of very good flavor.

CROWN BOB.

DUKE OF SUTHERLAND.

DUKE OF SUTHERLAND.

A first-class gooseberry.

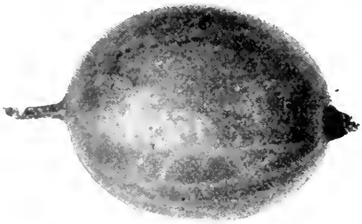
BUSH, vigorous, large, spreading ; wood, long and slender ; foliage, dark green ; very productive ; grown free of mildew by Mr. A. Morton, Brampton.

BERRY, very large, oblong ; skin, dark green, smooth ; flavor, fair.

SEASON, late.

WHITESMITH.

One of the best of the English varieties for cultivation in Ontario; succeeds best on clay land, with northern aspect. On the sandy soil of the Niagara district it is much affected by mildew.



WHITESMITH.

ORIGIN, England.

PLANT, upright, fairly productive, fairly vigorous.

FRUIT, large, often $1\frac{1}{4}$ to $1\frac{1}{16}$ inches; oval, downy, with distinct regular veins; green, and when ripe sweet and agreeable.

SEASON, July 20th to August 10th.

QUALITY, first-rate for home uses.

VALUE, first rate for market.

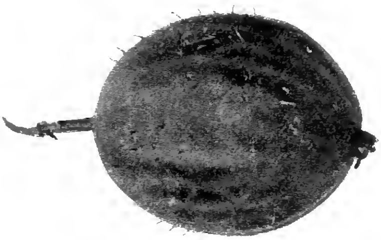
LARGE SCOTCH RED.

BUSH, a free grower, healthy, large, productive.

FRUIT, large, sub-acid; a favorite table berry.

LARGE SCOTCH RED.

ONE OF THEM.



ONE OF THEM.

BUSH, very vigorous, with healthy foliage, moderately productive.

BERRY, very large, dark red when fully ripe.

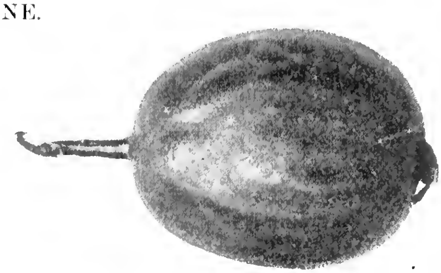
QUALITY, first-class.

TWO TO ONE.

A desirable variety for family use. It is among gooseberries what the cherry is among currants in mode of growth.

BUSH, fairly productive; growth straggling.

BERRY, of the very largest size; fresh, tender; flavor good.



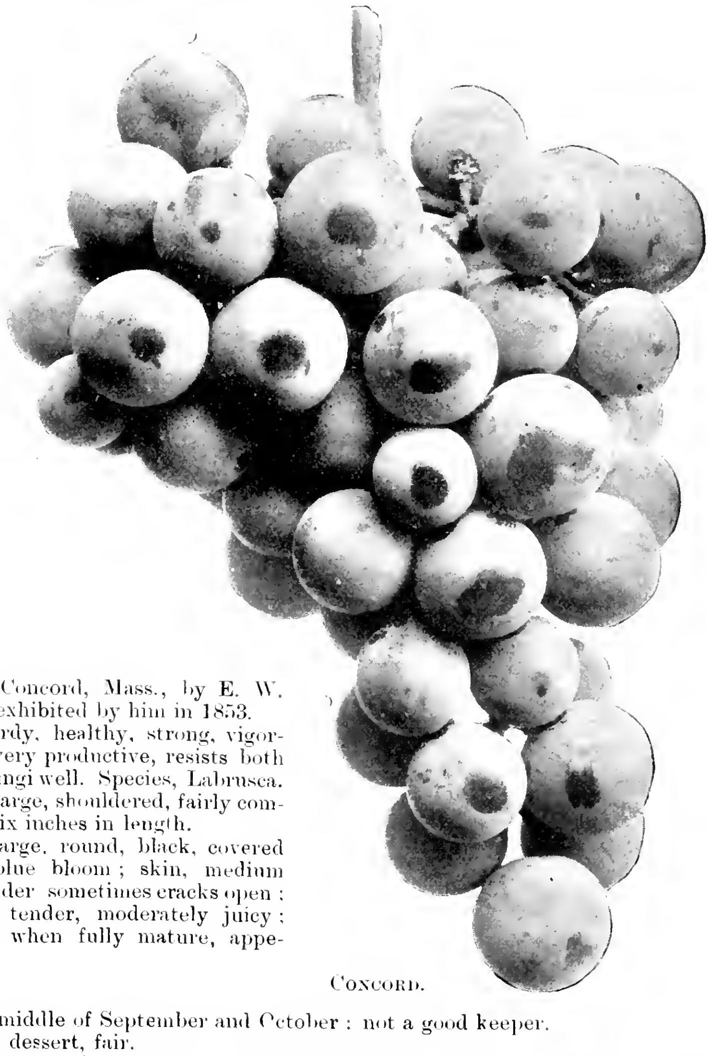
TWO TO ONE.

GRAPES

CONCORD.

The principal out-door grape grown for market in the Province of Ontario. Probably more than half the vines in the large commercial vineyards of the Niagara district, as well as in Essex and other parts of southern Ontario are of this variety.

The reason of this is (1) its comparative freedom from mildew, (2) its vigor of vine, (3) its productiveness. Four tons to the acre is not an uncommon yield, so that, even when it sells as low as $1\frac{1}{2}$ cents per pound, there is yet a fair return for the investment. Still it is an open question whether in the near future it will not pay the grower better to plant varieties of higher quality that will bring a higher price, though they may be less productive.



Concord.

Origin, Concord, Mass., by E. W. Bull. First exhibited by him in 1853.

Vine, hardy, healthy, strong, vigorous grower, very productive, resists both insects and fungi well. Species, Labrusca.

Bunch, large, shouldered, fairly compact, five to six inches in length.

Berry, large, round, black, covered with heavy blue bloom; skin, medium thickness, tender sometimes cracks open; flesh, pulpy, tender, moderately juicy; flavor, sweet when fully mature, appetizing.

Season, middle of September and October: not a good keeper.

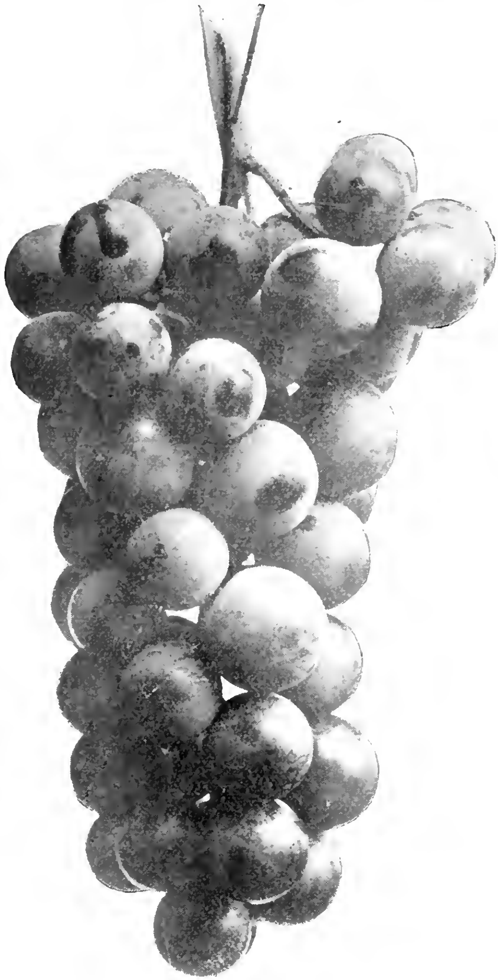
Quality, dessert, fair.

Value, near market, 2nd rate; distant market, 3rd rate; of no value for export.

Adaptation. Tested at Wentworth, Niagara, Southwestern and Bay of Quinte stations, in all of which it ripens well in the open air.

DELAWARE.

Universally acknowledged to stand at the head of all American grapes in point of quality. For the home garden a few vines of this variety are indispensable, for it is the most excellent of dessert varieties. It is also one of the highest priced grapes in our markets, often bringing more than double the price of the Concord. It is, however, not very much grown in our commercial vineyards, because the foliage is badly subject to thrip and the yield is only moderate. On rich deep soils, well drained, however, with high cultivation, thinning and close pruning, it is productive and profitable. It should be planted much closer than the Concord. Vines of the latter variety are usually planted ten feet apart, while the Delaware may be set five or six feet apart.



DELAWARE.

ORIGIN, unknown. Name from Delaware, Ohio, where in 1855 it was first brought into notice, though not disseminated until ten years later. It was first found in a garden in Frenchtown, N.J. The Bushberg Catalogue thinks it a natural cross between Labrusca and Vinifera, a native American and a European variety.

VINE, moderate grower, foliage delicate, subject to thrip; wood slender, hardy, regular, sometimes an abundant bearer.

BUNCH, small, compact, usually shouldered.

BERRY, small, round; skin, thin, beautiful light red, with whitish bloom, translucent; pulp, sweet, sprightly, aromatic; juice abundant, sweet, vinous.

SEASON, September.

QUALITY, dessert, 1st class.

VALUE, dessert, 1st rate; market, 1st rate.

ADAPTATION. Succeeds at the Niagara, Wentworth, and Bay of Quinte stations, and throughout the southern and middle portions of the province generally.

PEARS.

ANJOU.

(Beurre d'Anjou, Ne Plus Meuris of Le Roy.)

A fine market pear, succeeding admirably on the quince, but on the pear the tree is not so productive, nor the fruit so large. Its fine size, and melting, buttery texture, make it a favorite market pear for the month of December, and the experience of 1897 proves it a desirable variety to export to Great Britain.

ORIGIN, Louvain, Belgium, about 1823 ; named Ne Plus Meuris, after Father Meuris.

TREE, a vigorous, strong grower ; productiveness scarcely first rate even on the quince, third rate on the pear.

FRUIT, large, some samples in 1897 measuring $4\frac{1}{4}$ inches long by $3\frac{1}{2}$ wide ; form, obovate, blunt pyriform, sides often uneven, and samples not very uniform ; skin, thick, yellow at maturity, with greenish patches and brown dots, brownish red on sunny side ; stem, scarcely half an inch long, stout and fleshy ; calyx, open, set in a shallow basin ; core small, seeds few, if any.

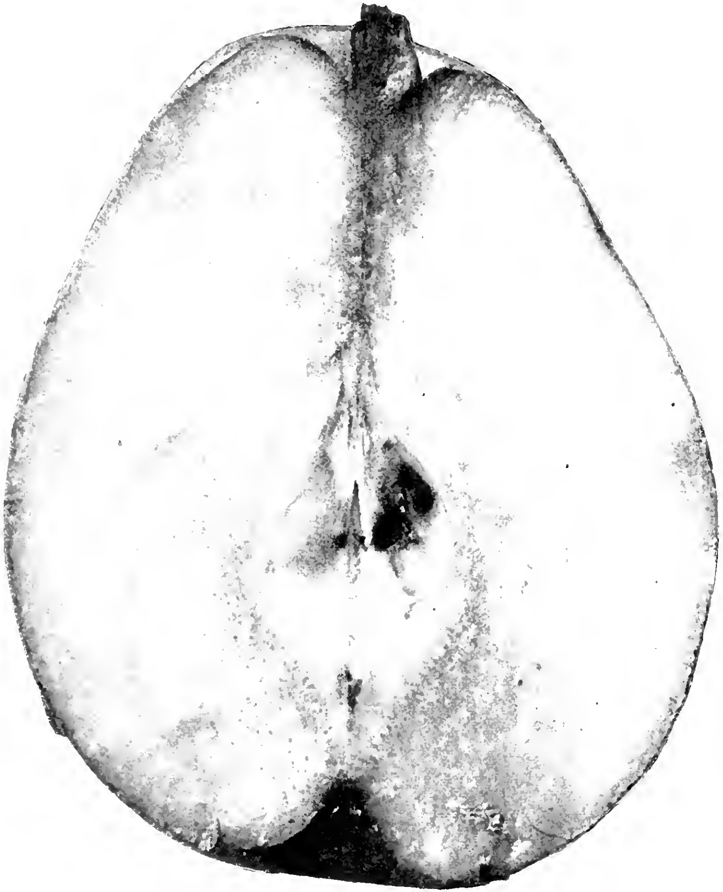
FLESH, white, fine grained, buttery, melting ; flavor, pleasant, perfumed, not very sweet.

SEASON, November and December

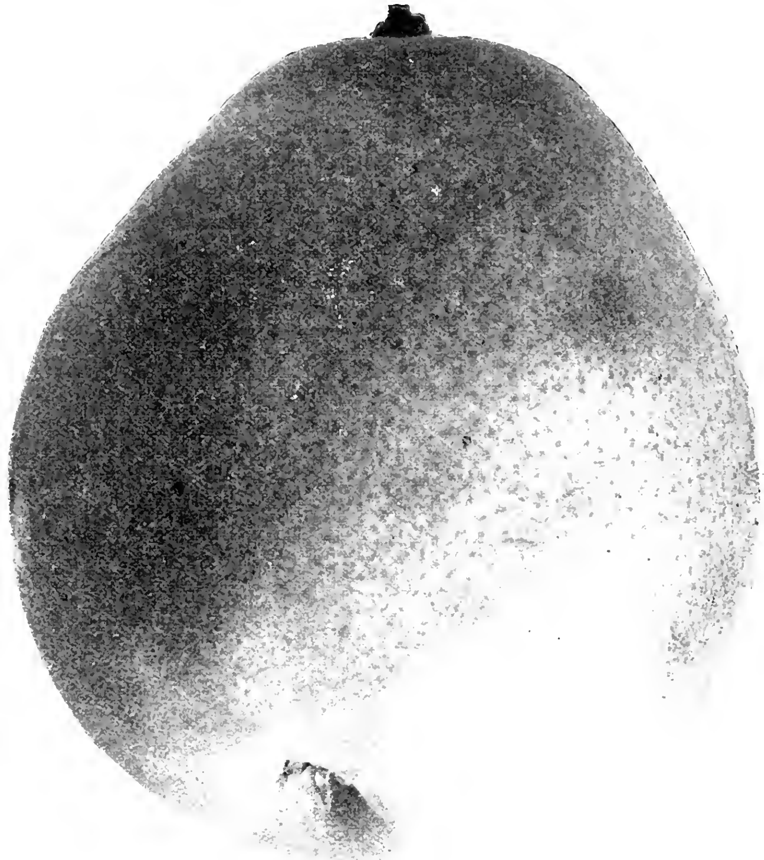
QUALITY, table or cooking, good.

VALUE, home market, 1st class ; foreign market, very good.

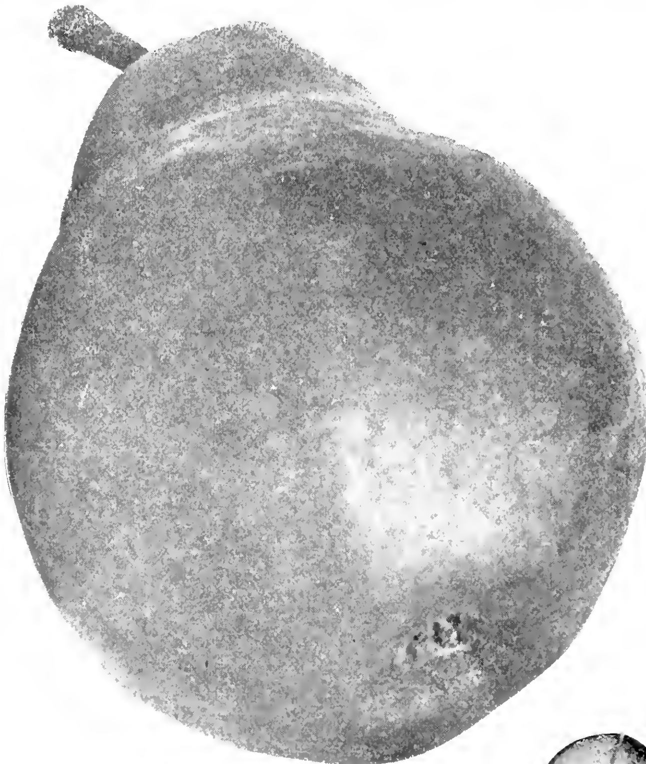
ADAPTATION, succeeds admirably south of Toronto.



Section of Anjou.



Anjou.



BARTLETT.

BARTLETT.

(In England, Williams' Boncretien.)

No pear of the same season equals in popularity the Bartlett, for either dessert or canning. Indeed, while it is in the market, no other pear compares with it in price or brings as much profit to the grower. Of late large orchards of this one variety have been planted in Canada and the northern States, and immense quantities of this pear are also shipped in car lots from California to our eastern cities, often causing the price to rule very low. In 1896 first-class Bartletts were sold in Toronto during a great part of September at from 30 to 40 cents a basket, and ordinary stock for \$2 and \$3 a barrel.

ORIGIN, Berkshire, England, 1770, propagated by Mr. Williams, near London. Introduced into America and dissemmated by Enoch Bartlett of Boston.

TREE, healthy, vigorous, half-hardy, overcomes blight better than most varieties, very productive.

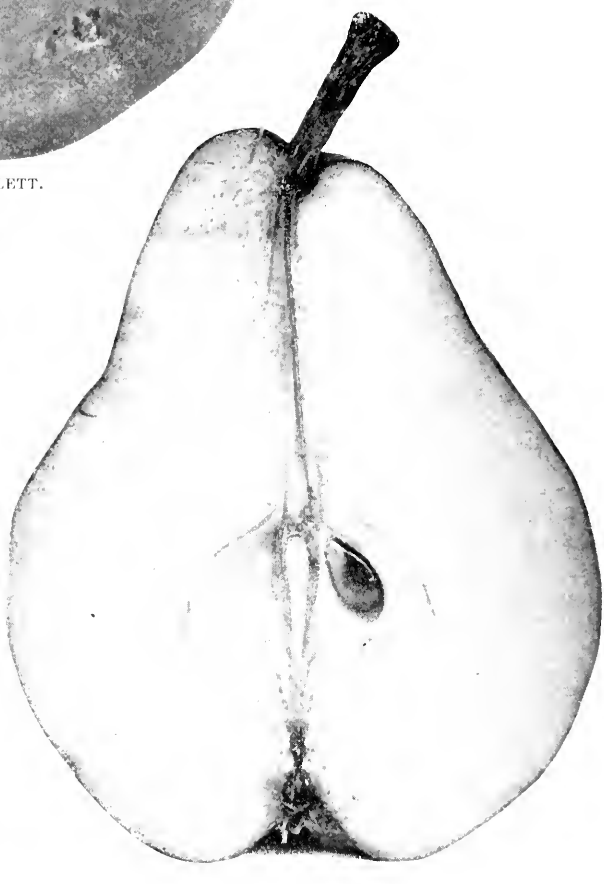
FRUIT, large, oblong, obtuse, pyriform. Color, yellow, with very numerous minute brown dots, often russetted at the apex. Stem, $1\frac{1}{4}$ inches long, in a small irregular cavity. Calyx, open in an irregular basin.

FLESH, creamy white, fine grained, very buttery and juicy; flavor sweet, perfumed, vinous.

SEASON, September 1st to 15th.

QUALITY, dessert, very good, market, best.

ADAPTATION, succeeds admirably in southern Ontario, and as far north as our Bay of Quinte station.



SECTION OF BARTLETT.

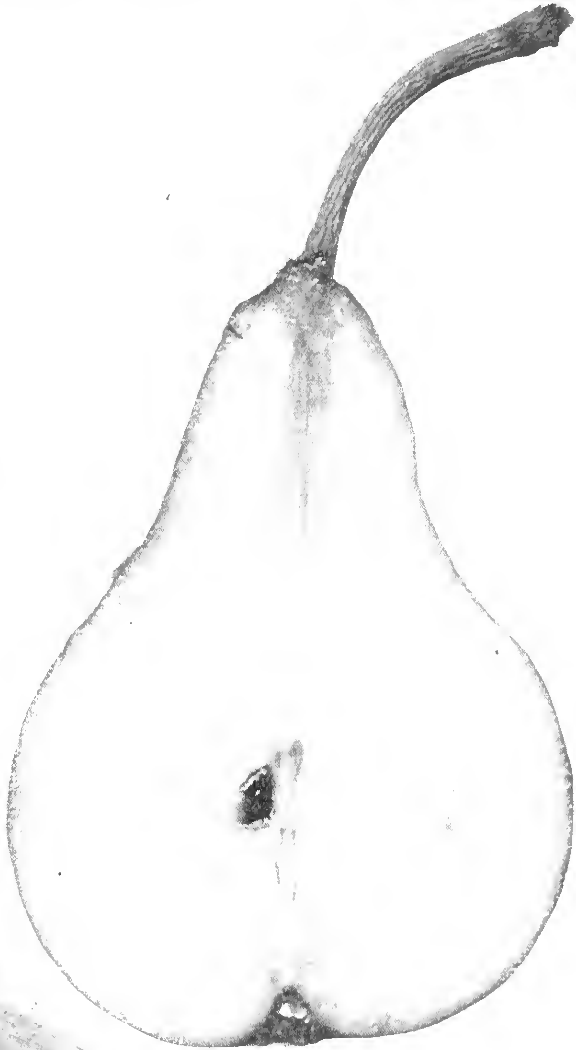
BOSC.

(Beurre Bosc, *Downing.*)

The Bosc pear is not as widely known among cultivators in Canada as its merits deserve. Though a russet, it yellows as it ripens; the pear is large in size, and uniform on the tree as if thinned purposely; and the texture is such that it can be exported in fine condition. In quality, a well grown Bosc is first-class. On the whole, we would place this pear among the valuable kinds for planting for export to the foreign markets

ORIGIN. A chance seedling found in France, and dedicated to M. Bosc, the eminent director of the Jardin des Plantes at Paris, about the year 1835.

TREE. A vigorous grower, and a regular bearer, carrying its fruit singly and not in clusters as is the habit of some varieties.



SECTION OF BOSC.

FRUIT, large, 4 inches long by 3 inches broad, elongated acute pyriform, covered with slight indentations; color, greenish yellow ground nearly covered with cinnamon russet; stalk, $1\frac{1}{2}$ to 2 inches long, stout and usually curved, inserted without a cavity; calyx open in a shallow basin.

FLESH, white; texture, fine, breaking, juicy; flavor, sweet, rich, delicious.

SEASON, October.

QUALITY, first-class for dessert.

VALUE, first-class for either home or foreign markets.

ADAPTATION, southern Ontario.

Bosc (Photographed and engraved from a sample grown in 1898).

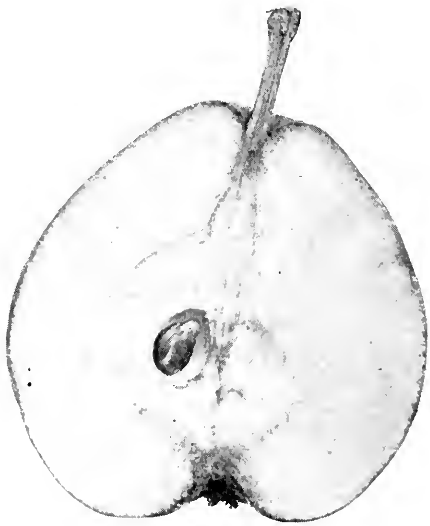
BUFFUM.

Formerly this pear was much in favor as a profitable orchard variety, because of its productiveness and the wonderful hardiness and vitality of the tree, but of late years it is much less in favor with pear growers on account of its small size and ordinary quality. Some trees of this variety at Maplehurst, forty years planted, have never shown the slightest tendency to blight, and have attained a great height, more resembling Lombardy poplars than pear trees.

ORIGIN, Rhode Island.

TREE, remarkable for its vigorous, symmetrical, erect habit of growth ; it is regularly and fairly productive, but unless gathered early the fruit drops badly ; not subject to blight.

BUFFUM. (Reduced.)



BUFFUM. (Section reduced.)

FRUIT, medium size, obovate, slightly oblong, sometimes $2\frac{3}{4}$ inches long by $2\frac{1}{2}$ inches wide ; skin, rough, yellow at maturity, with bright or dull red or russet on sunny side ; dots, small, brown ; stalk, $\frac{3}{4}$ inch long in small cavity ; segments of calyx small, in a small basin

FLESH, yellowish white, crisp, not fine, not juicy, sweet with pleasant flavor.

SEASON, September.

QUALITY, dessert, fair ; cooking, fair.

VALUE, home market, poor , foreign market, very poor.

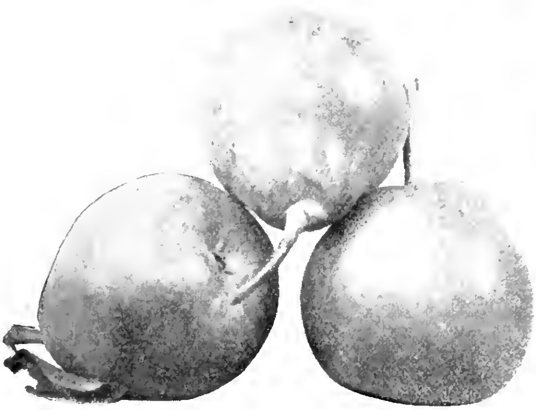
ADAPTATION, counted hardy in Bruce and Huron Counties ; slightly tender in North Ontario County.

CHAMBERS.

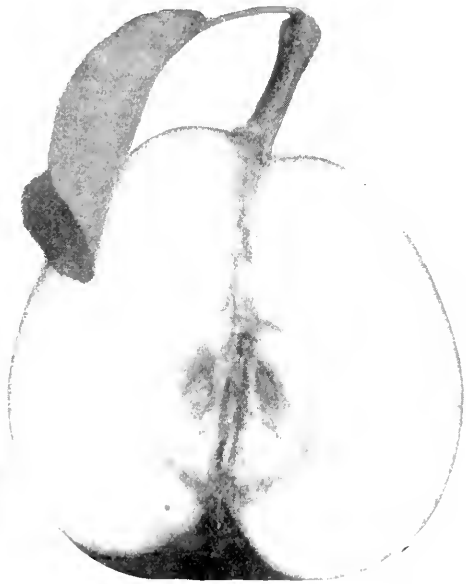
The Chambers pear has been grown at Maplehurst for about ten years on dwarf stock and commends itself as a fine market variety the beginning of August, for it is a good quality, large, and the tree is productive. Commended in Kentucky.

ORIGIN, brought from Maryland to Kentucky by Judge Wm. Chambers.

TREE, moderately vigorous, very hardy, productive.



CHAMBERS. (Reduced.)



CHAMBERS. (Section, full size.)

FRUIT of medium size, $2\frac{1}{4}$ inches long by $2\frac{1}{2}$ inches in diameter; form obtuse, obovate, pyriform: color, pea green, turning yellow when fully mature, with numerous brown and green dots, and reddish brown cheek on sunny side; stalk, stout, 1 inch long, set on an angle in a flat cavity, often one shoulder prominent; calyx, small, half-open; seeds, few.

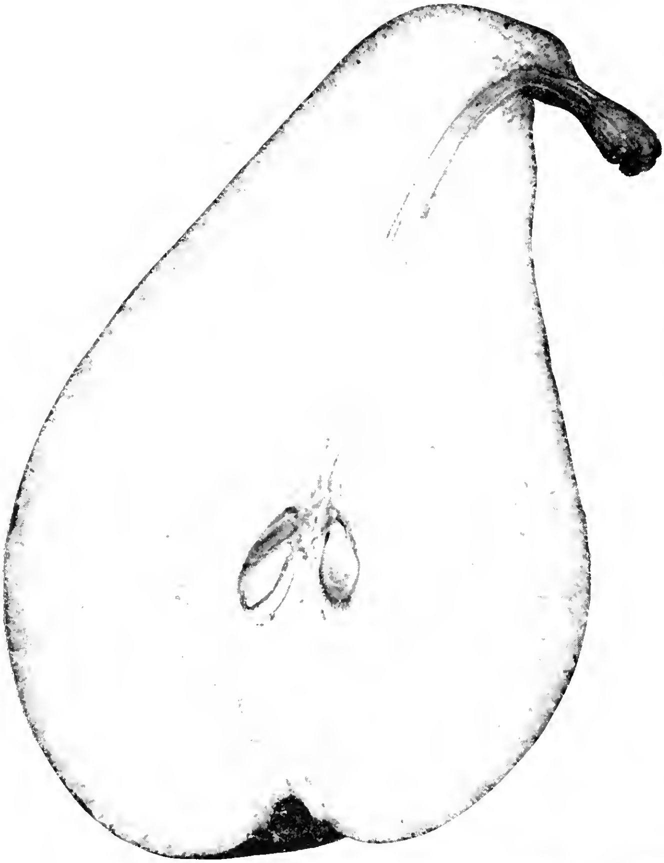
FLESH, white, half fine, tender, fairly juicy; flavor, aromatic, sweet and pleasant.

SEASON, August 1st to 10th.

QUALITY, good.

VALUE, for a near market, first rate.

CLAIRGEAU.



As a commercial pear, especially for a distant market, we know of no variety of the same season that is superior to this variety. Its large size, and the beautiful cheek which it takes on during the month of October, its excellent shipping and keeping qualities, all these combine to make it a profitable variety, and one that is easily grown, either as dwarf or standard, though usually large and fine sized as the former. The quality is variable according to the conditions of growth; in France it is counted first quality; in England, third quality; with us, when well ripened, it is second rate.

ORIGIN, Nantes, in France, with a gardener named Clairgeau, about 1834.

TREE, first-class in vigor, hardiness and productiveness; wood, stout, and upright in habit of growth; branches, numerous, grown as a dwarf can be trained to make a fine pyramid; an early bearer.

FRUIT, large, $4\frac{1}{2}$ inches long by $3\frac{1}{2}$ inches in width, one-sided, pyriform; skin, green, turning pale yellow at maturity, almost overspread with splashings and dots of russet, which completely covers it about the stalk and about the calyx; orange red on sunny side; stalk, $\frac{3}{4}$ inch long, stout, fleshy at the base, usually set at an angle with the axis; calyx, small, open, in a shallow furrowed basin.

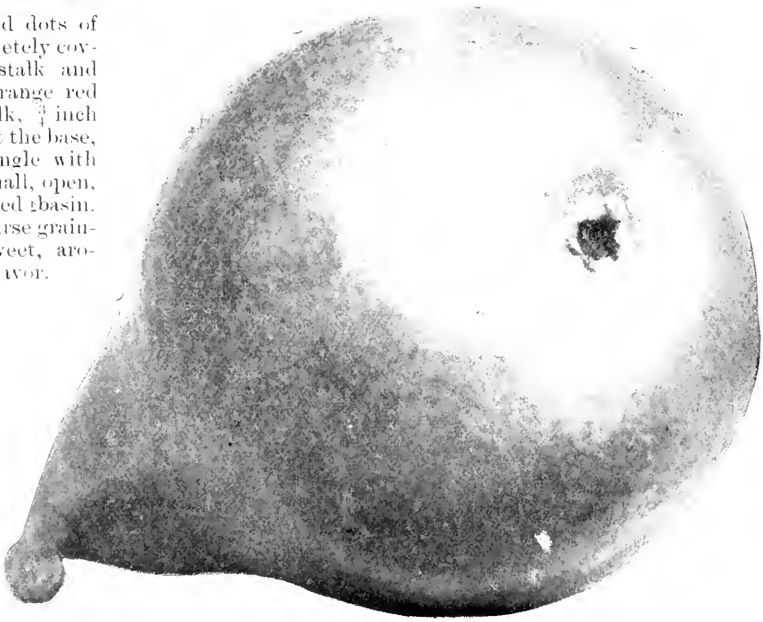
FLESH, white, coarse grained, juicy, with sweet, aromatic and vinous flavor.

SEASON, Oct. to January.

VALUE, home or foreign market, first rate.

QUALITY, cooking, good; desert good.

ADAPTATION, succeeds admirably as far north as Thornbury; and east as far as Prescott.



CLAPP'S FAVORITE

Clapp's Favorite is a beautiful pear where well grown and well colored. It is also of good quality, so that it is well fitted to be a profitable market pear; with one fault, that it soon passes out of prime condition, and, if allowed to ripen on the trees, it will rot at the core. On this account the fruit must be gathered as soon as full grown and well colored, and shipped while firm.

ORIGIN. Raised by Thaddeus Clapp, of Dorchester, Mass., U.S.

TREE, upright, vigorous grower, somewhat spreading, forming a symmetrical top; bears fruit of uniformly large size, pretty evenly distributed; productive; succeeds well as a dwarf on rich soil.

CLAPP'S FAVORITE.

SECTION OF CLAPP'S FAVORITE.

FRUIT, very large, pyriform, obovate, usually symmetrical, sometimes with unequal sides; skin pale green changing to yellowish green, with dull red on sunny side, which becomes bright crimson at maturity, somewhat resembling the coloring of the well-known Louise; stalk, stout and fleshy, obliquely inserted without cavity; calyx, large, half open, in shallow basin.

FLESH, creamy white, fine, tender, juicy, with very agreeable flavor; good to very good.

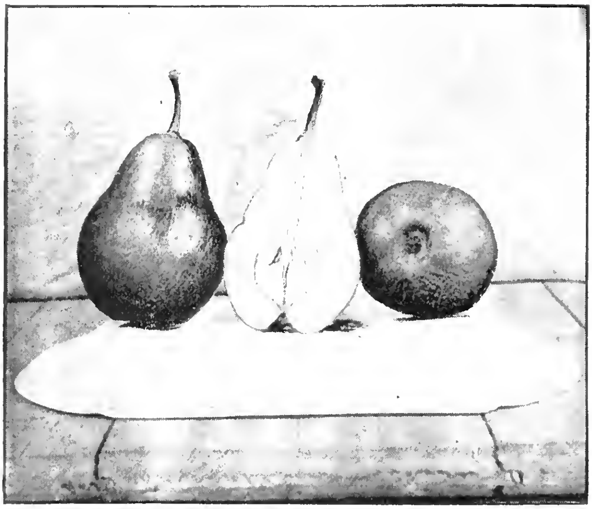
SEASON, August 20 to September 1.

QUALITY, good for dessert and cooking.

VALUE, good for home market.

ADAPTATION, hardy.

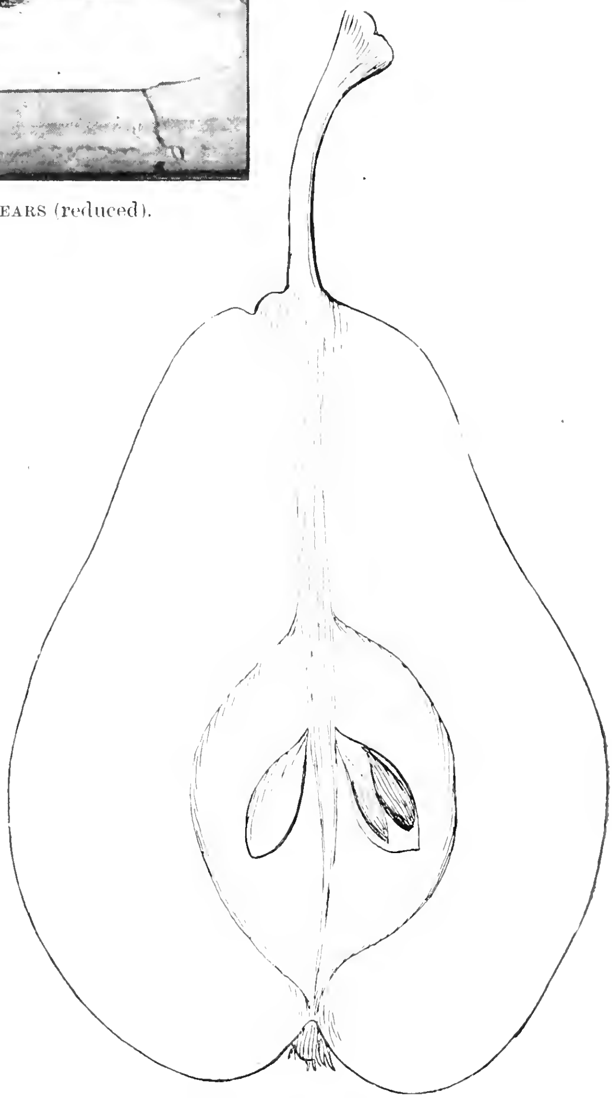
DEMPSEY.



A Plate of Dempsey Pears (reduced).

The Dempsey was originated near Trenton in Prince Edward County, by Mr. P. C. Dempsey, the late well-known Director of our Association for that district. It was produced from a seed of a Bartlett, fertilized with Duchess d'Angouleme. The tree is a good grower and quite productive. The fruit is firm and consequently would ship well.

Description: Fruit large, oblong, obovate, pyriform; skin smooth, yellowish-green, with brownish-red cheek in sun; stem about one inch long, set in a fleshy base, and with almost no cavity; calyx nearly closed in a moderately deep uneven basin, core small. Flesh white, fine grained, tender, almost melting, with sweet delicious flower. Season, last of October, November.



Section of Dempsey Pear.

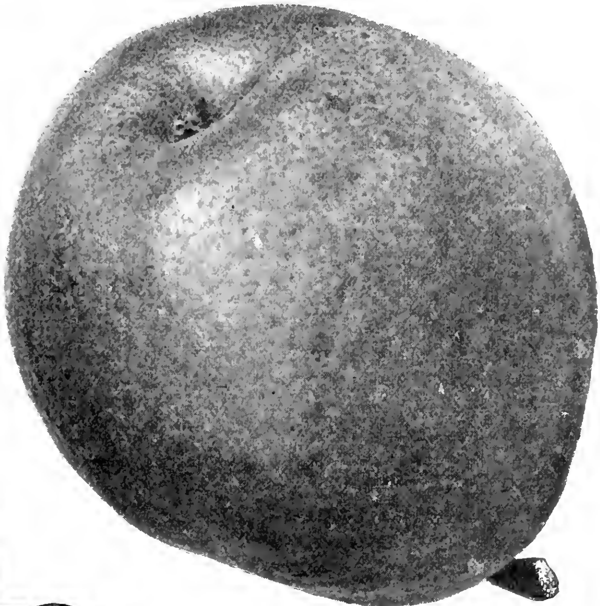
DIEL.

A pear of ordinary appearance as grown in Southern Ontario, but of such size and excellent quality that it deserves a place in every collection, whether for home use or market.

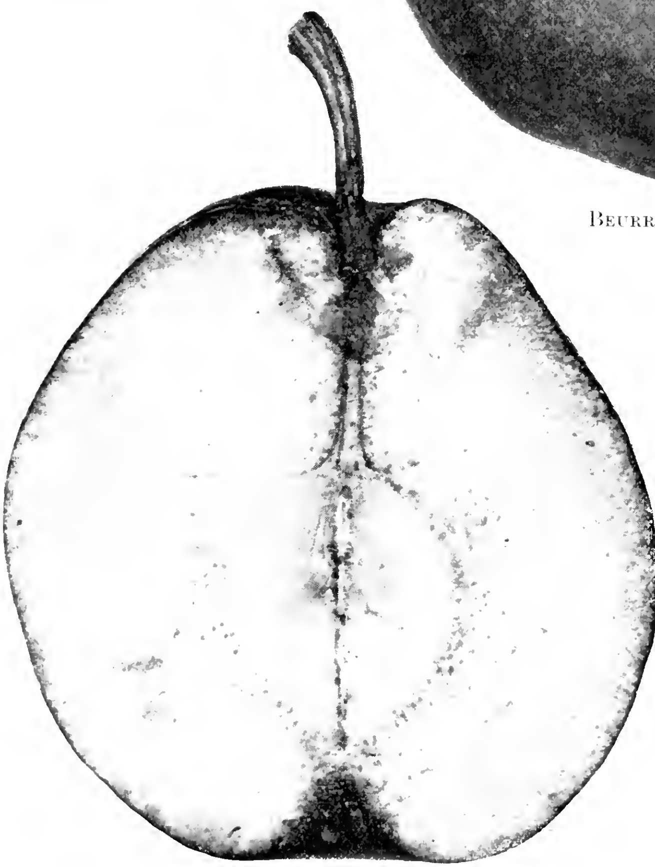
ORIGIN, a chance seedling near Brussels, Belgium, named in honor of Dr. Diel, a German pomologist

TREE, very vigorous, hardy and productive.

FRUIT, large to very large; obovate; stem pale green, turning yellow at maturity, with numerous large brown dots and patches of russet; stem, curved, stout, from 1 inch to $1\frac{1}{4}$ inches long, set in an open uneven cavity; calyx, open, in a basin of moderate depth and not very regular.



BEURRE DIEL.



BEURRE DIEL (Section).

FLESH, cream color, moderately fine, except at the core, juicy, buttery, aromatic, sweet, and when well grown and well ripened very delicious.

SEASON OF USE, November and December, just preceding the Lawrence.

QUALITY, dessert, very good.

VALUE, home market, second rate, because lacking in color; foreign market, possibly first rate, because it carries well and has fine flavor, but not yet tested in this respect.

ADAPTATION, not yet proved (1897).

DUCHESS.

(Duchess d'Angoulême, LeRoy and Downing; Angoulême, American Pomological Society; Duchesse, common name in France.)

For many years this pear was counted among the best and most profitable varieties in Ontario, especially when grown on quince stock, and, in consequence has been largely planted; but, since 1890, the Canadian markets for fruit have been overstocked, and prices for this pear have ruled low, even if held until December; and the fruit itself has been inferior in size, and much knotted with curculio stings. Prime samples are excellent stock for export, carried in cold storage.

ORIGIN, Angers, France, in 1812, a chance seedling. In 1820 Andusson, the propagator, sent a basket of the fruit to the Duchess d'Angoulême, who authorized him to bestow her title upon the pear as its name.

TREE, a strong grower, succeeds best on the quince: variable in productiveness.

FRUIT, exceedingly variable in size, from three to five inches in either diameter, sometimes weighing a pound and a quarter: form, obovate, large at the base: surface, uneven, sometimes knobby; skin, light green, patched with russet, and numerous grey dots; stalk, stout, curved, one inch long, often swollen at point of attachment, deep set in an irregular cavity; calyx, small, closed, in an uneven, often russeted basin.

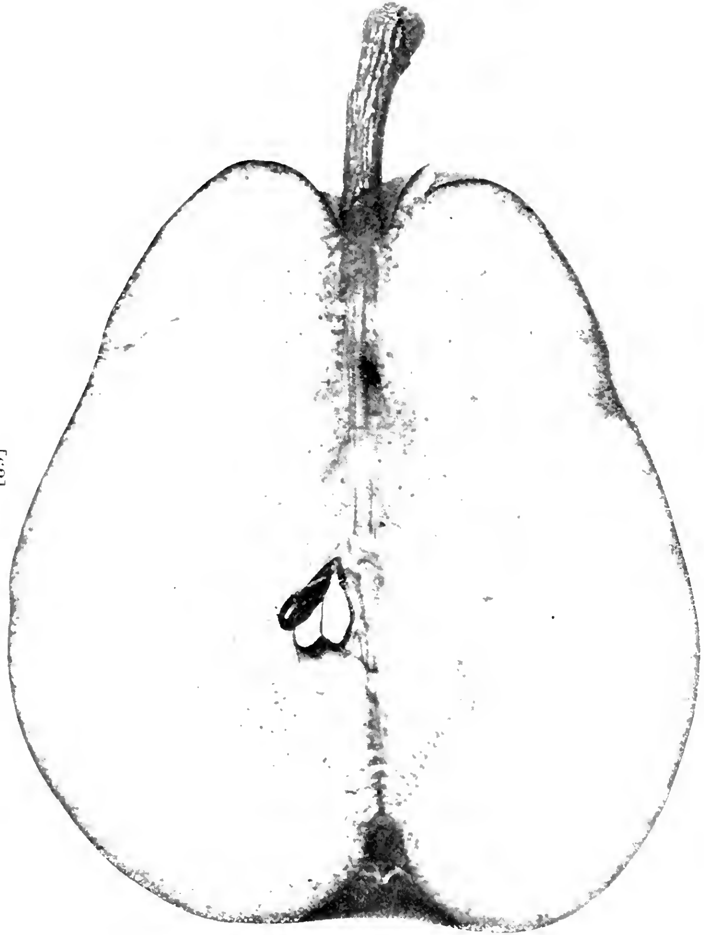
FLESH, white; texture, fine when well grown, but often coarse grained, melting, juicy, and, when properly matured, of a sweet and excellent flavor.

SEASON, October and November.

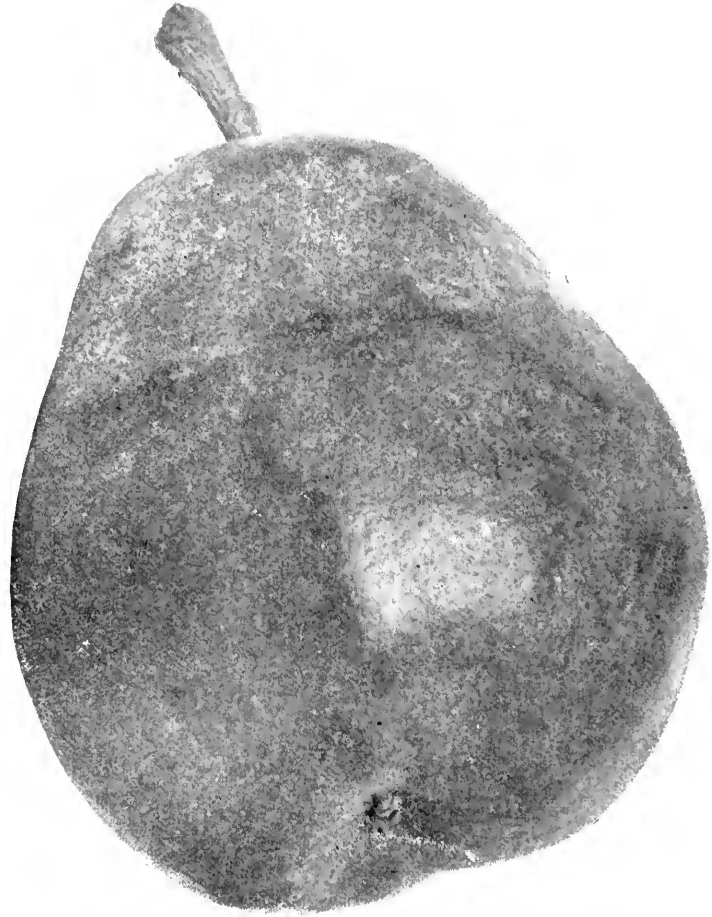
QUALITY, dessert, very good; cooking, good.

VALUE, very good for either home or foreign market.

ADAPTATION. Hardy in southern Ontario, but only half hardy in Grey and Bruce, York, etc.



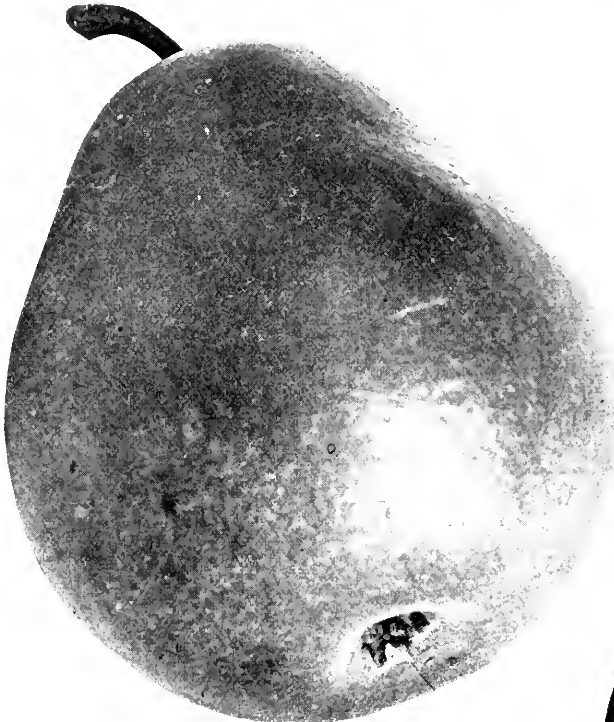
SECTION OF DUCHESS.



DUCHESS.

FLEMISH BEAUTY.

(Fondante des Bois of "LeRoy.")



A variety that has been a great favorite in Europe ever since the beginning of the eighteenth century, as is evidenced by the thirty-five synonyms which have been given it as shown in "Dictionaire de Pomologie par Andre LeRoy." This and the Bartlett were among the first imported varieties of pears planted in Ontario, and it has been widely tested. In the northern sections, where it succeeds, it is a most popular variety, but in southern Ontario it has been of late so subject to scab and cracking of the fruit, that it has lost favor with growers, notwithstanding its excellent quality.

Origin, discovered by Van-Mons about the year 1810 in Eastern Flanders, and distributed among his friends.

Tree, first class in hardiness; almost first in productiveness; an early bearer.

Flemish Beauty.

Fruit, large often measuring $3\frac{3}{4}$ long by $3\frac{1}{4}$ inches broad, averaging about 3 inches either diameter; form, obovate, obtuse pyriform; skin, light yellow when ripe, with frequent patches of brownish red on sunny side, with scattered minute dots; stalk 1 inch to $1\frac{1}{2}$ inches long, set in a narrow, deep cavity; calyx open, segments short, in a small round basin.

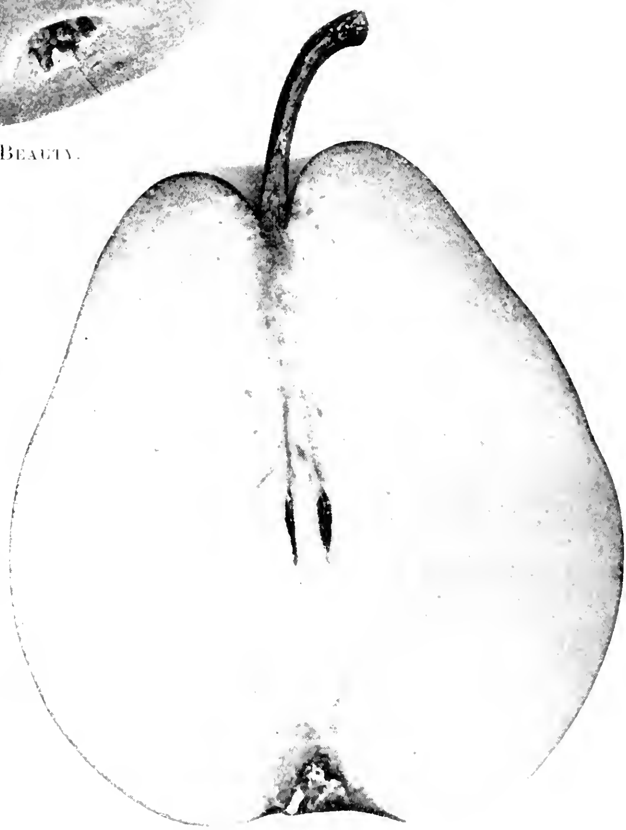
Flesh, creamy white, melting, buttery, juicy; flavor, rich, sugary, delicious.

Season, September 15 to 30. Should be gathered before quite ripe or it will drop and waste.

Quality, first class.

Value, first class where well grown, but counted second class on account of its being subject to fungus.

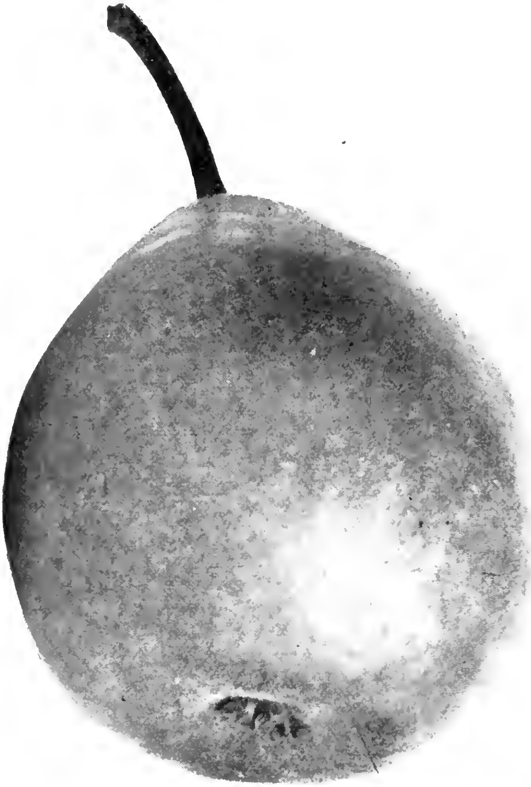
Adaptation. Quite general; fine samples are grown at our Georgian Bay station and at our St. Lawrence station.



Section of Flemish Beauty.

HOWELL.

One of the best market pears of its season for southern Ontario, especially where grown on a standard. Its vigor of tree, regularity of bearing, clear skin, and good size and quality make it a desirable variety for the commercial orchard.



HOWELL.

ORIGIN, New Haven, Conn. Named after the originator, Thomas Howell.

TREE, upright, healthy and vigorous, an early bearer, productive.

FRUIT, large, obovate pyriform; skin, yellowish green, waxen, reddish dots on sunny side, russet dots in shade; stem one and three-quarter inches long; no cavity, sometimes lipped; calyx partly open in a deep russeted basin; core small; seeds few, small.

SECTION OF HOWELL.

FLESH, creamy white, juicy, melting, granular near the core; flavor agreeable, vinous; a little tart.

SEASON, middle September to middle of October.

Tested twenty-five years at Maplehurst, Grimsby.

KIEFFER.

There is perhaps no pear about which a greater diversity of opinion exists; some fruit men condemning it because of its lack of quality, and others insisting that its beauty of appearance, its enormous productiveness, and its wonderful health and vigor of tree make it a profitable market variety, and that when properly grown and ripened it is quite a desirable kind, especially for cooking. Certainly the tree surpasses every variety in our collection for productiveness and vigor of growth; while the fruit is always uniformly perfect in form, free from blemishes, and, when the tree is cultivated and manured, large in size.

Kieffer Pear—Exterior.

Origin, by Peter Kieffer, Roxbury, Pa., a seedling of Chinese Sand pear.

Tree, wonderfully vigorous and healthy; an early and extraordinary bearer, often being laden with fruit after two years planting.

Fruit, medium to large, averaging about 3 x $2\frac{1}{2}$ inches; form, ovate, tapering at both ends, widest at middle, and narrowest toward stem: skin, light golden yellow, with bright cheek, and very numerous brown russet dots; stalk, one inch long, fairly stout, in a one-sided cavity; calyx, half open, in a medium sized irregular basin.

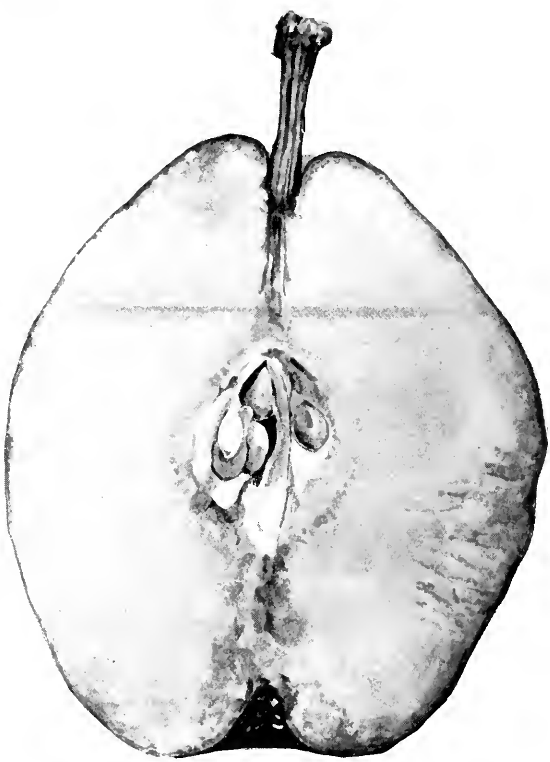
Flesh, yellowish white, half tender, half melting, not very fine, juicy: flavor, moderately sweet, poor.

Season, October, November and December to January.

Quality, dessert, very poor; for cooking good; valuable for canning.

Value, second rate for all markets.

Adaptation, very hardy.



Kieffer Pear—Section.

PETITE MARGUERITE.

Among the desirable varieties of dessert pears for the home garden we would certainly include the Petite Marguerite, a pear of the highest quality for table use. At Maplehurst the tree has proved itself an abundant bearer and a good grower. The fruit is not large, but as size is not an object in a dessert pear, this is not a fault. Its season is immediately after the Giffard and just before the Clapp and the Tyson. As a market pear it is hardly to be commended, because of its small size and color ; and it will be a long time before we can convince the average dealer that size and color are not the chief considerations in a fruit.

(Section reduced.)

PETITE MARGUERITE (reduced).

ORIGIN, Angers, France, in nurseries of Andre LeRoy.

TREE, second rate in vigor, and first rate in productiveness : succeeds as either standard or dwarf, but more vigorous as a standard.

FRUIT, medium size, about $2\frac{3}{8}$ in either diameter ; form, oblate, obtuse pyriform ; skin, light green, often tinged and mottled with bright red on sunny side, yellowing somewhat at maturity ; stalk, $1\frac{1}{4}$ inches to $1\frac{1}{2}$ inches in length, set in a narrow cavity, of which one side is often much higher than the other : calyx, partly open, in a shallow corrugated basin.

FLESH, white, yellowish at core ; texture, fine, melting, juicy ; flavor, sweet, vinous, agreeable.

SEASON, August 20 to 30.

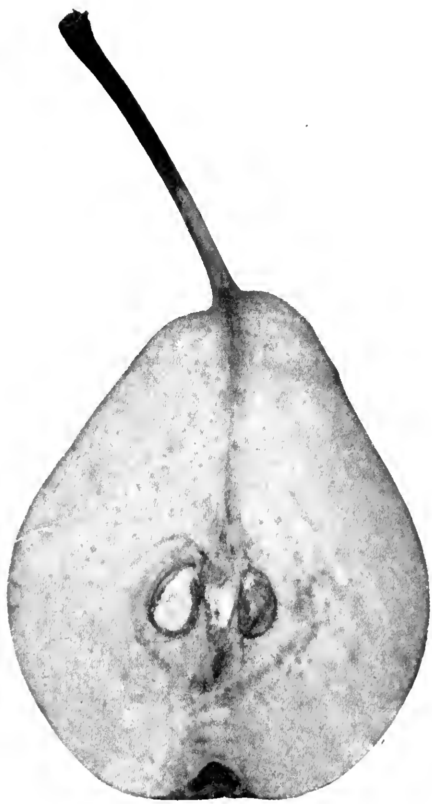
QUALITY, first rate for dessert, good for cooking.

VALUE, home market, second rate.

ROSTIEZER.

A small unattractive looking pear, of very high quality. It is the best of its season in quality for dessert purposes, and should have a place in the home garden. What the Seckel is in October, this pear is in August. Packed in small packages and labelled "extra quality dessert pears," the writer was able to sell them at a fancy price, but usually the pear sells far below its value on account of its ordinary appearance.

ROSTIEZER



SECTION OF ROSTIEZER.

ORIGIN, foreign

TREE, healthy, vigorous, sprawling habits, shoots few, and need shortening in.

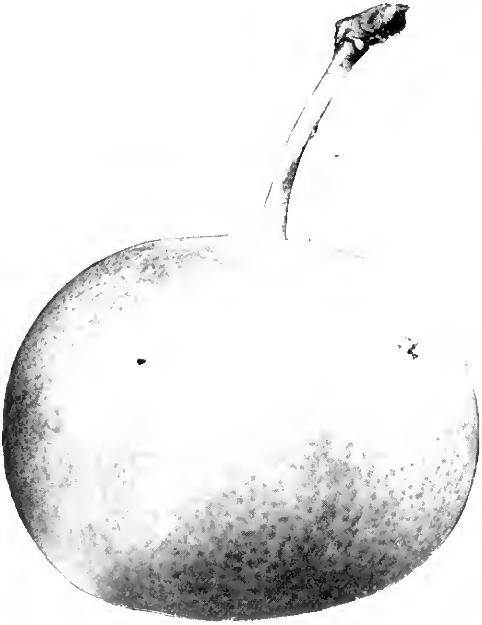
FRUIT, small to medium, obovate, oblong pyriform ; skin, green, sometimes turning yellowish, with reddish-brown cheek ; stem slender and nearly two inches in length ; calyx open ; basin small.

FLESH, juicy, melting, sweet, very delicious, of very finest quality.

SEASON, middle to end of August.

TESTED twenty years at Maplehurst.

SAPIEGANKA.



SAPIEGANKA.

A Russian pear of fine appearance, scions of which were sent out to the Secretary of the Ontario Fruit Growers' Association in 1892, by Mr. Jaroslav Niemetz, of Winnitza, Podolie, Russia. It fruited at Grimsby in 1895 and 1896, ripening August 12th to 20th. Its fine appearance is in its favour, but its quality is inferior to other varieties of its seasrn, and, unless it should prove desirable on account of its hardiness, would not be worthy of general cultivation. Mr. Niemetz says, "In its home in Lithuania, old and large trees are met with which have endured many and severe winters in the Tamboff Government, it is the most hardy of all pears there grown, and, therefore, is certainly a hardy variety. The flavor of the flesh depends upon local conditions, for, though it is tasteful enough in the warmer districts, it is sometimes harsh; when grown in the north is juicy and buttery." Unfortunately the tree is subjeet to blight.

TREE, hardy, productive but subject to blight.

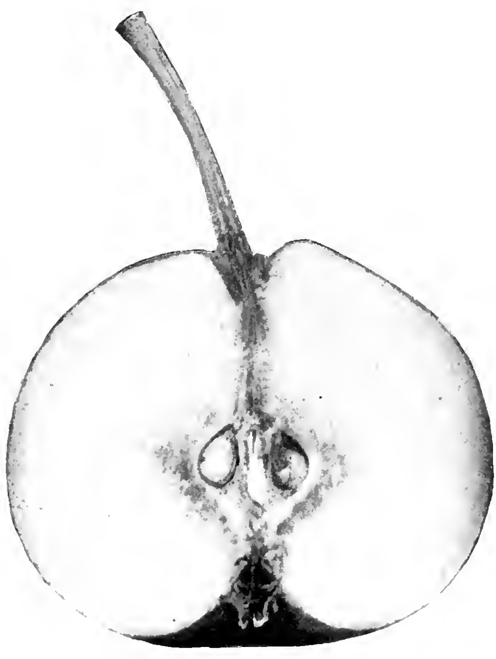
FRUIT, medium size, oblate, often somewhat flattened; color, brownish yellow, with brownish red in sun, with numerous small dots; stem, long in small cavity; calyx, sergments large, partly open in a broad, wrinkled base.

FLESH, white texture coarse, somewhat firm and juicy; flavor, sweet and agreeable.

SEASON, August 12th to 20th (1896.)

QUALITY, dessert, poor: cooking, poor.
VALUE, home market, fairly good; distant market, poor.

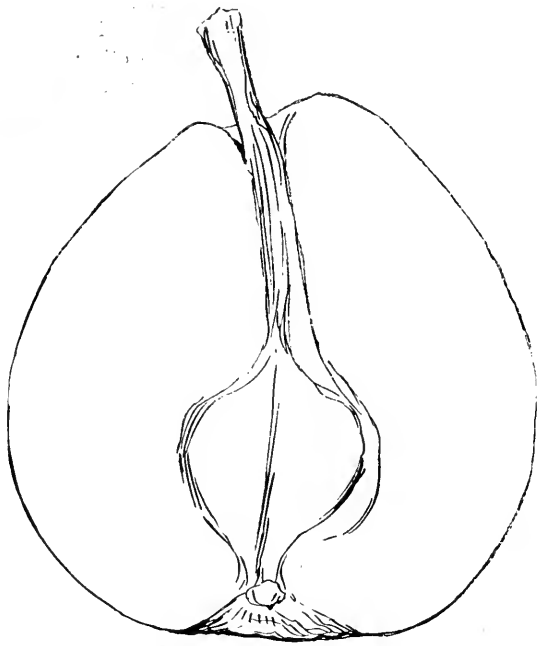
ADAPTATION, succeeds well at Grimsby. Tested by the Dominion Experimental Farm system and found tender in Manitoba and the Northwest, but perfectly hardy at Ottawa and in Muskoka.



SECTION OF SAPIEGANKA.

SHELDON.

One of the most delicious of dessert pears, if eaten just at the proper time. Worthy of a place in every home garden, but not productive enough to be planted for market.



SECTION OF SHELDON.

ORIGIN, accidental on farm of Norman Sheldon of Huron, Wayne Co., N.Y.

TREE, vigorous, erect, not very productive, late coming into bearing.

FRUIT, above medium in size, roundish, obtuse obovate ; skin, yellowish-green, covered with thin light russett, brownish crimson in sun, russet dots ; stalk, short, stout, in a narrow cavity ; calyx nearly open, in a broad basin.

FLESH, creamy, buttery, juicy, sweet, aromatic.

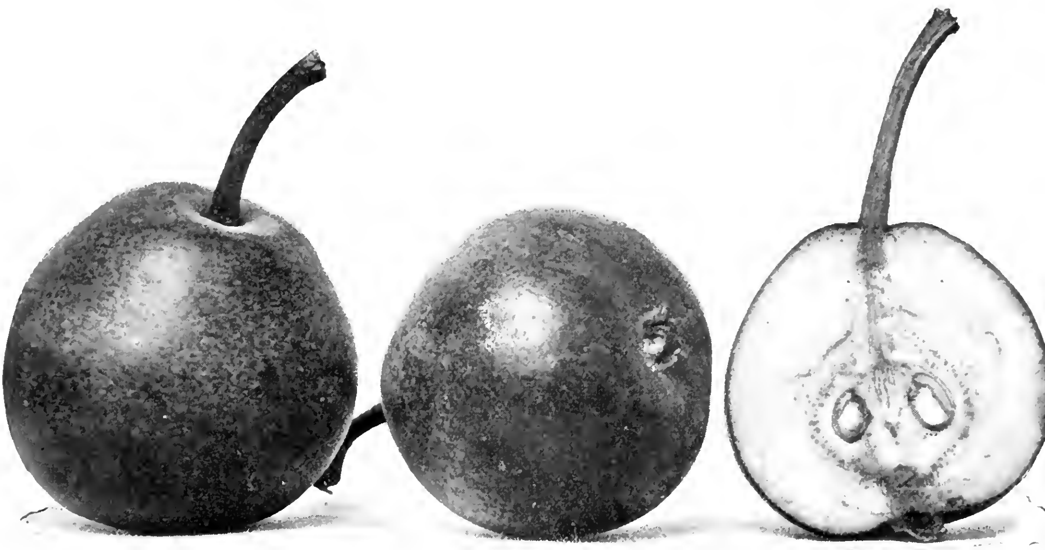
SEASON, October.

Tested twenty years at Maplehurst.

SUMMER DOYENNE.

DOYENNE D'ETE—*Hogg*: DOYENNE DE JUILLET *Le Roy*.

For the home garden this pear is most desirable, not only for its good quality for dessert purposes, but because it has no competitor in the last half of July. It should be gathered before it is mellow to preserve its juiciness, for, if ripened on the tree, it becomes mealy and insipid. Its very small size makes it undesirable in the commercial orchard, especially now that we must compete with larger varieties from California which ripen earlier in that climate than they do with us



ORIGIN, Dr. Van Mons, Professor at Louvain, Belgium, about 1823, at which time he had on his grounds about 2,000 seedlings of merit.

TREE, vigorous young shoots, light yellowish brown, of upright slender habit, an early and abundant bearer; dwarf trees two years planted beginning to fruit; succeeds as dwarf or standard.

FRUIT, small, about $1\frac{3}{4}$x2 inches; form, roundish, obovate; color, green to lemon yellow with brownish red cheek on the sunny side, and numerous grey dots; stalk about an inch long, stout, attached in a very slight depression; calyx, small, half open, in a shallow plaited basin.

FLESH, white; texture, fine, tender, juicy; flavor, sweet and pleasant with slight aroma.

QUALITY, dessert, very good; too small for cooking.

VALUE, too small for a market pear, except in limited quantities.

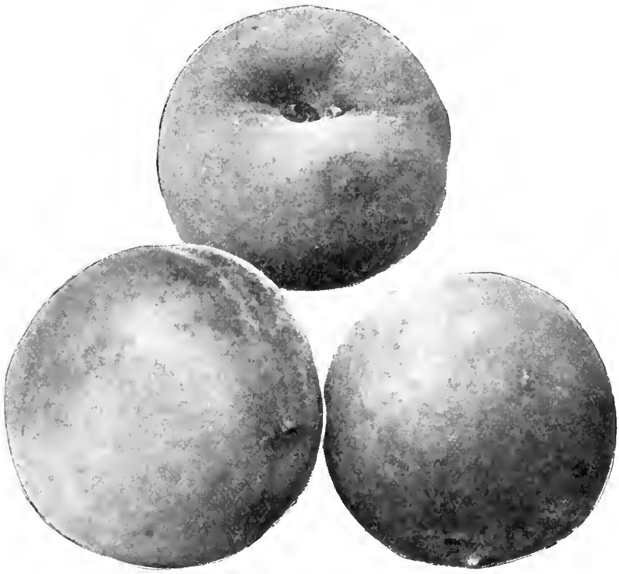
SEASON, 15th to 30th of July.

ADAPTATION, hardy in Southern Ontario; fairly hardy in Bruce and Huron.

PEACHES.

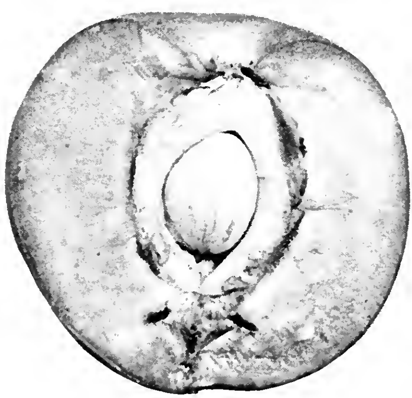
ALEXANDER.

The earliest peach grown in the Niagara district and in Essex county. It is a clingstone, of poor quality for dessert purposes, and poor also for cooking, so that, in competition with yellow-fleshed Elbertas and Crawfords from southern peach orchards, it sells at a low price in our markets.



ALEXANDER (reduced).

ORIGIN, chance seedling, Mount Pulaski, Ill., on farm of A. O. Alexander.
TREE, vigorous, hardy, productive.
FRUIT, medium, globular, sides unequal ; color, greenish, suffused with dark and light red suture, broad ; apex, slightly sunken.

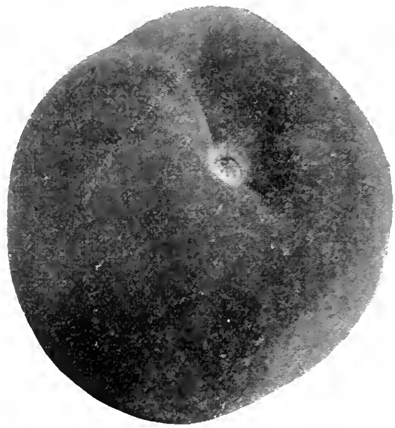


SECTION OF ALEXANDER.

FLESH, greenish white, firm, juicy, half melting, clings to stone ; flavor, sweet and fairly good
SEASON, July 20 to 30 (1896).
QUALITY, dessert, poor ; cooking, poor ; home market, poor ; distant market, very poor.
ADAPTATION. Succeeds at Niagara and Southwestern stations.

EARLY PURPLE.

For home use, as a dessert peach, this is one of the best of its season. Between 1860 and 1870 this variety was grown as the earliest market peach in Southern Ontario, but its extreme tenderness of flesh and rapid softening after maturity led to its giving place to other varieties.



Early Purple (Reduced).

TREE, thrifty, vigorous, hardy, fairly productive.

FRUIT, size 2⅛x2 inches; form, irregular, ovate, one-sided; skin, bright red, downy; basin, deep; stone, almost free.

FLESH, greenish white in color; texture, very tender, very juicy, melting; flavor, sweet, rich, very agreeable.

Early Purple (Section reduced).

SEASON, August 25th to September 1st (in 1897).

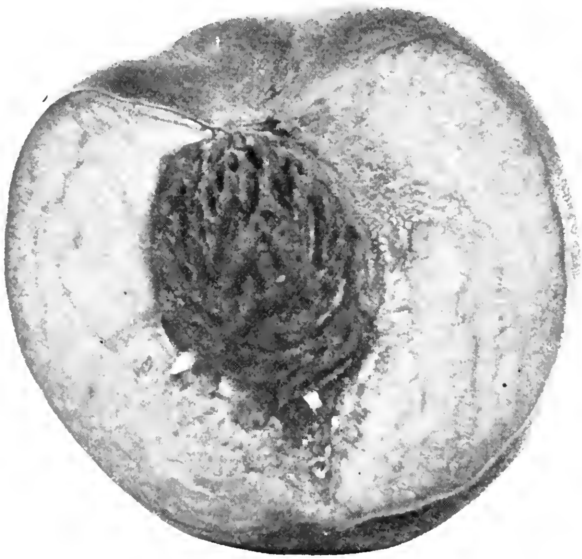
QUALITY, dessert, very good, cooking, poor.

VALUE, near market, third rate; distant market, of no use.

ADAPTATION, Southern Ontario

CRAWFORD'S EARLY.

Crawford's Early has long held its place at the head of the list of peaches both for home use and for market. Its beautiful golden color, its large size, its free stone and rich flavor all unite in giving it a just claim to this position. Its buds are a little more tender than those of some other varieties, and, consequently, many growers hesitate to plant it, but where high cultivation and plenty of fertilizer is given, fine crops of luscious fruit have resulted.



SECTION CRAWFORD'S EARLY.

ORIGIN, Middleton, N.J., by Wm. Crawford.

TREE, vigorous, productive under favorable conditions.

FRUIT, large to very large, oblong ; suture, shallow ; apex, prominent, swollen : color, golden yellow, with rich red cheek.

FLESH, yellow, sweet, rich, free from stone which often parts in middle when nearly ripe.

SEASON, September 1st to 12th (1897).

QUALITY, dessert and cooking, very good ; market value, best.

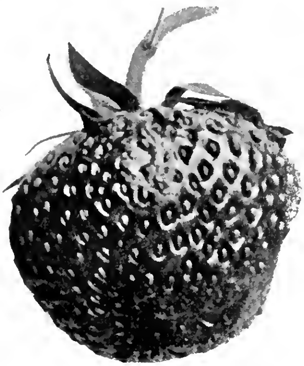
ADAPTATION, Niagara district and parts of Essex county.

STRAWBERRIES.

ANNIE LAURIE.

(Perfect blossom.)

This is a very late variety, also one of the best quality. It may be taken as a standard for quality and flavor. A fine one for amateurs to pet.



Annie Laurie.

Origin, a seedling grown by John F. Beaver, of Ohio, in 1889.

Plant, is very healthy and good grower, making plenty of runners for a fruiting row. No rust ; moderately productive.

Fruit, berries are large and round, like the Jersey Queen, with gold seeds prominent. A very bright glossy scarlet, making fine appearance.

Flesh, pinkish white, of the very finest quality ; a fine table variety.

Season, late.

Adaptation, does better in some soils than others.

S.

AROMA.

(Perfect blossom.)

The Aroma is a good late one, taking the place that the old Gandy occupied. The Aroma is more productive, a good pollenizer for large late pistillates. Wherever grown it is a favorite.

Aroma.

Origin. It was produced from seed of Cumberland by E. W. Cruse, of Kansas.

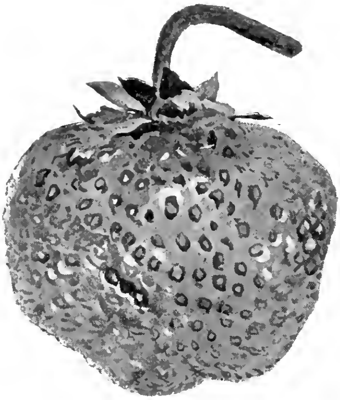
Plant. It is a good vigorous grower, very healthy, no lust, making a good stand of large plants, quite productive.

Fruit, is very large, bright dark red in color, fine looking berry, keeps its size well to the last picking, quite firm.

Flesh, pink, solid, and good quality.

Season, medium to late.

Adaptation, does well in all soils and climates.



Bismarck.

BISMARCK.

(Perfect blossom.)

This is a seedling from Bubach, and in some respects an improvement, in others not as good; its color is not as fine as Bubach. It is a good grower and productive.

Origin. It was grown from seed of Bubach crossed with Van Deman, by J. C. Bauer, Arkansas.

Plant, very healthy, strong, vigorous, resembles Bubach in color of leaf and style of plant; it makes plenty of runners; its foliage is fine: fruit stalk is strong and medium to short; plant quite productive.

Fruit, large to very large, round, resembling Jersey Queen, but more conical; gold seeds very prominent, light scarlet and bright looking; sometimes hollow.

Flesh, pink in color, medium in firmness, good flavor.

Season, medium to late.

Adaptation, good accounts come from all places where it has been tried. S.

BOYNTON.

(Imperfect blossom.)

This variety so closely resembles the old Crescent in its best days that it has been affirmed by some that it is the Crescent under a new name.

Origin, said to be a cross between the Crescent and Sharpless. Comes from Albany, N.Y.

Plant, is a strong, vigorous, and healthy grower, making a wild, matted row; very productive.

Fruit, is medium in size, light scarlet in color, medium in firmness.

Flesh, pink, acid, but fair quality.

Season, early, medium.

Adaptation, does well anywhere.

Boynton.

BRANDYWINE.

(Perfect blossom.)

BRANDYWINE.

ORIGIN, originated in Pennsylvania, from seed of Glendale, crossed with Cumberland, grown by E. Ingram. It was introduced to the public by Mathew Crawford, of Cuyahoga Falls, Ohio, in 1894. It is a fine variety, it's only fault is, it is not as productive as we would like.

PLANT, one of the most vigorous growers, making a wide matted row if allowed to do so, in fact it makes too many plants for its own good.

FRUIT, is large, heart-shaped, fine dark scarlet in color, golden seeds quite firm.

FLESH, red, tartish, but very good quality.

SEASON, medium to late.

ADAPTATION. It does well in most soils S.

BUBACH.

(Imperfect blossom.)

This is a grand stand-by and is very widely grown, is one of the largest and finest of them all. Plant is all that could be desired for fruit. Strong, deep rooted and healthy, one of the best for near-by market.

ORIGIN, it was grown by Mr. Bubach, of Illinois.

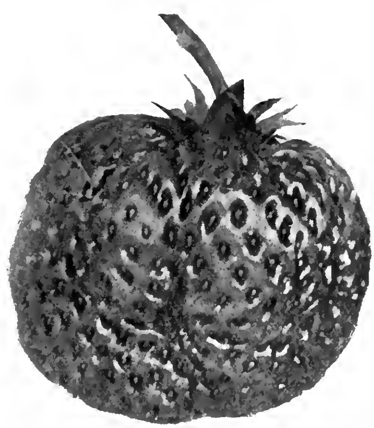
PLANT, the plant is a strong and deep-rooted one, dark red foliage; no sign of disease of any kind; makes plants enough for a good fruiting row: fruit stem is short, strong and firm, productive and profitable.

FRUIT, is wonderful for its size and color; the berry is bright and showy.

FLESH, pink; medium in firmness and good quality.

SEASON, medium.

ADAPTATION. It does well in all soils. S.



BUBACH.

CARRIE.

(Imperfect blossom.)

The Carrie would appear to have a bright future before it. It is one of the late sorts bidding for public favor. It is a good one.

CARRIE.

ORIGINATED from seed of Haverland, by Mr. Thompson, of Virginia.

PLANT, is large, vigorous and healthy, making long and strong runners and plenty of them: it somewhat resembles Haverland: not as productive.

FRUIT, the fruit is not so long as Haverland, very firm, almost as firm as an apple; the color, bright scarlet, with gold seeds.

FLESH, white and solid, good flavor.

SEASON, medium.

ADAPTATION. Has done well wherever tried. S.

CLYDE.

(Perfect blossom.)

Originated in Kansas, from seed of the Cyclone, about 1890, by Dr. Stayner, the Cyclone being produced from Crescent crossed with Cumberland. Thus we find out where the Clyde gets its great hardiness and productiveness, viz., from the Crescent. The first berries are as large as the Bubach and very productive. It grows very much like its parent Cyclone, also like the Haverland, but more vigorous than either. It has secured for itself very quickly a place among the standards, if it does not stand first, which place many are claiming for it.

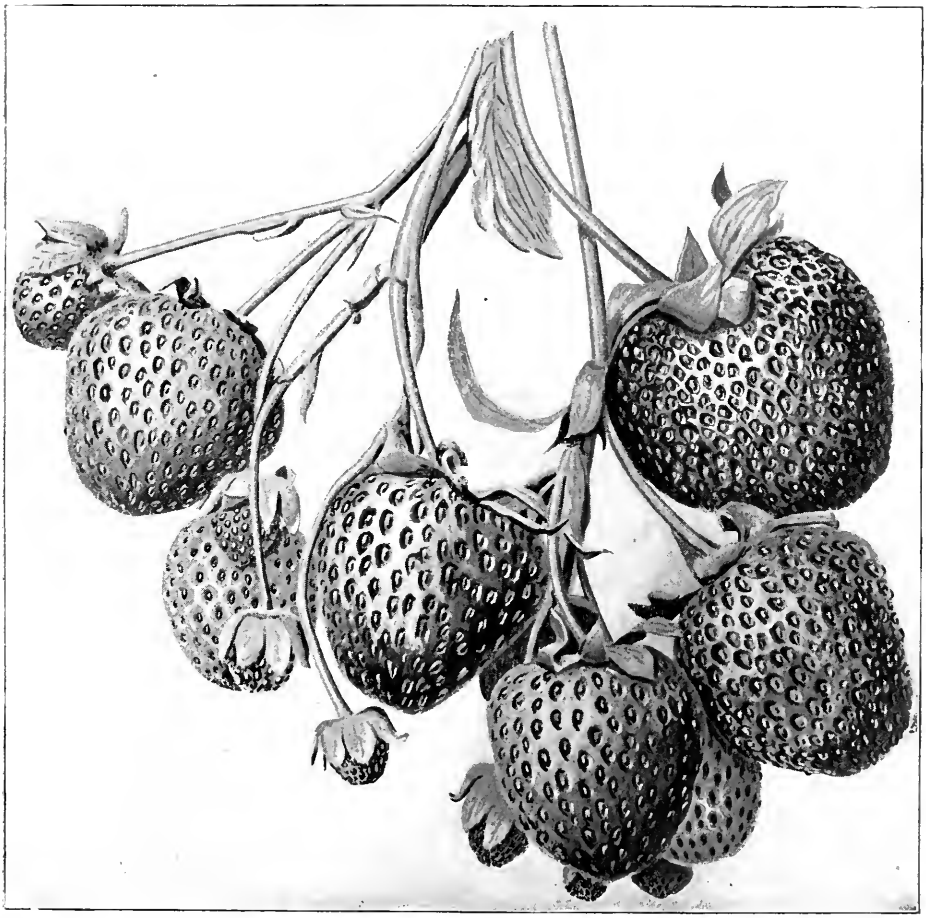
PLANT, a strong and vigorous grower. Perfect in every respect. No rust or trace of disease. Its fruit stalk is just the right length and strong enough to hold up the great load of fruit. In color, light, like Haverland. Strong, and has many runners that take root easily.

FRUIT, very large, as large as Bubach, roundly conical, bright dark scarlet in color, and very firm.

FLESH, pinkish white, fine eating, very pleasant to the taste, quality first-class.

SEASON, second early.

ADAPTATION. Does well everywhere and in all soils. S.

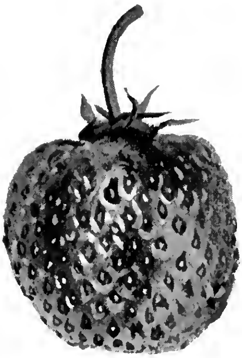


CLYDE.

ELEANOR.

(Perfect blossom.)

The Eleanor is one of the extra early ones ; a good healthy vigorous grower ; fruit, good size, fine shape ; in wet seasons it has a kind of mildew like on the Michel's.



ELEANOR.

ORIGINATED in New Jersey, a chance seedling found by Mr Coombe ; a good market berry.

PLANT, very healthy, vigorous grower, small and slender, dark in color, making many runners, quite productive.

FRUIT, color, dark scarlet or crimson ; medium in firmness.

FLESH, red, white centre ; acid, but good flavor.

SEASON, one of the earliest.

ADAPTATION, does well in most soils.

S.

GEISLER.

(Perfect blossom.)

This is a very fine variety ; it is new as yet, only having been introduced in 1897.

ORIGIN, a chance seedling found in Michigan, somewhat resembling the Seaford in shape and size.

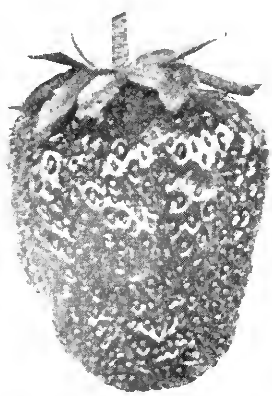
PLANT, it is a very strong plant, making plenty of runners. The plant is very healthy, no sign of rust and quite productive. The plant is a very early bloomer, one of the first.

FRUIT, is large, bright dark scarlet, round to oblong in shape, berry is solid.

FLESH, light pink in color, medium in firmness and of good quality.

SEASON, early to medium.

ADAPTATION, seems well adapted for most localities. S.



GEISLER.

GLEN MARY.

(Perfect blossom.)

This is a variety of great promise, it is one of the newer sorts. No doubt it will take a place among the standards on account of its size and productiveness.

Glen Mary.

Origin, a chance seedling found by J. A. Ingram of Pennsylvania.

Plant, a very large, strong, vigorous grower, making plants freely. No sign of any disease on it. Dark, rich foliage. An ideal plant. Fruit stem, medium in length, strong enough to hold up the very large berries. Very productive.

Fruit, very large—the largest, dark crimson in color, ribbed like the Marshall, a hard, green seedy end that does not ripen well.

Flesh, pink to white, fair quality, inclined to acid.

Season, medium to late.

Adaptation, it has done well wherever tried. S.

GRENVILLE.

(Imperfect blossom.)

The Grenville is one of the best of the Pistillate or imperfect blooming kinds; in some respects it is an improvement on the Bubach. It is a healthy, vigorous grower and quite productive, making it a good market sort.

Origin, it is a chance seedling found in Ohio by Mr. Beuchly.

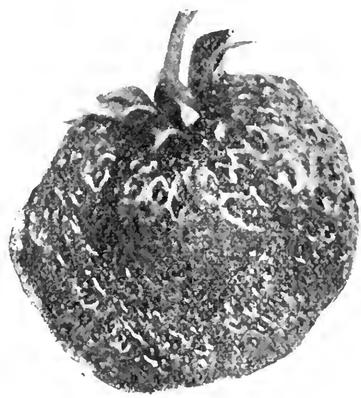
Plant, very heavy and vigorous grower, making plants freely, very productive.

Fruit, dark scarlet in color, large in size, heart shaped, medium in firmness and fine looking.

Flesh, pink to white, somewhat hollow, good quality.

Season, medium.

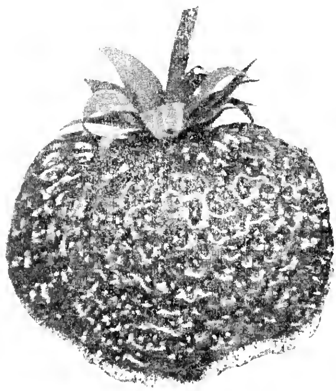
Adaptation, does well in all soils. S.



Grenville.

HALL'S FAVORITE.

(Perfect blossom.)



HALL'S FAVORITE.

When this variety was introduced it was claimed that it was as large as Bubach. It has not proved to be so. It is a fine, large berry.

ORIGIN, a chance seedling found by J. W. Hall, of Marion Station, Md.

PLANT, the plant is a good grower, healthy, vigorous, no rust, and makes plenty of plants ; medium in productiveness.

FRUIT, is large, not so large as Bubach, is firm, scarlet in color, the berry is solid.

FLESH, is a light scarlet, good quality.

SEASON, it is a medium season.

ADAPTATION. Does well wherever tried.

HAVERLAND.

(Imperfect blossom.)

Originated in Ohio by Mr. Haverland. Parentage unknown. Widely planted, and is one of the most productive. Its only fault is that in a wet season the fruit is somewhat soft. On the whole it is somewhat soft.

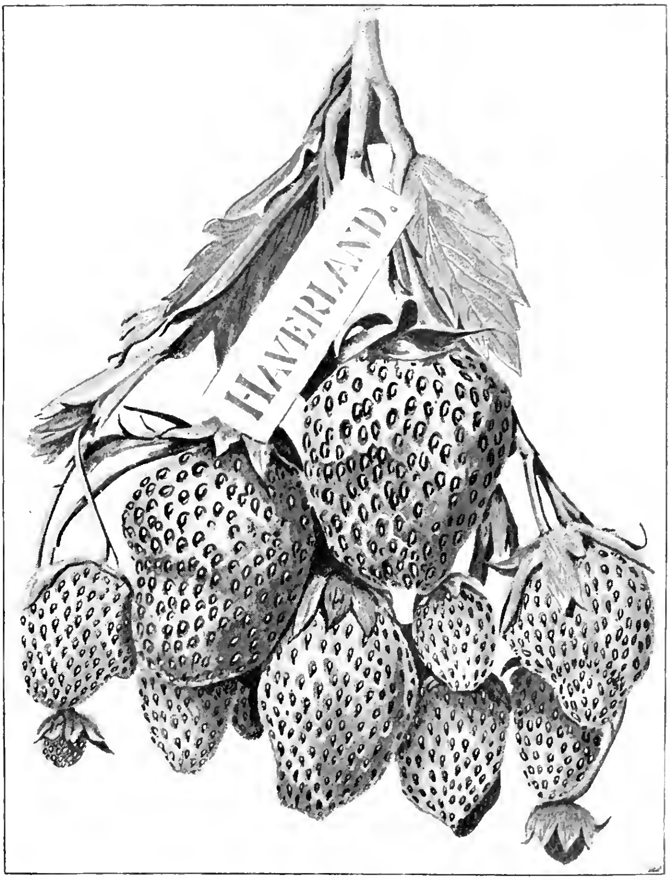
PLANT, very healthy. Vigorous grower, sending out strong runners. Its foliage is magnificent. Fruit stalk is very long and often not able to bear up the immense load of fruit the plant matures. Light in color of leaf.

FRUIT, large to very large, long, bright scarlet, medium in firmness.

FLESH, pinkish, sweet and good quality.

SEASON, it is one of the first to ripen and continues all through the season.

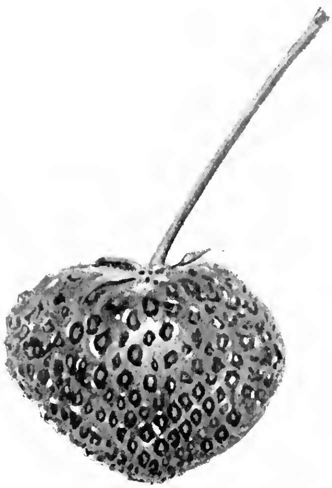
ADAPTATION. It succeeds well everywhere and all soils suit it. S.



HAVERLAND.

JERSEY QUEEN.

(*Imperfect blossom.*)



JERSEY QUEEN.

ORIGIN, unknown. This is one of the best late varieties, frequently being the highest price. The berries are large and fine looking.

PLANT is a good one, very healthy one, no sign of rust ever appearing on it; grows close to the ground, the foliage always fresh and green when well fertilized quite productive.

FRUIT is large, round and very bright scarlet in color with gold seeds, medium in firmness, very attractive in appearance.

FLESH, white to pink, solid and fair quality.

SEASON, late to very late.

ADAPTATION, does well in most soils. S.

LOVETT.

(*Perfect blossom.*)

This is a great favorite in many places; is a standard as a shipper and is thus favored by market growers.

ORIGIN, a seedling of Crescent and Wilson by J. H. Norris, of Kentucky.

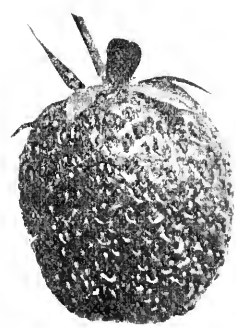
PLANT is a good grower; strong runners; the plant sometimes rusts; is quite productive.

FRUIT is large dark crimson, somewhat irregular; somewhat resembling the Williams, but a better berry than the Williams; a good market berry because it is firm.

FLESH is red, solid, good quality though a little acid.

SEASON, medium.

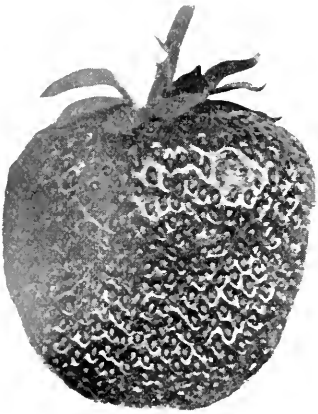
ADAPTATION, it seems to do well in most places. S.



LOVETT.

MARGARET

(Perfect blossom.)



Margaret.

Origin, the Margaret is a good one, will be a standard. It originated in Ohio, was sown from the seed of the Crawford by Mr. Beaver.

Plant, the plant is large and strong, sending out the largest runners of any sort, plant is very healthy and quite productive.

Fruit is large, very regular, crimson in color, seeds golden, solid and firm.

Flesh, red, inclined to tartness but good quality.

Season, medium.

Adaptation, will suit most soils. S.

MARSHALL.

(Perfect blossom.)

This variety has perhaps received more favorable notice than most others of recent introduction. It is vigorous in growth, leaves very large and produces a quantity of very large, beautiful, dark crimson berries of fine quality.

Origin, it is a chance seedling found growing on a stone heap by Mr. Ewell, of Massachusetts.

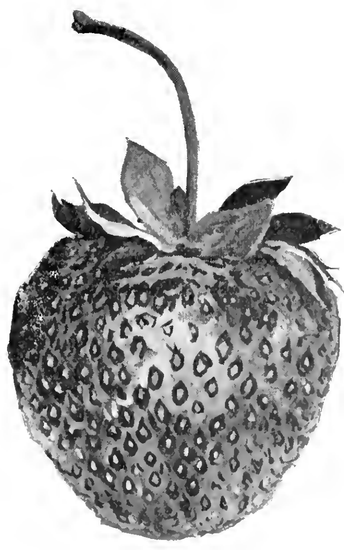
Plant, a vigorous grower, large leaves, somewhat tender both in foliage and blossom and subject to rust, medium in color, first growth being yellow, fruit stem strong and able to bear up the immense berries, medium in production.

Fruit, is of the largest size, dark crimson, firm and fine looking, quite regular in shape, *i.e.*, each berry is of same shape, but ribbed and tough seeds imbedded.

Flesh, red, with dash of white in centre, solid, fine quality, one of the best for dessert.

Season, early to medium.

Adaptation, only does its best in some soils and under highest cultivation; a fine one for amateurs. S.



Marshall.

MICHEL'S EARLY.

(Perfect blossom.)

MICHEL'S EARLY.

This has been grown over a very wide extent of territory, but in many places it has been a failure.

ORIGIN, chance seedling, thought to be from Crescent, by J. G. Michel, of Judsonia, Ark.

PLANT, a very vigorous grower, making too many plants; a rampant grower; sometimes in some soils very little fruit is set, in some soils it is fairly productive.

FRUIT, is medium in size to small; dull reddish color; has a withered appearance; quality is good, the berry is tough and leashery and so carries well.

FLESH, is pink, the quality is good, medium in firmness.

SEASON, extra early.

ADAPTATION, does well only in some places and on some soils. S.

MASTODON.

(Imperfect blossom.)

This is very like Bubach both in plant and fruit, it is a good one, quite as good as Bubach. The plant is large and stony.

ORIGIN, it is also called Salzer's Late Mastodon, introduced by James Lippincott, Jr., Mount Holly, N.J.

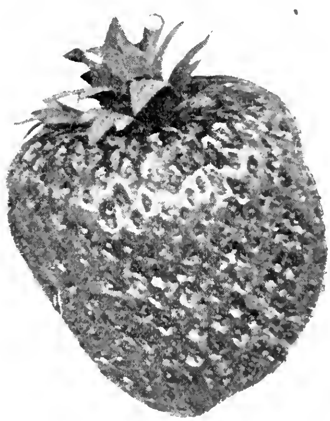
PLANT, the plant is strong, large dark foliage; very healthy; makes plants freely enough for a good fruiting row; fruit stalk is short and thick and strong.

FRUIT, the cherry is very large and bright crimson and very showy.

FLESH, is pink, medium as to firmness and good quality.

SEASON, medium.

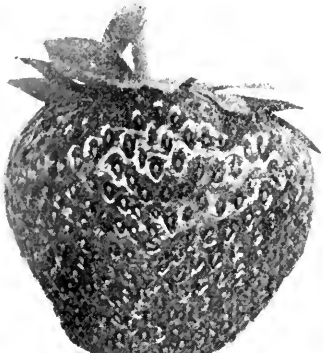
ADAPTATION, suited for all soils. S.



MASTODON.

NICK OHMER.

(Perfect blossom.)



NICK OHMER.

This is one of the best of all varieties lately introduced: it promises to be a standard.

ORIGIN, a seedling of Widdifield by John F. Beaver, of Ohio.

PLANT, is a strong and stocky grower, sending out plenty of strong runners that root easily; very healthy; dark foliage.

FRUIT, is large; bright crimson in color with gold seeds; fine in appearance; smooth and regular in shape.

FLESH, is pink at outside and white in centre; solid and very firm and of best quality.

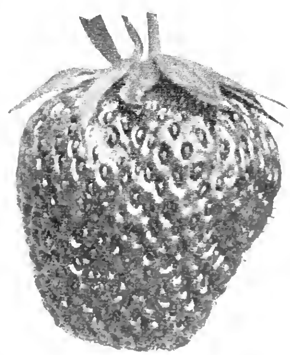
SEASON, medium to late.

ADAPTATION, it seems to do well in most localities. S.

RUBY.

(Perfect blossom.)

This gives promise of taking a first place in many places, it has been an improvement on the Bubach.



RUBY.

ORIGIN, this sort is thought to be a seedling of Crescent and Sharpless by Mr. Riehl, of Illinois.

PLANT, is a strong vigorous grower; under some conditions it rusts some but it makes plenty of plants and productive.

FRUIT, is large and plenty of it; crimson in color; quite regular in shape.

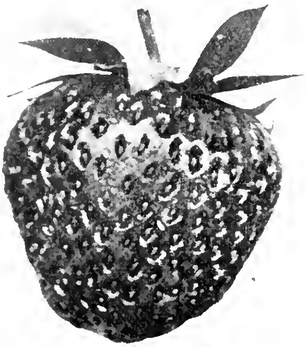
FLESH, is red in color, firm and best quality.

SEASON, mid-season.

ADAPTATION, good reports come of it from many places. S.

RIDGEWAY.

(*Blossom perfect and large.*)



RIDGEWAY.

The Ridgeway is a good medium. It somewhat resembles the old Cumberland, it is darker.

ORIGIN, a seedling of Jersey Queen and Parker Earl, by Mr. Ridgeway, of Indiana.

PLANT, strong and healthy, stools out, would be a good one for hills or narrow rows, foliage free from rust, is quite productive.

FRUIT, the fruit is medium to large, highest scarlet color, prominent golden seeds, fine looking berry, medium in firmness.

FLESH, the flesh is red, solid and very good quality, fine flavored.

SEASON, mid-season.

ADAPTATION. Good reports of it come from wherever it has been tried. S.

SAUNDERS.

(*Perfect blossom.*)

This is one of the best market sorts, producing a good crop of large fine looking berries. The better it is known the more it is grown, taking the place of the old Wilson.

ORIGIN, it was originated by John Little of Ontario.

PLANT, is a vigorous grower, making many plants and healthy. Sometimes a little rust appears when grown under unfavorable conditions. Quite productive, blooms late, thus often escapes spring frosts.

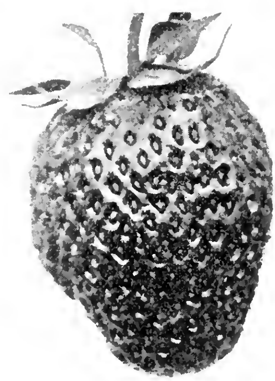
FRUIT, is large to very large and firm; color, bright crimson.

FLESH, red, firm, and very good quality, fine for table.

SEASON, medium to late.

ADAPTATION. Has done well wherever it has been tried.

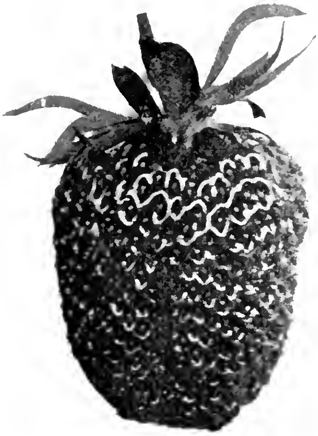
S



SAUNDERS.

SEAFORD.

(*Perfect blossom.*)



SEAFORD.

The Seaford is a very good, medium season berry, one of the best. It is very productive, of large, bright, fine looking and better tasting berries.

ORIGIN, a chance seedling, and introduçed by Slaymaker & Son, of Dover, Del.

PLANT, the plant is strong, vigorous grower and healthy, producing large clusters of fine fruit. It is also a good runner, making many plants, very productive.

FRUIT, is large and fine looking, bright crimson, with gold seeds imbedded. The berry is very solid and firm.

FLESH, is scarlet in color, very firm and of very good quality.

SEASON, early to medium.

ADAPTATION. It seems to do very well on all soils, it has been tried over a wide extent of territory. S.

SHARPLESS.

(*Perfect blossom.*)

The Sharpless has been before the public for a long time. In some parts it is still told to be one of the best, but in other places it is not productive enough to make it profitable for market.

ORIGIN, it was grown by Mr. Sharpless.

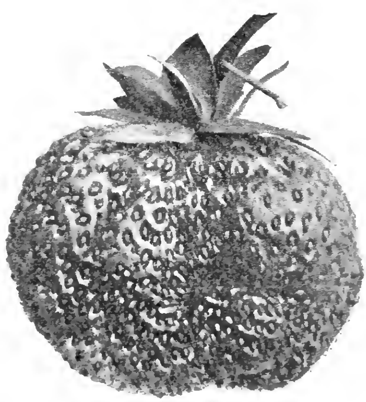
PLANT, a strong, vigorous grower, plant large and healthy, no rust, quite productive on some soils.

FRUIT, is very large, light scarlet in color, glossy, gold seeds prominent, does not color well.

FLESH, white to pink, firm and very best quality, fine for the table.

SEASON, medium.

ADAPTATION. Does very well in some places. S.



SHARPLESS.

SUNRISE.

(Perfect blossom.)

SUNRISE.

There are other kinds that are more profitable than this to grow. It does very well in some places.

ORIGIN, a seedling of Crescent and Sharpless from Massachusetts.

PLANT, is quite a vigorous grower, making a good row, quite healthy, medium in productiveness.

FRUIT, is scarlet, roundly conical, gold seeds, berry solid and of good size.

FLESH, is white, medium to soft, acid and fair quality.

SEASON, medium to late.

ADAPTATION. Does well in some places, not in all. S.

STAPLES.

(Perfect blossom.)

This is one of the extra early kinds that will make it profitable for market, having a perfect blossom. It is a good color and quite firm and good quality.

Originated from seed of the Warfield by the late Mr. Staples of Ohio.

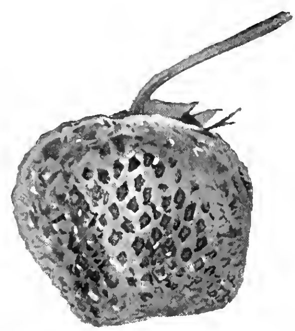
PLANT, quite healthy, making plenty of runners for a wide row, if needed, quite vigorous in growth, a good early staminate to fertilize early Pistillates with.

FRUIT, dark crimson in color, firm and good flavor. Color very like Warfield. Size, medium to large; large for so early a berry.

FLESH, pink and solid, good flavor, somewhat acid yet spicy.

SEASON, extra early.

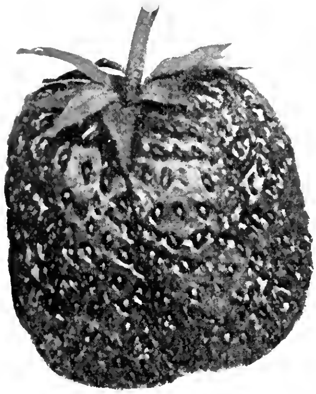
ADAPTATION. It seems to do well in most places. S.



STAPLES

TENNESSEE PROLIFIC.

(*Perfect blossom.*)



TENNESSEE PROLIFIC.

This has a fine record, has become a standard wherever grown.

ORIGIN, a seedling of Crescent and Sharpless; grown by Capt. J. C. Hodges, of East Tennessee.

PLANT, is a vigorous, healthy grower, making many strong runners, very productive, an early bloomer.

FRUIT, is a bright crimson, medium to large in size; the berry is sometimes double at the point, but quite firm.

FLESH, is red, very good quality and quite firm.

SEASON, early medium.

ADAPTATION. It does well wherever grown. S.

VAN DEMAN.

(*Perfect blossom.*)

This is one of the earliest; seems to do better in some places than others, some growers having discarded it while others look upon it as the best early.

ORIGIN, it comes from Arkansas, having been originated by J. C. Bauer, of Judsonia, Ark., from seed of Crescent crossed with Capt. Jack.

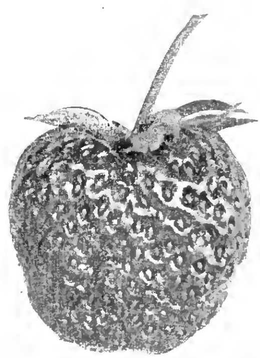
PLANT, is a vigorous grower, rusting somewhat in some soils; fruit stalk is medium strong, able to hold up fruit; dark in foliage; quite productive, not a heavy picking at any one time but continuing through the season.

FRUIT, bright crimson in color, gold seeds; very attractive, conical; ripens and colors all over at the same time, best extra early for this.

FLESH, pink, very firm and very best quality.

SEASON, ripen with the first and continues to mid season.

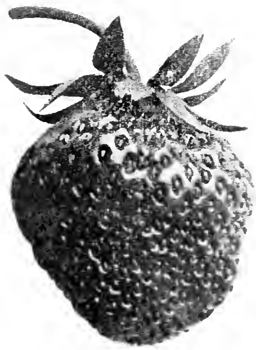
ADAPTATION. Does better in some soils than others. S.



VAN DEMAN.

WARFIELD.

(Imperfect Blossom.)



WARFIELD.

This variety has been a great favorite in many places. Nothing else was thought by some to be as good for a market crop. Where there is plenty of moisture it does well.

ORIGIN. Supposed to be a cross of Crescent and Wilson found growing wild by B. C. Warfield of S. Ill.

PLANT, is a vigorous grower; in some seasons it rusts somewhat; the plant cannot stand hot, dry weather; does not mature its crop; it is very productive, one of the most productive of all the varieties.

FRUIT, is dark crimson, very firm, medium to large in size, regular in shape, a good shipper.

FLESH is red, firm and good quality though somewhat acid.

SEASON, early medium.

ADAPTATION. Does well in all soils. S.

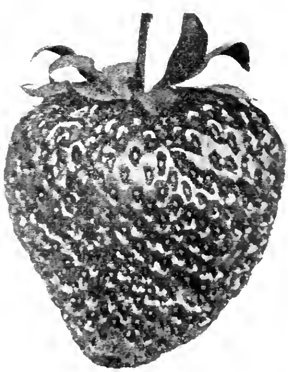
WM. BELT.

(Perfect Blossom.)

WM. BELT.

ORIGIN, this berry comes from Ohio, having been originated by Wm. Belt, of that State. It is being grown largely as a fancy berry; large conical berry, the first berry being sometimes very large and very irregular.

PLANT, the plant is large and strong one, but rusts sometimes very badly; is quite productive.



WM. BELT.

FRUIT, large to very large, conical; bright scarlet in color, medium in firmness.

FLESH, pink slashed with white, nice mild flavor, fair quality.

SEASON, medium to late.

ADAPTATION. Seems to do well in many different soils thus well suited for all sections. S.

WILLIAMS.

(Perfect Blossom.)

WILLIAMS

This is a great favorite, in some localities prefer it to all others; it has some serious faults.

ORIGIN, a seedling from Sharpless, of Canadian origin, by Mr. Williams of Burford, Ont.

PLANT, is a vigorous grower, runners abundant, short, thus placing plants close together, rusts badly in some places; is quite productive.

FRUIT, is large, crimson, seeds imbedded, does not color well at the point, having white tip, berry firm.

FLESH, red, fair quality; the berry sometimes hollow.

SEASON, Medium to late.

ADAPTATION, seems to do well in moist soils, especially when it does not rust.

S.

WOOLVERTON.

(Perfect Blossom.)

Originated in Ontario by John Little, of Granton, about 1889, and sent out by him, it is now widely known as one of the best, not perhaps as productive as some, but the fruit is of the largest size and quite firm.

PLANT, a strong healthy grower; plant is large and deep rooted; dark in color; makes runners freely and root easily.

FRUIT, very large, as large as Bubach; crimson red seeds; flesh, red and solid.

FLESH, red, milk flavor, no acid.

SEASON, late.

ADAPTATION. It seems to do well everywhere; good accounts of it coming from all quarters.

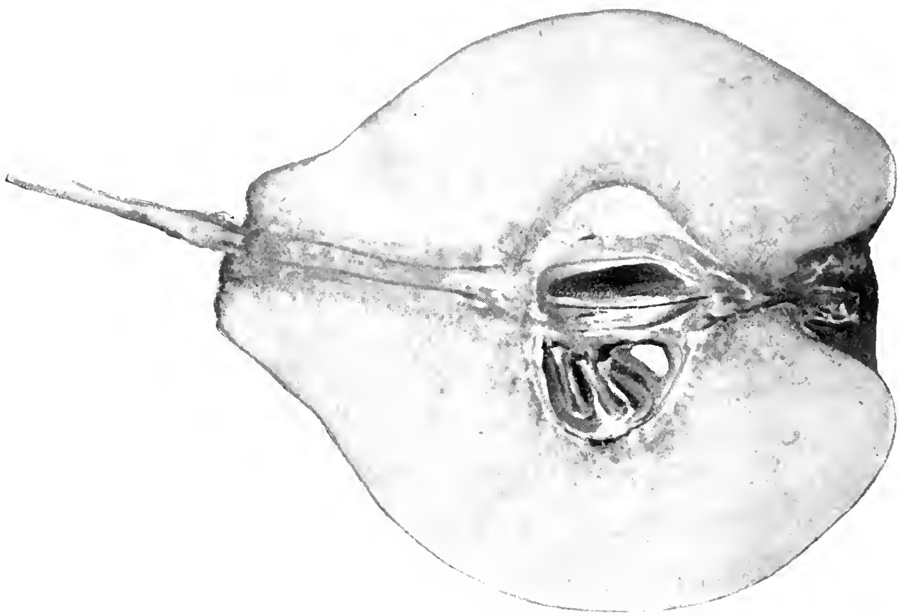
S.

WOOLVERTON.

QUINCES.

ORANGE (OR APPLE.)

The leading market variety of Quince in Canada. Previous to 1870, this and the Angers were the only varieties of quinces known in Ontario, the former as a stock for budding dwarf pears, and the latter as a standard market variety. The Orange quince succeeds admirably in the Niagara peninsula, ripening well, taking on a beautiful rich golden color, and reaching a



fine large size, either on clay or sandy loam. In old days this variety brought $6 or $7 per barrel in Toronto market, but in 1897 twenty-five and thirty cents per twelve quart basket was a common price.

ORIGIN, Southern Europe.

TREE, a slow grower, bushy, seldom attaining a height of more than twelve or fifteen feet ; hardy, will endure neglect but responds well to good cultivation and manure ; delights in moist land, without standing water ; fairly productive.

FRUIT, large and weighing from eight ounces to a pound ; form, somewhat like an apple, but with protuberance about the stem instead of a depression ; skin, golden yellow at maturity, with often a little greenish or russett color about the stem, which is set in a narrow cavity ; calyx large segment, which are leaf like, in a large deep, corrugated basin.

FLESH, tender : flavor good.

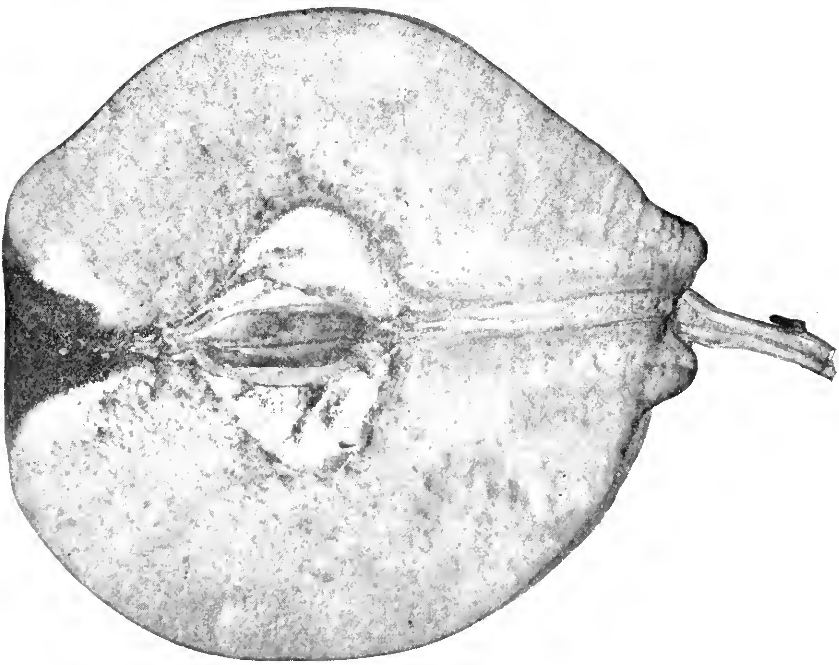
SEASON, October 1st to 15th, sometimes end of September.

VALUE, limited demand in Canadian markets.

CHAMPION.

A variety introduced betwen 1880 and 1890, probably raised from the Orange quince. It grows to a larger size than the Orange, and ripens later. Season about the 20th of October.

This variety usually ripens well in Southern Ontario, but would be too late farther north. Where it succeeds it is of more value for market than the Orange, on account of its large size, and freedom from blemishes. Not yet tested sufficiently for a full description.



FRUIT EXPERIMENT STATIONS OF ONTARIO.

MEETINGS OF THE BOARD OF CONTROL

At the annual meeting of the Board, held at Zimmerman House, Waterloo, December 14th, 1897, it was decided to send zinc labels to each experimenter for out-door use, because lead pencil marks on zinc are almost indelible; to make a full exhibit at the Industrial; and to send Prof. Hutt and Mr. L. Woolverton as a delegation to Algoma to consider the advisability of locating a fruit experiment station there.

Other business details were also considered.

On Monday, the 21st of February, the Board met at Toronto for the consideration of the estimates for 1898, the whole amounting to about $2,600. New forms were agreed upon for the experimenters.

It was also agreed that in view of the great number of varieties of trees and plants already distributed to the stations, the planting in the spring of 1898 should be confined to novelties such as are being offered in Canada, and to such stock as may be needed to fill vacancies.

On Friday, the 18th of November, 1898, the Board of Control met at the Walker House, Toronto. After reading of the minutes and correspondence, and other routine business, the report of the Visitation Committee to Algoma was read by Prof. Hutt, who explained that the report was a joint one, the part referring to St. Joseph Island having been written by Mr. L. Woolverton and that about the mainland by himself.

ALGOMA AS A FRUIT COUNTRY.

Your Visitation Committee left Toronto for Algoma on Saturday morning, July 23rd, having first called on the Minister of Agriculture for detailed instructions.

Reaching Richard's Landing, on St. Joseph Island, on Monday, the 25th, we were met by three representative men of the section, viz., G. Hamilton, Crown Lands Agent; Chas. Young, President of the Farmers' Institute, and Mr. Richards, after whom the village was named.

About three days were spent on St. Joseph Island, in order to study its capabilities for fruit growing. Almost every orchard we could hear of was visited, and inquiries made regarding the varieties that are grown, and the success attending them. We found the soil on the island quite varied, from heavy clay to clay loam on the north side, to sand and sandy loam on the southwestern side. There is a good deal of limestone in the soil, and it responds well to good cultivation and manure. Although the thermometer often drops to 40 below zero in the winter, there are very few summer frosts, and the heavy snows of winter are a wonderful protection to the roots of trees, all of which showed a vigorous healthy growth, especially on the clay loam where well cultivated.

The forest growth on the island is vigorous, consisting largely of poplar, maple, larch, arbor vitæ, beech, basswood, yellow birch, oak, white spruce, hazel, etc., the latter being heavily laden with nuts; but the reckless destruction of forests prevails here as everywhere else in Algoma.

The Pin cherry grows wild everywhere and produces its small red fruit in great abundance. The High Bush cranberry is common, also two or three varieties of gooseberries, wild currants, red and black, and red raspberries. Summer frosts do not prevail, that of July 10th, which did so much mischief even in southern Ontario, was not felt except on low ground in St. Joseph Island. Of course the summer season is shorter, and only the earlier varieties of grapes could be expected to ripen, but the heavy snows, which cover the ground the whole winter, have much to do with the present capabilities of the island for fruit growing. This condition of things may be largely changed unless the people are instructed in the importance of forest protection which prevents the snow from being drifted off the land. As it is now, the ground seldom freezes, owing to the great depth of snow protection.

The following is a report of some of the orchards visited, and the varieties which have proven hardy in the island :

Chas. Young, Richard's Landing. The soil is clay loam, on high land, overlooking the lake. Mr. Young showed us fine trees of Transparent, Duchess, Alexander, Whitney No. 20, Charlemoff, Walbridge, and Longfield, all heavily laden with fruit. The trees were about five years planted, and so far were uninjured by winter, though often much affected with borer.

Mr. Young also had Late Kentish, Early Richmond and Ostheim cherry trees doing well and bearing abundantly. He has even planted a Yellow Spanish, and the tree has endured one winter, but it remains to be seen whether its fruit buds will endure the winter. Of grapes he has ripened the Janesville and found it quite productive.

Mr. Young has one hundred acres in his farm, and has a fine piece of ground sloping down toward the water, which he intends to devote to fruit culture.

A. Raines, Sailors' Encampment. On the west side we visited the orchard of Mr. A. Raines, on the slope toward the west passage between the Sault and Mackinac. At his door we found dahlias in bloom, July 26th, and a tree loaded with common blue plums. Mr. Raines has clay land, well manured, and he has about one hundred apple trees, five years planted, growing vigorously, many of them laden with fruit, especially the Transparent, Duchess, Wealthy, Wolf River and Haas He said the Hyslop does particularly well, and one season he sold $8 worth of fruit off a single tree, twenty-five years old. He showed us a Kieffer pear tree making vigorous growth. He had planted trees of Baldwin, Greening, Spy and King but had found them a complete failure, not being sufficiently hardy.

Wm. Dunn. On the south side we visited Mr. Wm. Dunn, whose farm is situated on a highland overlooking Mud Lake. Mr. Dunn's father settled in this section about eighteen years ago, and had united with our Fruit Growers' Association of Ontario, whose literature has been received every year since. Bringing a taste for horticulture from Scotland, he had at once begun gardening, and had made the mountain side attractive with fruits and flowers, now more or less neglected. Mr. Dunn says, however, that, if he could be relieved of his farm work, he could make some money growing fruit for the Sault, if only there were a nearer landing for the steamers. As it is, he loses the best part of a week whenever he takes a yacht load of fruit to that market. He has tested a good many varieties and finds the following to endure the winter and produce fruit:

Apples. Transparent, Duchess, Wealthy, Alexander, Golden, Russet, Walbridge, Scott's Winter, Pewaukee, Charlemov, Borsdorf, Gipsy Girl.

Plums Duane's Purple, Moore's Arctic and Lombard.

Cherries. Early Richmond and Ostheim.

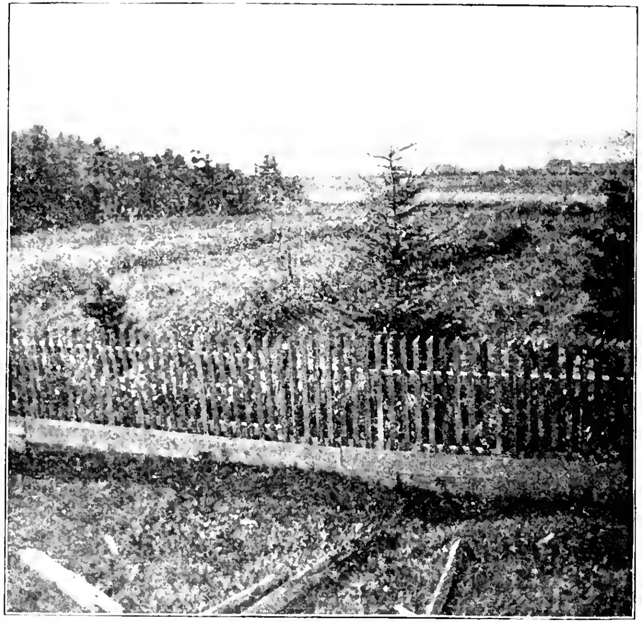
Grapes. Janesville, Lindley and Delaware, all of which had ripened.

Pears. Flemish Beauty.

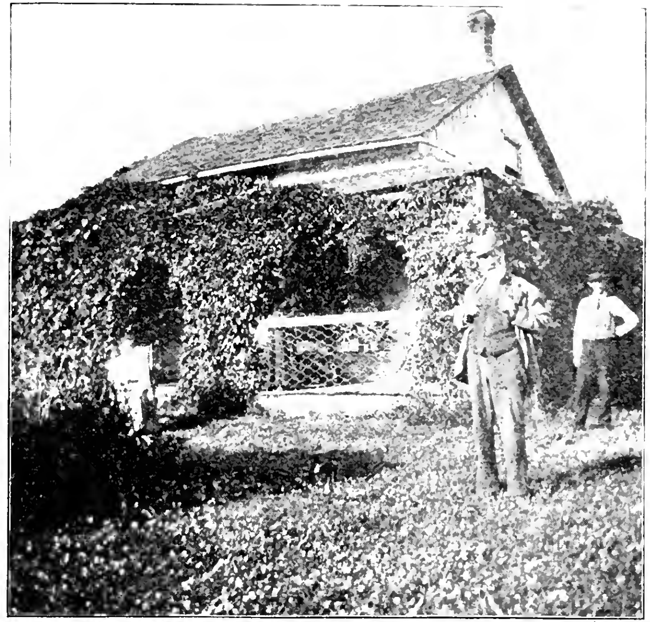
Mr. Dunn's apple trees were badly affected with the bark louse, which seems to increase very rapidly on them.

A. Eddy, Hilton. On the east side of the Island we visited the orchard of Mr. A. Eddy, of Hilton, whose son attended the O. A. C., Guelph, session of 1897-8, and who has six hundred acres of land on the Island. He planted an orchard of two hundred trees in 1897, all of which are growing well. The varieties are Duchess, Wealthy, Golden Russet, Snow, Longfield, Stark, Ben Davis and Scott's Winter.

ALGOMA AS A FRUIT COUNTRY.



Plot of ground at Richard's Landing proposed for Experiment Station--belonging to Chas. Young.



Residence of Mr. Chas. Young, Richard's Landing, St. Joseph Island, Algoma.

Throughout the Island we found a good many more small orchards, from fifty to one hundred young trees—for example, that of

Mr. A. Clifford, on the A Line, who has two hundred and fifty acres, four and a half miles from Richard's landing. Here, in addition to the varieties above mentioned, we found the Montreal Peach apple in bearing, the Lombard plum heavily laden, though only two years planted, the Weaver plum, and, to our surprise, also the Shipper's Pride and the Abundance. The latter has withstood the climate for two years. The other plums were five years planted.

Mr. Reesor has a tiny orchard under good cultivation. In addition to the apples, he has the Lombard plum, Early Richmond, Vladimir and Ostheim cherries, and the Delaware, Niagara, Concord and Moore's Early grapes.

Near by we saw the finest black currants we ever saw, grown by Mr. Fish on clay soil. Never elsewhere have we seen this currant so productive, and we would judge that this fruit would be very profitable.

Messrs. Amos and John Oheer have heavy clay farms two miles north of Richard's landing, and have each about one hundred apple trees two years planted, some of which are already showing fruit. The varieties are Transparent, Duchess, Wealthy, Gideon, Stark, Walbridge, Ben Davis and Mann.

One of the peculiarities of the apple in this northern region is its earliness of bearing, probably resulting from a slower habit of growth than with us.

The great drawback to the fruit interests of the Island is the ignorance concerning suitable varieties. During the last fifteen years thousands of dollars have been squandered on the Baldwin, Greening, King, Spy, etc., varieties altogether too tender, and which succumbed to the cold within a year or two after planting. Unscrupulous men have also done much harm, palming off novelties upon a too confiding public. The Deacon Jones apple, for example, was largely sold for 75 cents per tree throughout St. Joseph Island as a most desirable variety, and just now another kind is being pushed called the Arctic ; both untested varieties.

All agree in hoping that a fruit experiment station may be established to save them from such waste of money, and direct them in their future purchases.

On the mainland, or north shore as the islanders call it, we went over a central stretch of country about fifty miles long, from Bruce Mines east through Thessalon, Sowerby and Iron Bridge to Dean Lake Station—wheeling through country lying some distance back from the lake. Generally speaking the mainland is not so well settled or improved as St. Joseph Island, although a large portion of the land is evidently well adapted to farming. The principal crops grown are hay, oats, peas, spring wheat and barley. Nearly all of these were looking well. At the time of our visit farmers were in the midst of haying, which goes to show that their season is two or three weeks later than that in the southern parts of the Province.

The people, as a rule, seemed contented with their lot and prospects, and were hopeful for improvements. In the matter of barns many of them are ahead of their friends in the older settlements. Most of the barns now being put up are large and built on modern plans.

The soil on the mainland is not much unlike that on St. Joseph Island, but is generally inclined to be somewhat heavier. Just here it may be well to mention that the tourist passing through on the steamers and seeing the rock-bound shores, is apt to get a very wrong idea of the value of the land in this country for farming. There is, of course, plenty of rocky and hilly land to be seen inland, but there are also great stretches of fertile level land and rich valleys.

Some idea of the nature of the soil may be had from the character of the timber growing upon it. In the lowlands may be seen miles of tamarac, white spruce and white cedar. The original pine, for a number of miles back, has been cut off, and may be seen in immense lumber piles on almost every northern wharf. On the best loamy high lands the hard maple grows plentifully along with white birch and oak, but the tree seen most abundantly is the white poplar. This has sprung up wherever the original timber has been burned off.

Forest fires have been one of the greatest depredators in this northern section. The waste of valuable timber through fire has been deplorable, and even yet there is more or less waste from this cause every year. At one place we rode alongside of a fire about half a mile long, which had just started that morning.

The hazel, which is abundant everywhere on St. Joseph Island, is not so abundant on the mainland, but in its place may be seen acres upon acres of blueberries, the principal fruit crop of the Indian.

The climate on the mainland bordering the shore is not unlike that of St. Joseph Island, but as we go inland it becomes more severe. We were told that the thermometer often registered ten degrees colder on the mainland than on that island. Forty degrees below zero, however, is not an unusual temperature for either the mainland or islands.

One point claimed for the winters in this section is that they are steady, and that there is no January thaw and attendant loss of snow, which is often so injurious to vegetation in the more southern parts of the Province. The snow comes early, and is usually so deep that the ground beneath is seldom frozen. This naturally makes the country well adapted to the growing of strawberries and the low-growing bush fruits. The late spring and early fall frosts, which so frequently do great damage in other parts of the Province, are said to be not at all common in this district. We were surprised that none of the effects of the frost of July 10th, which did so much damage in inland parts of the Province this year, were to be seen in this northern section. In many gardens were to be seen good growths of potatoes, tomatoes, squash, cucumbers, etc., which would naturally be the first to show the effects of a frost.

In growing the fruit trees—apple, pear, plum and cherry—the settlers on the mainland have not as a rule attempted so much as their neighbors on the island. Many of them have not yet planted anything, but we found orchards enough to convince us that they can easily grow plenty of the more hardy varieties for their own use and home market, and probably in time also for the north-west market.

Most of the trees planted have been put out within the past four or five years. the extent of each orchard usually being from two to four dozen apple trees, and two or three odd trees of pears, plums and cherries.

Two of the finest orchards found in our travels were adjoining each other at Sowerby, several miles inland and about twelve miles east of Thessalon. In each of these were about 200 trees, which had been planted about six years ago. Among the varieties of apples in these orchards were Duchess, Transparent, Astrachan, Alexander, Wealthy, Snow, Wolf River, Gipsy Girl, Talman Sweet, Scott's Winter, Gideon and Longfield, and Martha and Whitney crabs. The Duchess, Transparent, Wealthy, Gideon and Longfield appear to do extra well in this section, and wherever seen were usually heavily loaded with fruit. Even little trees two or three years planted were to be seen bending under their load. In some cases the fruit had been thinned to save the trees, but more often the trees were propped to save the fruit. In one of these orchards we were surprised to find a Gueii plum tree, five years planted, quite as large and as heavily loaded as one would expect to find in a southern orchard. Mr. B A. Hagan and Henry McMillan, owners of these orchards, have promised to send a small collection of samples for exhibition at the winter meeting of the Fruit Growers' Association, to show what apples can be grown in Algoma

Near Iron Bridge, about twenty miles east of Thessalon, we found a young man, David Tait, who has started a nursery for the propagation of the hardier varieties of fruits for this section. He has two or three acres in nursery, and is budding and grafting his own trees on imported stocks He has a good collection of the hardy varieties of apples, pears, plums and cherries. The trees were well cared for and looked thrifty and healthy. We were pleased to find this, because many in this northern section who hav bought trees from the agents of southern nurseries have been greatly disappointed with the results owing to the difficulty of getting trees in good condition. A nursery in their own district, supplying good trees of the hardy varieties, will be a great help towards successful fruit growing in Algoma.

All spoken to on the subject, were agreed that an experiment station, which would give them some idea of the most suitable varieties for this northern section, would be a great boon to all settlers. The general impression was that St. Joseph Island would be as suitable and as central a spot as could be selected, and that the results obtained there would be of value to all of the Algoma district.

L. Woolverton,
H. L. Hutt.

The report was received and adopted, and it was agreed to recommend to the Department of Agriculture the advisability of locating a fruit experiment station at Richard's Landing.

A letter from the Hon. John Dryden was read suggesting the advisability of testing hardy fruits on the Pioneer Farm at Wabigoon. It was agreed to adopt this suggestion, and utilize the Pioneer Farm for this purpose.

INSPECTION OF THE ONTARIO FRUIT EXPERIMENT STATIONS.

By Prof. H. L. Hutt, Official Visitor, O.A.C., Guelph.

Since the establishment of the first stations five years ago, it has devolved upon me, as the representative from the College, to make an annual tour of inspection to each station, and to report upon the same to the Board of Control.

In previous reports I have made mention of the kinds of fruit which are being most extensively grown at each station, of the nature of the soil, of the capabilities of the men for carrying on the work, of the additional planting which has been done, and the care and attention which have been given to the work. Many of these points need not again be touched on. In this report, therefore, I have dealt more particularly with the progress of the work at each station, with the care taken of the stock sent for test, and with the condition of the crop upon which the experimenter has to base his report.

Previous to the enactment excluding American nursery stock the stations had been pretty well supplied with all the leading and promising varieties to be had from American as well as Canadian nurserymen. Consequently there was but little additional planting done this year at any of the stations, the little stock that was planted coming altogether from Canadian nurseries.

As far as possible each station was visited at the most opportune time for seeing at maturity the fruits specially under test. On account of the close attention which had to be given to our own experiments during the strawberry season I had not an opportunity of getting away to see Mr. Stevenson's plantation. Mr. Woolverton, however, spent a day with him and took photographs of a number of his leading varieties.

All particulars as to the value of different varieties I have left to be dealt with in the reports of the experimenters, where they can be more fully and properly given. I shall mention each station in the order in which they were visited during the season, beginning with the raspberries early in July, and ending with the grapes during the latter part of September.

The Lake Huron Station.

Visited July 12th, 1898. At this station we have now under test a large collection of varieties of raspberries, and in addition quite a number of varieties of apples and plums most likely to be of value in the section. Mr. Sherrington has been propagating from his stock of raspberries and setting out a new plantation, having a 20-foot row of each variety To prevent the suckering varieties from mixing, he is alternating these in the row with those which are propagated from tips.

Some varieties, like Shaffer, Gregg, Smith's Giant and Superlative, were more or less winter-killed last winter. Such points will be more fully noted in Mr. Sherrington's report, along with a record of the yields from the different varieties under test.

All of the plum trees, among which are several of the Japanese varieties, have so far come through the winters uninjured. These, and the young apple trees sent for trial, are making a good growth.

In the bearing apple orchard, the crop this year was light. The Northern Spys, however, were carrying a fair load.

All trees and plants sent to this station are being well cared for.

The Simcoe Sub-station.

Visited July 22nd, 1898. The collection of gooseberries under test at this station is not large, but it includes most of the American varieties and a number of the most promising English varieties. For the past two seasons Mr. Spillett has been having a very severe fight with the mildew, and in spite of repeated sprayings with the Bordeaux mixture it is still very bad on many of the English varieties. So far Pearl and Downing are the most satisfactory varieties in the collection.

The Georgian Bay Station.

Visited August 3rd, 1898.—At this station we now have a fine collection of plums, made up of about 140 varieties. Eighteen of these have been bearing since the station was established. Thirty-five varieties put out three years ago are now beginning bearing. Among those most heavily loaded this year were Burbank, Abundance, Arch Duke, Saunders and Golden Prolific.

In another year or two the greater part of this large collection of varieties will be in bearing, when some valuable reports may be looked for.

So far all varieties of plums, as well as a number of varieties of pears and peaches, have come through the winter uninjured.

Mr. Mitchell is a first-class cultivator, and all of his trees have been well cared for.

On account of the severe drouth up till the time of my visit, it had been useless to sow crimson clover for the fertilizer experiment in the orchard, but after the rain at that time it would be sown at once.

The Simcoe Station.

Visited August 4th, 1898. This being the most northern of all the stations it was thought wise to send here for trial a number of other fruits besides the specialties. Accordingly we have here a number of varieties of pears, plums, apricots, and a general collection of the small fruits, such as currants, gooseberries, raspberries, blackberries and strawberries.

The apple crop through this section this year is light, the winter varieties bearing little or nothing, but as usual there is a beautiful crop of Duchess and Wealthy, every tree of these varieties being heavily loaded.

The cherry crop was all off before the time of my visit, but Mr. Caston is much pleased with a number of the new varieties which begin bearing this year, and which will be dealt with in his report.

All the young trees set out four years ago, when this station was first established, have made a good growth, and a number of varieties, particularly among the plum trees, are beginning to bear.

The small fruits are now in full bearing, and will be reported on in Mr. Caston's report. The cultivation and attention given is all that could be desired.

THE BURLINGTON STATION.

Visited August 6th, 1898. With reference to this station we might say that it is as well stocked and as well managed as any fruit farm to be found in the country. Besides the raspberries, blackberries and currants, upon which Mr. Peart has been reporting, he has a good collection of varieties of grapes, plums, pears, peaches and apples.

As this station is situated in a section where fruits of all kinds are extensively grown, and where the conditions are quite different to those on the southern side of the lake, and from many of the other experiment stations, we think it would be well to enlarge Mr. Peart's specialty and ask him to report also on grapes, pears and plums.

His annual allowance should, of course, be proportionately increased, as he is at present barely paid for the full and excellent reports which he has been sending in.

Careful records have been made during the year of raspberries, blackberries and currants, a full account of which will appear in Mr. Peart's report.

THE SOUTHWESTERN STATION.

Visited August 26th, 1898. Mr. Hilborn's peach orchard is now probably one of the largest and finest in the Dominion, being over 100 acres in extent, and containing trees of over 150 varieties.

The peach crop in that section this year was said to be only about half an average crop, but, with the excellent cultivation given, Mr. Hilborn's orchard was doing much better than that. Very few of the young trees in the experimental plots are yet in bearing, although a great number of them should begin to bear next year.

The report from this station this year will, therefore, be based more particularly upon the yields from trees which were planted before the station was established.

THE EAST CENTRAL STATION.

Visited August 28th, 1898. The crop of apples and pears in this section this year was good, and Mr. Huggard's trees were generally well loaded.

The cultivation in the bearing orchard has not in the past been uniform. Part of the orchard has been given bare cultivation; another part has been cropped with roots; and a portion of it has been in sod for several years. Mr. Huggard is now convinced that early, clean cultivation is the best, and intends to give this in the future, using crimson clover as a cover crop, the seed of which will be sown about the beginning of August.

The young trees set out in the experimental orchard have been well cared for and have made a good growth. Some of them are already bearing a few specimens of fruit.

THE BAY OF QUINTE STATION.

Visited August 29th, 1898. At this station we have the largest collection of varieties to be found in the Province, and the reports from here should be of value to apple growers over a wide section of the country.

The young trees in the experimental orchard have been well cared for and have made a good growth. The older orchard has also been given first class cultivation all summer, but the scab came on very early in the season and the foliage on many varieties were so injured that they bore but little fruit. On account of the extremely severe drouth in this section for about two months all of the trees had suffered severely, and in many cases the fruit was not half its usual size. The varieties making the best show were Duchess, Alexander and Ontario. All the trees of these varieties were heavily loaded with very fair fruit.

Some of the grafts of new varieties put in three and four years ago are now beginning to bear.

The St. Lawrence Station.

Visited August 31st, 1898. The young trees sent here during the past two years were planted in good rich soil, have been well taken care of, and have made a remarkable growth. So far most of the varieties have come through the winter uninjured.

In his bearing apple orchard Mr. Jones had a nice crop of Snows and Scarlet Pippins. There was some scab, but it had been pretty well held in check by spraying. The Scarlet Pippin was making a fine showing, and seemed less liable to scab than the Snow.

There had been more rain in this section, and the country looked much better than further west.

The Niagara Station.

Visited September 20th, 1898. At this station we now have a large collection of the more tender fruits, including peaches, plums, cherries, apricots, nectarines, grapes, etc., and a number of the most promising new varieties of nut trees, such as Japanese chestnuts, English walnuts, filberts, etc.

Everything at this station receives the very best attention. The trees have all been well cared for, and most of them have made a good growth. The nut trees have, so far, been the most unsatisfactory to transplant and grow. Mr. Burrell has been budding a number of the Japanese chestnuts upon seedlings of our native variety.

Very few of the experimental trees are yet old enough to bear fruit, but in the bearing orchards and vineyard there was a fine crop of fruit.

Crimson clover, as a cover crop in the orchards, has always given excellent results in this section, and Mr. Burrell usually succeeds in getting a good catch of it.

The Cherry Station.

Visited September 21st, 1898. The experimental cherry orchard set out three years ago now presents a fine appearance. The trees have made a fine growth, and promise well for fruiting another year. Some varieties of the Morello type began bearing this year. Full notes on the growth and fruiting will be found in Mr. Woolverton's report.

The Wentworth Station.

Visited September 22nd, 1898. The young experimental vineyard set out here during the past three or four years is now pretty well established. The vines have all been trellised, and are beginning to bear. So far there are but few of the newer varieties that show signs of being equal to the old standard varieties.

In the old vineyards there was as usual an excellent crop. The cultivation and care given are all that could be desired. Some valuable reports on grapes may now be looked for from this station.

REPORT OF SOUTHWESTERN STATION, LEAMINGTON.

The peach orchards in Essex county gave but a partial crop of fruit this season. The trees ripened up both wood and fruit buds to perfection last autumn. They came through the past mild winter in perfect condition, and gave promise of a very large yield of fruit at the blooming period. Every variety was full of blossoms, none of which appeared to have been injured by the winter. The weather during spring was unusually cold for a length of time, thus retarding vegetation to a considerable extent. This condition of the weather was conducive to the growth of the curl leaf, and much injury resulted from this cause. Some varieties were injured much more than others. The same kinds suffered much more in some portions of the orchard than in other parts. As an instance, Barnard's Early in the south-western part of the orchard was injured to such an extent that they produced only about a dozen baskets to 100 trees. In the north-eastern portion of the same orchard, sixty roads away, 300 trees of that variety planted at the same time (six years) and receiving the same treatment throughout, produced a full crop of the finest fruit. The former lot of trees were on a somewhat higher elevation, and more exposed to the cold south west wind. This was the only cause I could detect to make the difference between the two lots of trees.

Among the varieties most injured are Champion, Elberta, Tyhurst, Lewis, Early Michigan and several others nearly as much affected. Young trees, three to four years planted, of nearly all kinds, were sufficiently injured to cause them to drop their fruit. Very little fruit was grown on trees less than five to six years planted. Among the kinds least injured may be named, Alexander Early, Rivers, Fitzgerald, Golden Drop, Hales' Early, Lemon, Smock, Longhurst, Hill's Chili and Salway.

During the time Early Rivers and Hales' Early were ripening the weather was warm, wet and showery, hence much injury resulted from the peach rot (Monilia).

As stated above, trees not more than four years planted produced no fruit, therefore those planted for experimental purposes were not old enough to produce fruit this season. All varieties have ripened up well this autumn and go into winter quarters in good shape.

Alexander is the first to ripen. It is very productive and has been planted in such large numbers in all peach-growing districts that the supply is greater than the demand. It being a cling stone and put on the market in such large quantities it injures the sale of later and better sorts. Those early cling-stone varieties are not good until they have been thoroughly ripened on the tree, and then they are not firm enough to carry to a distant market. For this reason most of them are sent to market in a half ripe condition, and are fit only for cooking, and for this purpose they are then of but poor quality. It would appear to be a mistake to plant many of those white fleshed early cling stone kinds. No doubt it would pay to take out a large portion of those already planted and substitute later and better varieties. The demand now is for large yellow flesh, highly colored sorts. Of this type the following may be named as among the most satisfactory market varieties, named in order of ripening: Crane's Yellow, St. John, Brigden, Crawford Early, Fitzgerald, Yellow Rareripe, Hinman, New Prolific, Engol's Mammoth, Longhurst, Late Crawford, Smock, Banner and Salway. The last named is too late, except for highly favored localities.

The Elberta is a very fine market peach, but has been so badly injured with curl leaf the past two seasons that it has had hard work to live.

Golden Drop has been one of the most profitable kind this season. It is only of medium size and not highly colored. It, however, produces such large crops of medium, even sized round clean fruit, that for canning or evaporating it has few equals.

Wager is a good peach when grown on healthy young trees. As the trees grow older they are liable to overbear, when the fruit spots and cracks to such an extent that it is of little value.

Lemon Free has in the past been one of the most satisfactory kinds grown. This season the fruit dropped bodily just before it was ripe enough to gather. This may be the result of the injury done by the curl leaf. While there was not sufficient injury to cause the fruit to drop while it was small, the indications are that the premature dropping at time of ripening was caused from that fungus.

Crosby gave a good yield of medium to large size fruit, of fine appearance and good quality on trees five and six years planted. On older trees it has a tendency to overbear, then the fruit is not so large or well colored.

Hinman is a very promising yellow flesh variety, ripening just after the Early Crawford. This is equally well colored, of as good quality, more hardy and will average larger than that old standard sort named above. This sort is well worth an extended trial.

Brigden is another of the Crawford type, ripens a little earlier, larger and equal to and surpassing that sort in all respects. Worthy of an extended trial.

Banner is a new variety originating in this (Essex) county. The fruit is large and round, skin bright yellow with red cheek, flesh fine grain and of the best quality of any variety of its season, which is with or just after Smock. The tree is hardy and very productive, one of the most promising late market varieties grown in this its native home. Well worthy of an extended trial.

W. W. Hilborn,
Experimenter.

REPORT OF NIAGARA STATION, ST. CATHARINES.

I beg to submit the following report of the work carried on at this station during the past season. As none of the trees planted on the experimental plots fruited this year, I am unable to present anything in the way of description of varieties. With the exception of the chestnuts, the trees generally have made a good growth, and under favorable conditions a large number of varieties should bear fruit next year.

I had intended to carry on again some experimental work in the thinning of peaches, but the failure of the crop rendered such work impossible. Last year the results of some experimental work against the peach 'borer' were included in the report, and below will be found some additional notes on the same subject.

As the question of crimson clover is an important one for the horticulturist of the Niagara peninsula, I have embodied in this report the result of the work done here with this clover.

There were added to the experimental blocks this year three Japanese Walnuts, all of which have made a thrifty growth, also three seedling peaches from Georgia, and three of the variety 'Connecticut'; also, one each of the following varieties of plums: Large Golden, Lombard Improved, Stark's Gage, Normands, Coe's Violet, Bleeker's Gage, Moyer Seedling, and Glass Seedling No. 2.

Leaf Curl.—Owing partly to unfavorable climatic conditions and partly to the disease known as "curl leaf" the peach crop of this section has been largely a failure this year. Smocks and Late Crawfords yielded a fair crop in some orchards, but most varieties were very light indeed. Careful notes were taken here at the time "curl leaf" was at its worst, with the view of ascertaining what varieties were chiefly affected. The notes are the results of an examination of three trees of each variety, the trees being in their third year.

Very Badly Attacked. Crosby, Champion, Elberta, Early Barnard, Honest John, Jacques Rareripe, Golden Drop, Lord Palmerston, Late Crawford, Morris White, Old Mixon, Red Cheek Melocoton, Steven's Rareripe, Stump, Troth's Early, Tyehurst, Yellow St. John, Yellow Rareripe, Wager.

Moderately Attacked. Conkling, Early Crawford, Early Canada, Early Richmond, Fitzgerald, Hortense Rivers, Ostrander Late, Susquehanna.

Slightly Attacked. Early Rivers, Foster, Hale's Early, Hynes' Surprise, Garfield, Longhurst, Smock, Salway, Shumacher, Waterloo, Wheatland, Wonderful. Although a number of peach trees were sprayed with the Bordeaux mixture, partly to determine the effect on the curl leaf fungus, practically no difference was observed between sprayed and unsprayed trees. As a good deal of light has been thrown on this matter by recent investigations at Cornell, and at the Ohio Experiment Station, fresh experiments will be undertaken here next year. Professor Selby, of Ohio, and the assistant botanist at Cornell, have both obtained good results from the use of Bordeaux mixture, applied before the blossoms opened. Professor Craig also informs me that in Pennsylvania, Ohio, and California satisfactory work against leaf curl has been accomplished by the use of lime, and I hope to test this agency also in 1899.

The cherry crop of this district was lighter than usual. Common sour cherries bore a very small crop, and the sweet varieties suffered badly from rot, and were injured to a considerable extent by the black aphis. The better kinds of sour cherries, such as Early Richmond and Montmorency yielded a full crop.

PLUMS.—Plums, with the exception of Lombards, Imperial Gage, Prince's Yellow Gage, and English Damsons, were a failure here.

PEARS.—Pears, with the exception of Sheldon, bore well. Bartlett, Clapp's Favorite, Seckel, Beurre Clairgeau, Beurre Bosc, Duchess d'Angouleme and Lawrence may be especially mentioned

GRAPES —Grapes were a good crop, and generally a clean sample. The varieties I found most profitable this year were Worden, Roger 44, Roger 9, Delaware and Niagara.

A seedling grape of unusual promise was recently brought to my notice. It is a white seedling of the Brighton, and probably fertilized by Moore's Early, a vine of which was near the parent Brighton Mr. Backus, the originator, lives about a mile from this station. He reports the grape to be ripe at least a week earlier than Moore's Early. The bunch is compact, not shouldered, berries as big as Lady, skin thickish, quality good. Vine not a rank grower, with slender, dark red wood, not unlike Pocklington. A few grapes had been left on the vine till October 10th, and I found no sign of shrivelling or cracking.

SPRAYING EXPERIMENTS.

Grapes—Mildew. Six vines were selected in a row of Brightons, which have always been more or less been subject to mildew. Two were left as check vines, two were sprayed with the 4, 4, 40 formula of Bordeaux mixture, and the remaining two received a light sprinkling of sulphur. There were three applications of both sulphur and Bordeaux mixture, the first on June 6th just before the blossoms opened, the second on June 24th, the third on July 9th.

The fruit was picked with following results :—

	Total grapes.	Badly mildewed.	Slightly mildewed.
Sprayed vines :—	24 lbs , 8 oz.	6 oz.	9 oz.
Sulphured vines :—	25 lbs.	....	5 oz.
Unsprayed :—	35 lbs., 8 oz.	3 lbs , 14 oz.	5 lbs., 4 oz.

The "slightly mildewed" were marketable, but not first-class. There was no brown rot on these vines, only the powdery mildew, against which sulphur would of course be far more effective than against the "downy" mildew. Lumping both "badly" and "slightly" mildewed, and reducing it to a percentage basis, the result would be—without going into decimals :—

Sprayed :—96 per cent. clean ; Sulphured :—99 per cent.; Unsprayed :—74 per cent.

Cherries—for Rot. The May Duke variety was selected for experiment. Formula used "4, 4, 40," with the addition of 4 oz. of Paris green. Three sprayings were given on April 28th, May 31st and June 9th.

	Total weight.	Sound cherries.	Unsound.	Weight of good fruit.
Sprayed tree—	54 lbs.	4,058	2,020	39 lbs.
Unsprayed tree—	47 lbs.	2,974	2,385	27 lbs., 8 oz

Sprayed trees :—72 per cent. sound ; Unsprayed trees :—58 per cent. sound.

If four sprayings instead of three had been given better results would probably have been secured. Climatic conditions were extremely favorable for the spread of the monilia fungus this year on cherries and plums.

Plums. These were sprayed four times, but on Imperial Gage and Lombards the rot was exceptionally bad. A marked difference, however, will be noticed in the treated trees.

Imperial Gage :—

	No. unsound.	No. good.	Weight of sound fruit.
Sprayed—	330	465	28 lbs.
Unsprayed—	596	246	17 lbs.

Sprayed tree :—Sound, 71 per cent.; Unsprayed tree :—Sound, 41 per cent.

The spraying has also had a marked effect on the foliage of the trees. At the present date (Oct. 18th) the sprayed trees retain nearly all the foliage, while those untreated have been practically bare of leaves for two weeks.

INSECTS.

Pear Slug (*Selandria cerasi*). Either from climatic causes, or an abundance of parasites, there was practically no sound brood of this injurious insect last year. This is probably the reason for the scarcity of the pest this year. I have not observed any serious injury from its work in this section.

Aphidæ. The currant aphis and black aphis of the cherry were both destructive during the past season, though the attacks of the latter were not so severe as in 1897. Good results were obtained here from a whale oil soap solution, 1 pound to 7 gallons. The solution is most satisfactorily made when the water is very hot. I would strongly urge those who have valuable sweet cherries to make an application even stronger than the one I mention before the blossoms open. It is an impossibility to thoroughly control this insect when it once gets established inside the leaf.

Peach Borer (*Sannina exitiosa*).—In the report of 1897 will be found the details of a number of experiments carried out against this enemy to peach trees. It was shown that the moths do not emerge in this latitude till about July 15th, and that eggs are laid from that time till well on in October. It was also demonstrated that no washes, except those of cement, will remain on the trees long enough to prevent the moth ovipositing. For this reason only the cement and skim milk wash was used this year. The use of paper wrapping was successful last season, but the slight additional expense and labour in putting them on, as compared with the washes, led me to discard them this year. There is also danger of "girdling" the trees by the wire or string with which they are tied on.

The cement and skim milk was applied to 45 trees this year on July 11th, all borers having been first removed. The trees were of various ages from three years to twelve years. On October 7th an examination was made and the wash found to be in fairly good shape. There were found—

On treated trees (45) :—Two very small borers evidently not very long hatched, one in a small cavity where the cement had failed to penetrate and the other where the wash had recently cracked.

On untreated trees (45) :—Nine borers were found, most of them half grown, and a considerable amount of damage had been effected.

The peach-borer has not been plentiful this season in the orchards here, otherwise I feel confident that results would have been still more marked. On the whole, I believe the cement wash to be the most satisfactory application that we yet know of to repel this destructive insect. Professor J. B Smith of New Jersey writes, under date October 14th : "The cement has been used quite considerably in our State this year, and, in general, with very good results." In making the wash it might be well to add enough crude carbolic acid to give a decided odor, the scent of carbolic being repugnant to a large number of insects.

Crimson Clover.

After an experience of four years with this clover, during which time it has been sown on plots of various sizes, from a third of an acre to two acres in extent, embracing different kinds of soil, I feel like strongly urging its claims on the fruit growers of this section. It provides the cheapest possible way of obtaining a large and valuable supply of humus and nitrogen which our fruit lands too often lack, and, in spite of occasional failure, I am convinced that it would pay to sow as much ground as possible every year. Last year a series of plots were experimented with, some of which were treated with manure, others with fertiliser, some with no manure of any kind, and some with crimson clover in full bloom plowed under. Corn and potatoes were planted, and, though the details (published in the Montreal Weekly *Star* for July 5, 1898,) are too lengthy to insert here, I may say that the results were highly satisfactory, as showing the fertilising value of this plant. With the exception of sowings in 1895 I have had no total failure during the last four years, and the fall of 1895 was exceptionally dry, and therefore unfavorable. This year I have three plots on which dense mats of clover stand, from four to eight inches in height now (Oct. 18). One is on a two acre block from which oats were cut for hay, and clover sown on July 28th ; the second on a strawberry patch turned under directly the fruit was picked, and the third on ground from which old peach trees were removed last winter. A few conclusions from the four years experience may be helpful to those who wish to sow another year.

1. The best time to sow, if a really good stand is required, is from July 25th to Aug- 5th—this is after a trial of dates ranging from the middle of July to the middle of September.

2. This clover is unlikely to succeed on clay soil, chiefly from the lack of moisture at the necessary time. A sand, or light loam provides the best conditions.

3. Twenty to twenty-five pounds of seed to the acre is none too much—preferably the larger amount. The seed is nearly twice as big as the ordinary clover, so this quantity is not as much as it seems.

4. It will thrive much better where the soil contains lots of potash and lime, because the micro-organisms, which secrete the nitrogen on the roots, flourish only when there is an abundance of those constituents in the soil. For this reason we have never failed to get an excellent crop of clover on an old strawberry bed to which we always give a liberal supply of hardwood ashes.

5. In sowing in orchards it is advisable to leave a clear space of at least two feet next the tree rows, otherwise, in plowing under rank crop the following spring, more or less injury will undoubtedly be done to the roots.

6. It will pay to have the seed-bed in fine order, and put a light smoothing harrow or roller over the ground directly after sowing.

I might add, with reference to the chestnuts, that the "Spanish" chestnuts have made a much more vigorous growth this season than heretofore From other peoples' experience and from that gained here during the last two years, it is evident that chestnuts thrive very slowly after transplanting. I have about eighty seedling chestnuts growing, many of which were budded this fall with Paragon, E. Reliance, and Spanish. Budding is usually unsuccessful, and I fear not many have taken': those on which the buds fail will be crown grafted next spring, and it is hoped that a careful transplanting of the trees later on may be followed with good results.

MARTIN BURRELL,
Experimenter.

REPORT OF WENTWORTH STATION, WINONA.

The past season has been a favorable one for grape growing, the crop has been a good average, and the vines comparatively free from disease.

GRAPES.—Many of the newer varieties which have fruited are very disappointing, and not worthy of a longer trial than next year, being far inferior in vigour, productiveness, appearance and quality to many of the old reliable kinds.

Eight varieties have not proved true to name. Those marked Berckmans, Concord Chasselas, Concord Muscat and Grein's Golden, are Taylor, a small white wine grape of the Clinton type. Rochester is Catawba, Croton is Pocklington, Triumph is Lindley, and Janesville is Noah. Some of the newer varieties worthy of notice are:

Brilliant, a dark red, medium size, of most excellent flavor; productive.

Dr. Collier, a black grape of Concord type. Although quite productive, do not think it could be grown as profitably as Concord.

Black Delaware, below medium size, fine quality with heavy blue bloom. The vine lacks vigour.

Eumedal, large clusters; good flavor; productive.

Watt, a dark red or maroon color, a little below medium size and of the very finest quality.

Mills, large black, goood quality, productive, and a very long keeper.

Moore's Diamond and *Winchell* are both early, productive white grapes of good quality, and could be profitably grown for market.

Woodruff Red is very handsome, bright red, productive, medium quality.

The annual record, giving yield and selling price, will show that many of the new varieties have produced a light crop for the age of the vine. This may be accounted for by some of them being small, one year old vines when planted. A test of the keeping qualities of about fifty varieties in open baskets in the cellar was made of last season's crop. The Mills far surpassed them all. On April 1st they were in fair marketable condition, firm, crisp and sprightly. Vergennes and Agawam stood next, but had shrivelled and lost considerable flavor. I would recommend planting the Mills for distant markets or for winter use at home.

PEACHES.—The experimental trees made a good growth last season and appeared in fine condition this spring, and bloomed very freely; but as soon as the leaves appeared they were so badly affected with curl leaf that the crop was very light. Of those very badly affected were Carlisle, Crosby, Willett, Elberta, Jersey Queen and Michigan No. 1.

Those least affected were Stewart, Hilborn, Pratt, Michigan No. 8, Mt. Rose, Foster, Centennial and Early St John. After the weakening effect of the curl leaf the extreme dry weather during the growing season caused the trees to make a short growth. Bowslow's Late, Hilborn and Pratt were the most productive.

PLUMS.—The experimental plum trees have made a good healthy growth. Burbank, Carduc, Ogan and Willard were the only varieties that fruited—Ogan, the earliest, ripening the last of July.

SPRAYING —Beurre Giffard pears, sprayed before budding, and three times after at intervals of about ten days, with Bordeaux mixture, yielded 20 per cent more fruit, and 80 per cent. of that free from fungus, while the unsprayed had 30 per cent. clean. The same experiment with Flemish Beauty pears gave a higher percentage of clean fruit, but very little increase in quantity. With the same experiment on Lombard, Washington, Bradshaw and Yellow Egg plums, there was considerable rot on all after the spraying was discontinued, but much worse on the unsprayed trees; while the leaves remained green and fresh for nearly three weeks longer on the sprayed trees.

M. PETTIT,
Experimenter.

REPORT OF BURLINGTON STATION, FREEMAN.

There are now under cultivation at this station over two hundred and twenty five varieties of fruits. Trees and bushes are, almost without exception, in a healthy, growthy condition. Upon the whole the season was not favorable to the production of much fruit. There were strawberries in abundance; grapes also were a good crop, but with these exceptions the output was very light. An almost unprecedented drouth set in early in June, which practically was unbroken for three months. In consequence fruit suffered severely, both in quality and quantity.

Raspberries and blackberries. The season was very unfavorable for these fruits, many varieties literally drying upon the bushes, and amounting to nothing. Among the former the red varieties stood the ordeal the best, and the black and purple the worst; while, of the latter the Kittatinny, Gainor, Early King and Early Harvest seemed to have the most strength Wilson Junior is peculiar in its habit of growth. Like the black raspberry, its canes are long and slender, trailing more or less upon the ground; but unlike most raspberries and blackberries it appears to propagate by both tips and suckers. Child's Tree also slightly shows the same tendency. Reliance and London both promise well. The Japan Wineberry canes were frozen to the ground. Young suckers rapidly pushed up from the parent root, and bore some small, very acid scarlet colored fruit, the sole merit of the variety appearing to lie in its novel, oriental appearance. Among the medium and late blackberries the Gainor and Kittatinny took a first place. The Marlboro and Loudon probably fruited the heaviest and withstood the drought the best of all the raspberries.

Currants. The crop was very light, although the quality was good. Cherry still leads among the older varieties, while Raby Castle and Red Victoria promise well. The Belle de St. Giles gave a few remarkably fine large berries. Among the black varieties Champion takes first place, with Naples and Lee's Prolific but little behind. Collin's Prolific thus far has given a rank growth of wood with but little fruit.

Pears were also a light crop of rough uneven quality. The Kieffer only bore heavily. There was very little blight and scab, the Flemish Beauty alone suffering from the latter, The young trees, however, made a fair growth of wood.

Apples, too, were very light and poor in quality. The codling moth was very busy, Baldwins, Greenings and Roxbury Russetts suffering the most. Upon the whole the fruit was distinctly undersized. The Wealthy (a new variety here) is a fine early fall apple, but, unfortunately, like the Anjou Pear, it is not tenacious enough, dropping too easily.

Plums were a light crop of excellent quality. Very rarely indeed have they colored up and been so showy as they were this year. Among the Japan varieties the Satsuma is rather a curiosity, having a dark red flesh and a dull reddish skin. It is an oblong-conical plum, medium to large in size, flesh firm, but of inferior quality. It matures nearly two weeks later than the Burbank, ripening this year about the 7th of September. The Reine Claude is one of the best and most satisfactory plums grown here. There was considerable rot, many varieties having to be picked on the firm side in order to save them.

Peaches were very scarce.

Grapes were a good crop of fine quality. The Concord, Worden, Moore's Early, Moyer, Catawba, Delaware, Vergennes, Niagara and Wyoming Red especially, gave a fine yield of excellent fruit. Insects did but little damage, but the Brighton and Lindley were considerably damaged by mildew.

Fertilizing experiment. The crimson clover sown on one-half acre of apple orchard in 1897, passed through the winter without injury by frost. When vegetation was renewed it grew rapidly and on the first of June was a thick, splendid mass of showy crimson blossoms, beautiful to behold. It stood from fifteen to twenty-four inches high, nd was, for about a fortnight, the Eden of bees and all nectar-loving insects. On the

6th of June the plot was sown with 50 lbs. of muriate of potash and 100 lbs. of bone meal. The clover and fertilizers were then plowed under. The ground was next rolled so as to compact the soil, check the escape of moisture, and accelerate the decomposition of the clover. It was then harrowed lightly, in order to fill up spaces and level generally, then occasional surface cultivation to prevent weed growth and retain moisture. Fourteen lbs. of crimson clover were again sown upon the same plot on the 9th of July, 1898. The seed was harrowed in and the ground rolled, thus completing the circle. The season was too dry and hot for a good catch of seeds, and at this date (Oct. 27th) there is a thin setting of young plants about four inches high.

By next year I hope to be able to give some relative results as between this method and my usual treatment of an orchard.

A. W. Peart,
Experimenter.

REPORT OF LAKE HURON STATION, WALKERTON.

The season of 1898 has been on the whole a very favorable one for the fruit grower. The apple crop was comparatively light, and very much scattered; but the crop was much better than was expected in the fore part of the season. While some orchards carried a full crop, others had less than a half and some none at all. The failure in the crop was, I think, owing to the heavy rains and cold weather during the blooming period. But the crop has been much better than last year, and the quality far superior. The winter of 1897-1898 was much colder than the winter of 1896-1897, the coldest being 13° below zero in the case of the former, while last winter it dropped to 20° below zero. My report as to hardiness of plants is based on that of 20° below zero, without protection.

There have been added to this experiment station this year eleven varieties of apples nine of pears, one plum, one apricot, one grape, five currants, one gooseberry, making a total of 61 varieties of apples, 28 of plums, 9 of pears, 12 of cherries, 1 apricot, 3 of grapes, 9 of currants, 6 of gooseberries, and 67 of raspberries and blackberries. All trees and plants are growing and doing well with the exception of one or two cherry trees.

Insects were very numerous this season, especially the tent and forest caterpillar—so much so that some of the orchards were entirely stripped of their foliage. A great many remedies were resorted to, coal oil being one of them, but to little effect; spraying with Bordeaux and Paris green was perfectly satisfactory. The codling moth has been bad; also one-third of the apples in some orchards are wormy.

Fungi.—These diseases in their various forms have not been so destructive as last season, the apple spot being the most prevalent There was some anthracnose on raspberries and a little of the red rust. These diseases I never saw here until I received plants for the experimental work. The raspberries were all sprayed twice, once before growth started and again just before blooming, Bordeaux being used at each spraying with satisfactory results.

Apples.—The crop, as stated in report, was very scattered, some varieties, as the King, Blenheim Pippin, Twenty-ounce Pippin, were better than usual and the quality good. The Ontario is still giving great promise of becoming a first-class shipping apple. Fruit, large, of good form and free of spot. A few samples kept in an ordinary cellar until August.

Pears.—Were a fair crop, quality better than last year. The varieties chiefly grown here are Clapp's Favorite, Flemish Beauty, with quite a few other varieties in smaller quantities. Some very good samples of Kieffer and Duchess were shown at some of the fall fairs.

Plums.—Were a light crop. A few of the young trees are commencing to bear, but not worth reporting as to yield. All of the Japan varieties stood the winter without injury at 20° below zero. The Abundance and Burbank ripened a few plums of large size. The Abundance measured 2 inches long, $1\frac{7}{8}$ wide and $5\frac{1}{2}$ in circumference. It is a very thin skinned plum, and of fine flavor. Burbank is nearly as large as Abundance, but not of as good quality. They are all very vigorous growers, Burbank making over four feet of growth this season.

CHERRIES.—Were light but the quality was good. Some of the young trees were full of bloom but failed to set any fruit; but if the black knot is not looked after and the law made a little more strict there will not be a tree left in this district. It should be made imperative for township councils to appoint inspectors.

RASPBERRIES.—The raspberry crop was very good considering the season, which was very dry, there being no rain from the 25th of June until the middle of August. After the crop was harvested quite a number of varieties were damaged by the winter frost, making the yield much less than otherwise would have been.

The Red Raspberries under experiment are grown on the hedge row system. Each variety occupying 18 feet long of row and 2 feet wide, and the yield from the Blackcaps is given in pounds and ounces. Estimating a pound to a box it will be readily understoods as to the yield per variety.

All-Summer has not fruited any as yet at this station; it is of dwarfish growth, foliage large and healthy; will give it another year's trial.

Brandywine is a red berry. So far it has proved to be hardy; not very vigorous, but early and stands record in yield; berry small and rather soft, but owing to its earliness it is a desirable variety for home market.

Brinckle's Orange. A yellow berry, medium size, soft, rather poor quality, not profitable.

Cuthbert Is without a doubt the best red raspberry under cultivation; it is vigorous and hardy, good crops of large size berries, quality best.

Caroline. Plant vigorous; hardy and a heavy yielder; berry, medium size; color, orange; very soft and poor quality; although this variety gave the largest yield it is not worth cultivation owing to the fruit being so soft.

Conrath. This is a blackcap of great promise; plant very vigorous; appears to be hardy and healthy; fruit large and quality first-class.

Columbia. Is not holding its reputation as a vigorous grower: the plant is not as vigorous as some of the blackcap varieties, it is a little tender, but yields well when not injured by the winter frost; berry, large; quality very good; hangs well on the bush.

Golden Queen Plant healthy; fairly vigorous and hardy; color, orange; medium size; quality very good; the best light colored variety.

Gregg. A blackcap; strong grower; a little tender; fruit, large and of good quality; covered with a heavy bloom.

Gault. Is not doing as well as expected at first. Plant fairly vigorous; canes very large, but do not grow laterals enough; fruit, large and firm; quality very good; color, black.

Hilborn The plants that I have under test of this variety I think are not correct. They are the poorest growers and weakest of those that are under test, while a row of Hilborns that was planted a year or two before are vigorous growers and good yielders. The berry is of medium size; quality good; color, black.

Hansell. A very early red variety. Plant about the same as Brandywine, a little earlier but as good a cropper; berry, small and soft; only good for near market.

Johnston's Sweet. Plant of the poorest growth and subject to disease. Berry, very small; is not worth growing.

Kansas. Is a very promising variety; plant, healthy and hardy, vigorous grower of strong canes; it gave the largest yield among the blackcap varieties; fruit, large, firm and of good quality.

Lovett. Plant, healthy ; poor grower ; fruit, black ; medium size ; quality fair ; season, medium.

Lottie. Plant, hardy ; fairly vigorous, but not as productive as it might be ; quality, very good ; color black.

Louden. Plant, healthy and hardy ; not so vigorous as some of the other varieties ; berry, large, of good quality ; color, red ; needs further trial.

Marlboro'. An early red variety ; plant, healthy and hardy ; dwarfish habit ; fruit, firm ; quality, medium ; yielded a little less than Cuthbert.

Miller. A red variety of vigorous growth, hardy and healthy ; season, medium ; berry, firm ; quality, only fair but does not yield well ; needs further trial.

Mammoth Cluster. The name is the best part of this variety ; it is simply worthless.

Ohio A blackcap ; vigorous ; a little tender ; fairly productive ; season, medium ; berry, medium size ; quality, fair.

Pioneer Plant, fairly vigorous ; hardy and productive ; berry, medium size ; quality, very good ; color, black ; profitable.

Phœnix. Plant, moderately vigorous ; healthy and hardy ; foliage, good ; berry; large ; quality, good but not productive enough to make it profitable.

Reliance. Plant, not so vigorous as some others, but hardy and healthy ; berry, rather small and soft ; color, red ; early ; quality, medium.

Rancocas. An early red variety ; medium grower ; healthy and hardy ; berry, rather small and soft ; quality, not quite as good as Reliance.

Red Field. Plant, vigorous ; hardy and healthy ; fruit, small, soft and of rather poor quality. This seems to be a cross between red and black, being purple in color.

Shaffer. Plant, very vigorous ; tender ; subject to disease ; fruit, large, firm ; quality, very good ; color, purple ; a good canning berry but not profitable.

Smith's Giant. A vigorous grower ; a little tender, but healthy ; berrry, large, firm ; quality, best ; color, black. This is a very promising variety if it will only stand the winter. It was damaged a little here last winter.

Superlative. Plant, rather weak and tender, but it has a beautiful foliage when healthy ; berry, very large and firm ; quality, very good ; color, red ; needs further trial.

Strawberry Raspberry. This is supposed to be a native of Japan. Plant, hardy and healthy ; the plant dies down to the ground every fall, growing up again in the spring in increased numbers to the height of twelve to eighteen inches ; the bloom comes out on the end of the canes ; the flowers are large and white, similar to the blackberry ; berry is red in color, large and of a handsome appearance ; the quality is of the poorest ; no use only as an ornament.

Turner. A very hardy variety, but not as vigorous as it might be ; healthy and of fine appearance ; color, red and quality good, but does not yield enough to make it a profitable variety.

Taylor. A blackcap ; plant, hardy ; fairly vigorous and healthy ; fruit, small ; quality, good ; but not profitable.

Thompson. A very early red variety ; plant, healthy and hardy, but not as vigorous as it should be ; berry, soft and small ; medium quality ; good for home use or near market

White Champlain. This is the lightest colored berry of its type ; poor grower ; fairly hardy, but not productive ; quality, fair.

Zetler. This is a local berry of great promise ; vigorous and hardy. The season is about the same as Cuthbert, or a little earlier ; berry, large, firm ; quality, second rate ; color, red.

Fertilizing Experiment.—This experiment was commenced in 1897 by selecting half an acre of the bearing orchard containing a number of varieties. In the month of

August 25 bushels of ashes were applied, and 11 pounds of red clover seed sown. Later on 100 pounds of bone meal was also applied. The fall being very dry the clover did not make much growth, but stood the winter well, and was plowed under after attaining growth of ten to twelve inches. On the first of August of this season instead of the ashes I applied 50 pounds of muriate of potash, and 100 pounds of bone meal and 15 pounds of crimson clover seed. At date of writing this report, November 4th, the clover has attained a growth of six to eight inches. This I shall plow down this fall, as I fear the clover will not stand the winter. No perceptable difference can be seen as to the effect on the growth of trees as yet.

A. E. SHERRINGTON,
Experimenter.

REPORT OF GEORGIAN BAY STATION, CLARKSBURG.

There are now in test at this station 141 varieties of plums, including most of the leading Japans. All are doing well with the exception of a very few whose nature may possibly be to grow slowly.

This season's experience fully confirms that of the past two, that to make plum raising profitable, we must grow only the large and showy varieties. Even quality will not compete against size and appearance, as the actual sales have fully proved.

PLUMS.—The best selling plums this season were Bradshaw and Washington for early; Glass, Quackenbos, Gueii and large Lombards for mid-season; and Pond Seedling, Coe's Golden Drop, Yellow Egg, Reine Claude, and German Prune for late varieties.

Arch Duke. A rather slow grower; habit upright; a great bearer of uniformly large, dark, handsome fruit, with a heavy blue bloom; a good shipper and keeper. Will make a valuable acquisition to our late varieties.

Abundance has done well with me this year for the first time. Three year old trees bore a full crop of most beautiful fruit. Size, medium to large. Shape, nearly spherical to distinctly sharp pointed. Color, yellow or amber, overlaid on the sunny side with dots and splashes of red, and in some cases, where most exposed, nearly covered with a deep blush red. Flesh, yellow, extremely juicy, with a peculiar sweet delicious flavor. Tree strong, upright grower. Fruit ripe this year ten days before Lombard.

Burbank. The most vigorous, spreading and sprawling grower in the orchard. A great bearer of strikingly handsome fruit. Seven eleven quart baskets were taken from three three-year old trees. It is only a few days later than Abundance here, and strongly resembles that variety in shape, but will average larger and rather better quality.

Diamond. A fine, large, late, dark plum; good shipper; tree moderately vigorous; upright grower; bears young; very promising.

Grand Duke. Tree a moderately upright grower; bears young. Fruit, large, dark purple, as large as Coe's Golden Drop, but a few days later. Will be a good shipper. Very promising.

Moore's Early. Valuable for its extreme hardiness. A regular bearer. Tree spreading with rather a scrubby top. Fruit medium size; grows in clusters; dark purple, with heavy blue bloom. Thin skin; fine flavor. Stone very small, and almost free. Good for jellies, jams and preserves.

Golden Prolific. Tree very vigorous, upright grower. Fruit medium size. Skin, yellow with a light bloom. Stone, cling. Very productive, but a poor shipper. Quality, best.

Prune d'Agen. A foreign variety of excellent quality. Tree of moderate growth; branches smooth. Apparently very productive. Fruit, medium sized, oval, slightly necked; suture small; skin violet purple, covered with a thick bloom. Flesh, greenish yellow, juicy, rich and delicious, slightly adherent to the stone. Best quality. Late September.

JAPAN PLUMS.—Contrary to my expectations, the Japan plums are proving themselves very promising. They all wintered well and several fruited a few plums, notably Abundance, Wickson, Red June, Chabot and Burbank, the latter setting fruit so thickly, that one could scarcely see the branches.

APPLES.—The most profitable are the best varieties of commercial winter apples. What is wanted is high colored stock of good quality. The following do exceedingly well here, viz., Baldwin, Ben Davis, Northern Spy and King. The latter should be top-grafted. They will then bear regularly and abundantly.

PEARS.—Until recently pear growing here has been confined to but one or two varieties, viz., Flemish Beauty, Bartlett and Duchess. We have fruited successfully this season, Flemish Beauty, Bartlett, Clapp's Favorite, Belle Lucrative, Beurre Clairgeau, Duchess, Beurre d'Anjou, Howell, Kieffer and Wilder, and we have a number of others quite promising.

CHERRIES.—This was a good season for cherries. Everything we had did well, except Windsor, which made a wonderful show at first, but the fruit gradually shrank up and dropped off, so that very few matured. Only once in three or four years do we get a good crop of Windsor. Ostheim, a Russian variety, which for the past two years bore rather lightly, this year produced a very full crop. Montmorency, English Morello, May Duke, Wragg, and Yellow Spanish are varieties of much promise.

PEACHES.—About seventeen varieties in test at this station. The wood wintered well to the last bud, and several bore a few stray fruits, notably, Bowslaugh's Late, Tyhurst Wonderful, and Smock. The peach "leaf curl" made its appearance here this spring on young Crawfords and Champions. We sprayed rather heavily with Bordeaux, which seemed to check it, for in about three weeks the trees appeared as healthy as ever.

INSECTS.—We were exceptionally free from insects the past season. Curculio and codling moth were all we had to contend with. The usual remedy, Bordeaux and Paris green, was applied.

FERTILIZER EXPERIMENT.—This experiment was tried on one-half acre of bearing plums. Soil, deep sandy loam, in perfect condition. About July 1st, 1897, I spread about twenty-five bushels of unleached ashes and one hundred pounds ground bone. On 12th July I sowed ten pounds red clover. It was nicely up by July 20th. It made thick growth from eight to twelve inches high with a very heavy growth of roots. Plowed under Nov. 23rd. Result: trees this summer had a heavier and darker foliage; fruit rather larger; better color and more bloom than on those not similarly treated.

This experiment has been continued this year on the same half-acre, crimson clover being used in place of red. Further observations will be given in next report.

J. G. MITCHELL,
Experimenter.

REPORT OF SIMCOE STATION, CRAIGHURST.

I received this year for planting six standard apple trees, three standard pears, seven half standard cherries, one plum, one apricot, three currants, one grape vine and one gooseberry, twenty-three varieties in all, comprising the following varieties:

Apples: American Pippin, Aitken's Red, Peter, Winesap, Scarlet Cranberry, Yates' Red. Three of these are duplicates of varieties already growing in experimental grounds.

Pears: Bartlett Seckel, Dempsey, Eastern Belle.

Cherries: Kirsch, Orel 23, Russian 207, Red May, King Amarelle, Straus Weischel, Schattan Amarelle.

Plum: Gold.

Apricot: Harris.

Currants : Pomona, Victoria, Prince Albert.

Gooseberry : Red Jacket, Grape, Campbell's Early.

These have all lived, and although the season was very dry, have made a satisfactory growth. None of the experimental varieties of fruit have failed this year, but all are thrifty and doing well so far.

Strawberries : Many of the new and much lauded varieties are failures under ordinary field culture. While they may produce large specimens under special care and treatment, when they come into competition with some of the old well tried sorts they are not in it. The best all round berry I have tried, since the days of the Wilson, is the Williams. It is firm, withstands drouth well, is healthy in foliage, and maintains its size well to the close of the season. It is also a fairly good bearer, and barring its white tip, it comes well up to the mark as an all round up to date berry. Crescent is still the best bearer, with Haverland a good second. One of the best of the large varieties I have tested here is Little's 44. It has the healthiest foliage; it beats Bubach in this respect. It has a large, strong, vigorous plant, and a good bearer of very large berries; is a trifle soft, but of fine quality. Afton and Warfield are of poor quality, and total failures in a dry season. Hunn, a new variety from New York State, is a very late berry of fair quality and large size, but it is a pistillate, and there is no staminate variety late enough to fertilize it with. Under these circumstances it is handicapped, and only bears a few specimens. It only gets a little pollen from a few late blossoms of some staminate variety. But with a staminate variety beside it, late enough to fertilize it properly, I believe it would be quite an acquisition, as it would extend the season. It was beginning to ripen this year when other varieties were done.

Raspberries : The Cuthbert is still queen of the market, though I believe Louden and Miller will come pretty well up to it. They have not been sufficiently tested here yet, however. This was an off year for raspberries They may be said to have been almost a total failure, owing to the extreme heat and severe drouth. The Columbian was badly winter killed. It is a rampant grower, and does not ripen its wood sufficiently to stand our cold winters. It is not as hardy as Shaffer. I would advise planters in northern sections to go slowly on the Columbian. Turner is a worthless scrub berry. There are better ones growing wild. I am plowing mine under. Of the blacks, Smith's Giant is still to the fore as one of the best black caps tested here. Though the berry does not come up to the Older or Hilborn in quality, yet it is larger and firm. The canes are healthy, hardy and vigorous and a good bearer.

Blackberries : Agawam and Eldorado are the best tested here so far. Several new varieties have not fruited yet.

These, like the raspberries, suffered from the heat and drouth. I hope that next year we shall have enough in bearing for comparative purposes.

Currants : Fays, Cherry, Varsailles and White Grape give the best results. As to the black varieties, I am not sure as yet that the new varieties are any improvement on the older sorts.

Cherries.—Of all the varieties of fruits planted here, none seems better adapted to the soil and climate of this section than the Russian cherries. Some of those will no doubt turn out worthless as to quality, but experience so far has proved that there are many excellent varieties among them. The fruit is large and fine looking, and although very few of them will ever rank as dessert quality, they can hardly be excelled for canning and other culinary purposes. They are, both in tree and fruit, remarkably free from disease. Nine varieties planted in 1894 have not as yet shown any signs of black-knot, though there is plenty of it in the neighborhood. I believe in this connection that cherry and plum trees that are kept well sprayed over both limbs and trunk with Bordeaux mixture so as to cover the bark of the limbs well, will be little affected by the knot. One of the enemies of the cherry is a kind of slug that eats the leaves. It is easily destroyed with Paris Green. The green and black aphis is a more troublesome pest, as it sucks the juices from the leaves. They are on the under side of the leaf and it is difficult to get at them. I would suggest an improved nozzle made to throw an upright or vertical spray so as to strike on the under side of the leaf. These insects can only be destroyed by spraying with something strong enough to kill by contact, such as kerosene emulsion, whale oil soap, tobacco water, etc. But the trouble is that these pests are at their worst at the time when the fruit is nearly ripe. This is especially true of the cherries, and I have found that spraying with kerosene emulsion at this time, in a dry season when there is no rain to wash it off again, leaves a very disagreeable taste on the fruit. The upper surface of a leaf may be covered with Bordeaux, yet the aphis will still thrive on the under side.

PLUMS.—In 1894, quite late in the spring, a bundle of sixteen plum trees were sent to me for planting, each a different variety. Though late and growth well advanced, they all lived, made satisfactory progress, and this year most of them came into bearing. We found little trouble with curculio. The chief enemies to contend with were slugs, aphis, shothole fungus, and, worst of all, plum rot. The variety most affected with rot was the Gueii. Fully a third of this variety was lost through this cause. The others were affected only slightly. Descriptive lists of those which fruited this year are given below.

Of the Japan plums tested here, *Burbank* is far the best so far. The trees of these, two years planted, have nearly a basket of very fine plums, and the growth of new wood on the leading branches measured thirty-two inches.

Abundance has not done very well, seems tender. Shensi also seems too tender for this section. Willard, Satsuma and Ogon promise well. Early Botan (mentioned in my report last year) bore a heavy crop this year, but the fruit was very small, and its main fault is in prematurely dropping from the tree. None of the plums planted here have failed, except three trees of Abundance and one of Shensi. There are several other that have not been planted long enough to describe.

The following plums fruited this year :

Burbank. Bloom on May 20, ripe Aug 30. Fruit conical, large. 1½ by 1¾ in. diameter. Skin purple, covered with a delicate bloom turning dark red when ripe. Suture, obscure : basin broad, shallow ; stalk short. Flesh, yellow, tender sweet, juicy, rich agreeable flavor ; stone, small, cling. A very promising variety. Tree healthy, vigorous, spreading habit of growth ; soil, warm loam cultivated with hoe crops, roots and small fruits between the trees. Fertilizer, stable manure and ashes. Planted in 1894.

Arch Duke. Tree spreading, healthy, moderately vigorous. Fruit large, 1¾ x 1½ inches diameter, oblong, irregular skin dark blue covered with a thick bloom ; cavity narrow ; stem ½ inch ; suture deep distinct. Flesh slightly coarse, medium quality. Stone medium, cling. In bloom May 24th. Ripe Sept. 7th.

Middleburg Tree upright, healthy, vigorous. Fruit large 1¼ x 1½ inches diameter, oblong, slightly rounded at apex ; skin purple, covered with a delicate bloom ; cavity, small ; stem stout, ¾ inch long ; suture obscure. Flesh whitish, juicy, pleasant. Stem, medium. In bloom May 24 Ripe Sept. 10th.

Staunton. Tree spreading, healthy, vigorous. Fruit medium to large. 1½ inches diameter, nearly round. Skin dark blue ; cavity medium ; suture none ; stem stout, ½ inch ; flesh whitish, juicy, agreeable flavor, very good ; stone medium. In bloom May 26th. Ripe Sept. 7th.

Black Diamond. Tree spreading, healthy, vigorous. Fruit, oblong, irregular, inclined to be lob sided, medium to large, 1¼ x 1½ inches diameter. Skin dark blue, covered with thick bloom ; cavity narrow ; basin small ; suture obscure ; stem ¾ inch.

Flesh, whitish, juicy, agreeable flavor, very good.

In bloom May 20th. Ripe Sept. 10th.

In the above descriptions of plums, nothing is said of productiveness, as these were planted in 1894, and fruited for the first time this year, many of them only bearing a few specimens. They will require to be several years in bearing in order to determine their respective or comparative merits in regard to yield. Also, it must not be understood that these, or any of them, are recommended for planting in this district. That can only be determined by several year's trial. A very severe winter may kill most of them. I only describe them as they are this year, four years from planting. But they must have further trial before recommending them.

Gueii. Tree, healthy, vigorous. Fruit medium to large, slightly oblong. Skin dark blue covered with thick blue bloom. Suture obscure, 1½ inches diameter. Basin shallow. Stalk ¾ inch, slender. Flesh sweet, tender, dry, agreeable flavor. Stone; medium, free. In bloom May 20th. Ripe Aug. 30th. Very badly affected with plum rot, fully a third of the fruit rotted, though sprayed with Bordeaux several times. Tree very productive.

Union Purple. Tree upright, vigorous, healthy. Fruit large, 1¾ inches diameter oblong; suture, wide, shallow, obscure: stem ½ inch, stout, set in a deep narrow cavity, basin shallow; skin, dark purple covered with a purple bloom. Flesh, greenish yellow, juicy, rich melting aromatic; stone, large, cling. In bloom May 20th. Ripe Sept. 1st. The best in point of quality yet tested.

Peter's Yellow Gage. Tree upright, vigorous, healthy. Fruit large, 1½ inches diameter, oblong, roundish; skin, greenish, deep yellow when fully ripe; stem 1 inch; cavity shallow: Suture, deep, distinct. Flesh greenish, yellow, juicy, sweet, rich; stone large, cling. Very good to best. In bloom May 24th. Ripe Sept. 4th.

Prince of Wales. Tree upright, healthy, vigorous. Fruit large, 1¼ inches diameter, rounded, slightly conical. Skin, white, overspread with pink, and covered a delicate bloom, Cavity, broad, shallow; suture obscure; stem ½ inch Flesh, greenish-yellow, sweet, juicy, agreeable; flavor very good. Stone medium, cling. In bloom May 24th. Ripe, Sept. 4th.

PEARS.—For a number of years little attention has been given to pears in this district, owing to the belief that they, or most of them, were too tender to succeed here. While this is true to a certain extent yet I believe pears can be grown here quite successfully. Flemish Beauty is quite hardy here, and I am trying the experiment of top grafting more tender varieties on them.

The Russian varieties growing here, viz., Baba, Bessemianka, and Bergamot, seem as hardy as a Duchess apple. The fruit of these varieties I judge will not be up to the mark in quality. One, the Bessemianka, bore a few specimens this year. They were small and of poor quality. The others may be better, but I do not expect much in the way of quality from Russian pears. Their value will be in their hardiness, and suitability as stocks for top grafting. I am working on these, and a number of Flemish Beautys planted for the purpose. Such varieties as Bartlett, Anjou, Sheldon, Lawson, Lawrence, Clapps, Duchess, etc., and so far the experiment is proving successful.

Duchess, grown here as a dwarf on quince roots is not satisfactory. Nurserymen should never use quince roots for pears intended for Northern districts.

APPLES.—Several varieties of apples fruited for the first time this season, descriptions of which are given. One new variety, the Duchavoe, a Russian, is not described, for the reason that it so closely resembles the Hare Pipka, described in a former report, that I fail to see any difference in the two varieties. These two, with the Wolf River, are all akin to the Alexander. They have the same size and color, same texture of flesh and of about the same quality. Wolf River is if anything a little later. But all are apparently of the same origin. They are all fine, large, clean, attractive looking fruit of good cooking quality, and will be valuable as fall market apples.

There seems to be no new winter varieties that are likely to supersede such old tried varieties as N. Spy, Baldwin, Greening, King, etc., in public favor, and I would strongly advise those who are now planting out apple orchards in this section to plant such varieties as Tolman Sweet, Gideon and Haas, and top graft them with the above varieties, as they will in this way get the best and most valuable results in the line of winter apples. The Spy is the most popular winter apple to-day in Canada and the States, and we can never grow too many of them. They will never go begging for a market, and we are not likely to get a winter apple that will ever supersede it. At the same time there is more money in the Duchess than any winter apple, provided a market can be found for them, even if sold for a low price; I have had more profit from the Duchess than any apple I have grown. And as long as I can find a market for them I will continue to grow them. But we must have winter varieties as well, and the advice given above with respect to varieties and the best and most profitable way to grow them is given from practical experience.

McIntosh Red, Fruit, rounded oblate, $2\frac{1}{2}$ by 3 inches in diameter, color dark red when fully ripe slightly mottled with small light dots, stem short, set in a wide shallow cavity, calyx closed, basin small. Flesh white tender juicy mild sub-acid. Core small. Resembles the Fameuse somewhat but much larger. The specimen here described is probably above the average size being grown on a young tree.

Wolf River, Fruit large to very large, $3\frac{1}{4}$ by $4\frac{1}{4}$ inches in diameter; roundish oblate, slightly ribbed, skin greenish-yellow overspread with crimson when fully ripe, with a few very small white dots. Stalk short, set in a deep russet cavity. Calyx nearly closed. Basin large deep often uneven. Flesh, white rather coarse, tender, mild, subacid, good for cooking. Season a little later than Alexander of which it is said to be a seedling, and which it resembles so closely that it is difficult to distinguish between them. A very fine handsome apple valuable for market.

Magog Red Streak, Fruit, medium to large, 3 by $3\frac{1}{2}$ inches, conical, slightly oblong. Skin, greenish yellow, marked with minute black dots and partly shaded and streaked with red. Stem short, stout, set in a medium cavity. Calyx closed. Basin deep, corrugated. Flesh yellowish, coarse, moderately juicy, sub-acid. Core medium.

The above fruits were grown on scions top grafted on seedlings and other trees and would likely be larger than the same fruit grown under ordinary conditions. But the shape, texture, flavor, etc., would be the same.

It must be remembered that the measurements given in these descriptions of fruit are of specimens grown on young trees and are no doubt larger than the same variety would be when the tree gets older and begins to grow heavy crops. Therefore the measurements here given, must not be taken as a true index of the average size of the fruit.

Also in giving the measurements of the season's growth of the varieties, the average growth is given as near as possible of the present year. While this will give a fair idea of the health and vigor of a tree, yet it is not always a sure index of the character of the tree, as a tree of open spreading habit, will have longer growths on the leading limbs than a closely brushy tree with fine willowy limbs, though perhaps not more vigorous.

G. C. Caston,
Experimenter.

REPORT OF BAY OF QUINTE STATION, TRENTON.

There are several of the new and old varieties of pears and apples, the scions of which were top grafted on bearing trees, that are fruiting, on which I give a few notes.

Apples.

Boiken. Top grafted on Royals Jennett in 1895, first fruit last year, large, $3\frac{1}{4}$ B. $2\frac{3}{4}$ H. Yellow, some ripe Nov. 20, and some did not mature until April. First fruit very uneven in shape; some fairly true, others ribbed. This year the shape is more true, color light straw with a little flush cheek in sun; numerous russet dots. None ripe up to this date. Think they will keep better and mature more evenly. Abundant bearer.

White Pippin, grafted on Royals Jennett in 1895; fruited this year. Fruit whitish yellow; numerous grey dots, very firm yet; subject to apple spot; has not made very strong growths.

Scott's Winter, top grafted in 1894; first fruit in 1896; fruit not good. 1897 fruit medium, true in form. Stored in fruit house, kept until April 15th, 1898. Fruit roundish conical, striped, splashed with red, numerous russet dots; pleasant sub-acid; rather small to be of much value.

Cooper's Market, top grafted in 1895. Two imperfect samples this year.

Peck's Pleasant, top grafted in 1895. One specimen.

Jefferis, top grafted in 1895.

Washington Strawberry, top grafted in 1895, and only one apple.

Akin, top grafted in 1895.

Bismarck, tree planted in 1896. One apple.

Utter's Red, top grafted in 1895. First fruit in 1897, round ovate, whitish yellow, with but very little streaks of red on side next sun, but not enough to attract attention. Quality poor; may improve, but the fruit is the same this season. Ripe now, Nov. 7th.

Longfield, planted in 1894. First fruit last year. This year 15 apples, ripened in September; very good; whitish yellow with red on side next the sun.

Winter Banana, top grafted in 1896. A few one-sided specimens this year.

Wolf River, top grafted in 1894. About one peck of imperfect apples this year.

Switzer, top grafted in 1894. One apple ripened in September.

Pears.

Dr. Jules Guyot, two trees planted in 1895. One pear in 1896; one half peck in 1897. Similar in form to Bartlett, and nearly the same in color. Flavor clear sub-acid, good. Did not fruit this year.

Manning's Elizabeth, three trees planted in 1895. Two specimens in 1897; six this year. Fruit small, ripened in August.

Duchess Precoce, top grafted in 1895. Fruited in 1897, and this year a heavy crop of fine, large pears ripened by September 20th. Very promising.

Dorset, top grafted in 1895. Fruit this year, large, fine; not ripe yet (November 7th.)

P. Barry, top grafted 1895, fruited this year, medium size, a winter pear.

Idaho, top grafted, 1895, first fruit 1897, large, a fair crop this year of large pears. Some blight on limbs.

Plums.

Burbank is the only one fruiting, planted in 1895. Exceedingly rapid grower, and formed fruit buds on the main body of the tree within one foot of the ground, and from there all the way to the top of the branches. Came into bloom 2nd May; fruit large, fine, very attractive. Ripe 1st September.

Fertilizer Experiment.—In regard to the fertilizer experiment, the half acre of orchard selected in 1896 for fertilizer experiment is a mixed block, containing Greenings, Baldwins, Seek-no-further, Gravenstein, and one White Doyenne pear tree, all planted seventeen years, and fruiting. The whole of that part of the orchard received in 1895 a fair coating of bone meal, in 1896 the $\frac{1}{2}$ acre received 100 lbs. of bone meal. July, crimson clover seed; it came up good, but made very little top.

In the spring of 1897 all the clover was dead, plowed in May, sowed 100 lbs. bone meal. In July sowed red clover seed; it came up fine, made a good cover. On May the 20th plowed it under, clover two feet high, sowed 100 lbs. bone meal. July 20th sowed 50 lbs. muriate of potash together with crimson clover, but the weather was so dry that the clover did not come up till the last of August, the ground is well covered at present, November 4th.

The surrounding block had in 1897 a thin coating of stable manure, in 1898 a light dressing of ashes, about 40 bushels to the acre. Both blocks received the same thorough cultivation up to time of sowing clover seed. The surrounding block was cultivated twice after.

Results: The foliage was a little better color on the plot, no difference in growth, fruit yield the same, the only difference I could see was an added brightness in the fruit.

W. H. DEMPSEY, Experimenter.

REPORT OF ST. LAWRENCE STATION, MAITLAND.

For 1898 I beg to acknowledge the receipt of the following trees and plants, viz.—

Apples. American Pippin, Parlin's Beauty, Rome Beauty, Starr, Scarlet Cranberry, Winesap.

Pears. Bartlet Seckle, Eastern Belle, Petite Marguerite, Wilder.

Plums. Blood, Berckmans, Coe's Violet, Lombard Improved, Yellow Prolific, Normands, Stark's Green Gage, Seedling, Gold.

Apricot. Harris.

Grapes. Campbell's Early.

Currants. Pomona, Victoria Rd., Prince Albert.

All of which lived and made fair growth.

All the apples now on test, numbering about sixty varieties, have lived well and made satisfactory growth with the exception of one tree of Downing's Winter Maiden's Blush that was killed through accident. Yellow Transparent, planted 1896, and Magog Red, planted 1897, blossomed and set a little fruit, but it did not reach maturity.

In my commercial orchard Fameuse, Scarlet Pippin, Golden Russet and Tolman Sweet set well and gave a fair crop of well grown fruit.

Canada Red and Yellow Belleflower were white with bloom, but did not set two per cent. of fruit. Other varieties did not bloom with me this year.

The annual record attached to this report shows very promising for plums and pears. They are making a wonderful growth and have withstood the effects of two winters without injury, with the exception of one or two cases of blight as shown in report.

The insects were the worst on record this spring. Tent caterpillars destroyed so much foliage in unsprayed orchards that they looked as though they had been swept by fire. Bud moths were so thick that they destroyed the opening buds on young trees, killing them outright in some cases. Oyster shell bark louse are so thick that they overlap completely, covering the limbs on many trees and even the fruit was covered in the worst cases. Cigar case bearer and codling moth not bad. The black spot fungi about as bad as in 1897.

SPRAYING RECORD FOR 1898.

April 18, 19. Sprayed Bordeaux and Paris green; buds opening.

May 11, 12. Sprayed Bordeaux and Paris green; blossoms opening.

May 27, 28. Sprayed Bordeaux and Paris green; blossoms fallen, bud-moth doing serious damage.

June 9, 10. Sprayed Bordeaux mixture and Paris green; apples set fairly well, spot showing badly on fruit, particularly on east side of tree.

June 16. Bordeaux; spot checked and apples growing rapidly.

July 11. Bordeaux ; spot made no further development since June 10th.

July 11. Unsprayed apples all badly spotted around blossom end.

Results of being sprayed six times:

Fameuse. Sixty to 75% clean, well grown and colored; unsprayed, none clean, small and misshapen.

Scarlet Pippen. One hundred per cent. clean, large and colored; unsprayed, 50% clean.

Golden Russet. One hundred per cent. clean; unsprayed 60% clean.

Canada Red. Ninety per cent. clean; unsprayed 30% clean.

Fameuse. Sprayed three times; last spraying, made May 27, 10% clean.

Tent caterpillars were all destroyed with first and second sprayings and bud moth checked, but the Bordeaux had no effect upon the oyster shell bark louse, the sprayed trees are as badly infested as the unsprayed. The trees on the half acre of bearing apple orchard that has been treated with twenty-five bushels wood ashes, 100 pounds of bone meal and sown with ten to fifteen pounds of clover annually for two years are in a very healthy condition and are making fair wood growth and setting fruit buds annually.

I can see no difference in the results between the above treatment and the plot under annual cultivation with the application of five tons per acre barnyard manure in the late fall. But both the above mentioned plots are in far better condition than the plot in sod; the bark is cleaner, wood growth more vigorous and foliage is of a dark green color, and nearly double the size of the leaves on the trees in sod and a dry summer or fall does not affect the foliage on the cultivated ground whereas the foliage on the trees in sod turn yellow and drop off in many cases before frost. There is the same difference to be noticed in the fruit, with the exception that the fruit in sod is higher colored than on cultivated ground.

HAROLD JONES,
Experimenter.

REPORT OF STRAWBERRY SUB-STATION, FREEMAN.

The season of 1898 was very favorable for a good crop. The crop was an immense one, and on account of this, no doubt, and strawberries having for two or three years paid the best of all small fruits, an enlarged acreage was planted. Prices were low, but the fancy berries brought a good figure. The fall of 1897 was favorable to the growth of plants, so that very wide rows were made. These rows, if not thinned out and harrowed, would produce a very large crop of medium to small sized berries. The standard varieties have held their place, while one or two new varieties have made a very favorable showing.

The Clyde did very well and easily stands at the head, the very best reports coming from all places where it is grown and no unfavorable ones. In the list of those that did the best with me I would place: Bubach, Haverland, Saunder's, Woolverton, Margaret, Seaford, Nick Ohmer, Tennessee Prolific, Brandywine, Bisel, VanDeman, Beder Wood, Glen Mary, Splendid, Bismarck.

Among the new ones fruited for the first time are the following:

Bird. Imperfect blossom. A seedling of Manchester and Mount Vernon by W. F. Bird, of Ann Arbor, Michigan. The plant is quite healthy and a good grower, making runners freely; berry medium to large in size; roundly conical; scarlet in color; flesh pink, medium in firmness; fine quality and quite productive. Worthy of a trial.

Cobden Queen. Imperfect blossom. A seedling of the old Wilson by John McCaffery, of Cobden, Illinois. Is a good strong grower, a good runner, but has some rust at times. The berry is round, crimson in color, seeds red, flesh pink and medium in firmness, fair quality, quite productive. No better than many others.

Benoy. Perfect. Seedling of Bubach and Jessie by Mr. R. Benoy, of Indiana Plant a strong robust grower, somewhat like Sharpless ; makes runners freely and free from rust ; berry large as Sharpless, crimson ; seeds red and imbedded, flesh red, solid, firm and good quality. Worth trying.

Earliest. Perfect blossom. Very much resembles the Michel's Early in every respect, both in plant and fruit and season. If it is not the Michel's Early under a new name it is a seedling so closely resembling the Michel's Early that I cannot distinguish between them.

Geisler. Perfect blossom. Fine healthy plant and a good runner ; blooms very early. The berry is large, bright dark scarlet ; flesh light in color, medium in firmness, and good quality ; oblong in shape. Worth a trial.

Hall's Favorite. Perfect blossom. A chance seedling grown by J. W. Hall, of Maryland. Plant healthy, a good grower, plenty of runners. Berry medium to large in size ; scarlet ; flesh light scarlet, solid and medium in firmness ; obtuse at end something like Crescent : quality good ; medium in productiveness.

Jerry Rusk. Perfect bloom. Seedling from Bubach and Jessie, by Mr. Ran. Benoy, of Indiana. Plant a good strong grower, healthy and free from rust, makes many plants. The berry is rounding conical ; bright crimson ; golden seeds ; flesh red, medium in firmness ; good quality and quite large and productive. Worth trying.

Jersey Market. Imperfect bloom. Introduced by J. T. Lovett, of New Jersey. This variety was not in a good place, had not a fair chance, would not like to judge it by what it did with me under unfavorable conditions.

King's Worthy. A seedling of E. W. Cone. The plant resembles the Bubach ; healthy ; some fine large berries, but not productive enough.

Kyle No. 1. Perfect bloom. A chance seedling ; plant small and does not stand dry weather. The berry small and irregular, with neck. Not valuable.

Leheigh. Imperfect bloom. A good grower, coming from Pennsylvania, by W. B. K. Johnson. Only medium in size ; quite productive. Not valuable here with me.

Mayflower. A second Michel's Early ; about as good, no better.

Manwell. Perfect bloomer. Supposed to be a cross of Sharpless and Crescent by Allen D. Manwell, of Vinton, Iowa. The plant is a strong, healthy grower ; no trace of rust ; the berry is large, scarlet ; seeds pink, imbedded ; the first berries sometimes double and hollow ; medium in firmness, quite productive and worthy a trial.

Mastodon. Imperfect bloomer. Sent out by Mr. Saltzer. Plant a strong, robust, healthy plant, resembling the Bubach very much. A second Bubach in fact in all points Berry is very large, beautiful bright scarlet, medium in firmness. In looking at a box of them you would say they are Bubach. I cannot distinguish between the two. It must be a seedling very closely resembling its parent Bubach.

Sixteen Nick Ohmer. Perfect bloomer. A seedling of Middlefield. The grower is Mr. G. Beamer of Ohio. The plant is a strong, vigorous, healthy grower, making runners freely, thus making a good row. The berry is large, roundly conical, bright crimson, gold seeds prominent, a beautiful looking berry ; flesh pink and firm ; very good quality and quite productive. A good one and worth trying.

Perfection. A seedling sent out by Mr. Saltzer. The plant is healthy and a good grower ; the berry is fair sized, with a neck ; very good quality ; somewhat rough ; medium in productiveness ; not very desirable.

Ponderosa. This is another seedling, I believe, of the Bubach. Plant healthy and a good runner, making many plants. The berry is quite large, but rough, resembling the Glen Mary a good deal ; dark crimson ; seeds golden and imbedded ; flesh red ; berry solid and firm and of good quality ; quite productive. The berry is like the Glen Mary.

Seaford. Perfect bloomer. A chance seedling. The plant is a strong, vigorous, healthy grower, a good runner, making plants freely. The berry is large, crimson in color, with golden seeds; solid and firm; flesh scarlet, very firm and very good quality. A good one and should be tried by all strawberry growers.

Shire Imperfect bloomer. The plant is healthy and is a good strong grower. The leaves curl back like the Grenville The berry is medium to large; dark scarlet; round in shape; flesh red, firm and good quality. Quite productive.

Seek-no-Further. Perfect bloom; by Mr. J. M. Wickizer. Another of the Bubach type, but not so good by a long way. I desire to give a further trial before finally pronouncing upon it.

Two Teft Seedling. A good plant maker. A strong, healthy grower. The berry is medium in size, round and somewhat irregular; scarlet is color with gold seeds prominent; flesh pink, of fair quality and medium in productiveness. There are many others better.

Stahelin, Fred. Imperfect bloomer. A chance seedling found by F. C. Stahelin, of Bridgeman, Mich. The plant is very vigorous and healthy, making plants very freely. The berry is large, roundly conical; bright light crimson in color with gold seeds; flesh pink; medium in firmness, good quality and quite productive. Worth a trial.

Planters cannot go astray in planting any of the above varieties as recommended worth a trial. The plants have not made as vigorous a growth this season as last year on account of the long, dry and very hot season. The rows are much narrower than usual, but I expect the fruit will be finer and larger on that account.

E. B. Stevenson,
Experimenter.

REPORT OF GOOSEBERRY SUB-STATION, NANTYR.

The severe scourging the bushes received in 1897 when the foliage rotted early in the season affected the fruitfulness this year and most varieties bloomed very sparingly. Red Jacket, Downing, Pearl and Oregon Jumbo were less affected than any others and bore a nice crop this year, Autocrat also escaped fairly well and bore a large crop of fine berries. For eating, when ripe, this berry is hard to excel.

Spraying was commenced this year on March the 25th, by using four pounds of blue stone to forty gallons of water. Spraying with Bordeaux and liver of sulphur was kept up till fruit was fully grown, five sprayings being given.

No difference could be detected between those sprayed with Bordeaux and those sprayed with liver of sulphur, all being affected upon foliage and some spots upon fruit.

Being convinced that spraying for mildew must be largely preventive, I shall spray this fall with pure blue stone water, four pounds to forty gallons, and again in spring before leaves come out.

In spraying with Paris green in Bordeaux for gooseberry worm, I find four ounces of green to forty gallons not strong enough, so increased to six and to eight ounces to forty gallons, or a coal oil barrel full before it had the desired affect. Foliage was not injured.

Of the newer varieties under test, Red Jacket and Oregon Jumbo, which seem to be identical, are certainly the most vigorous, but so far are not equal to Pearl in productiveness. Success and White Crystal and a variety called Red Champion are too small. Crosby's Seedling is certainly a monster and a red one at that. It has vigor, too, which is shown by its bearing a nice crop this year after the experience of 1898. Dominick made a nice growth of wood but did not give a berry. Queen, Chautauqua and Whitesmith bore a few berries, each very much alike.

All my bushes made a fine growth of wood this season.

In spraying nursery stock of gooseberries for mildew upon cliage, I find it is no use spraying if mildew is permitted to get hold, as it turns the leaves affected black and they soon rot and fall off. Prevention is not better than cure in this case, but is the only *cure.*

The Ohampion, when not affected by mildew, is the most productive variety yet tested, and is fit to use green (for those who choose to use this fruit in this condition), at least two weeks earlier than any other. It was badly affected with mildew in 1897, and killed badly last winter as did Triumph.

S. Spillett,
Experimenter.

Sir,—I beg to report size and weight of some of the leading varieties:

Variety.	Size in inches.	Weight of 12 berries.
	inches.	ozs.
Autocrat	$\frac{15}{16}$ by $\frac{14}{16}$	$2\frac{2}{5}$
Chautauqua	1 " $\frac{15}{16}$	3
Crosby's Seedling	$1\frac{1}{4}$ " 1	$4\frac{1}{2}$
Champion	$\frac{14}{16}$ " $\frac{12}{16}$	$1\frac{5}{12}$
Cook's Eagle	$1\frac{1}{8}$ " $\frac{14}{16}$	3
Downing	$\frac{11}{16}$ " $\frac{9}{16}$	$1\frac{1}{5}$
Green Chisel	$\frac{11}{16}$ " $\frac{12}{16}$	$1\frac{1}{2}$
Ingram's Ocean	$1\frac{1}{16}$ " $\frac{14}{16}$	3
London	1 " $\frac{13}{16}$	$1\frac{1}{5}$
Lancdolet	$1\frac{1}{4}$ " $\frac{13}{16}$	$2\frac{1}{4}$
Red Jacket	$\frac{13}{16}$ " $\frac{14}{16}$	2
Ontario	$\frac{13}{16}$ " $\frac{13}{16}$	
Pearl	$\frac{12}{16}$ " $\frac{13}{16}$	$1\frac{5}{12}$
Oregon Jumbo	$\frac{13}{16}$ " $\frac{14}{16}$	2
Winham's Industry	1 " $\frac{14}{15}$	$2\frac{3}{4}$
Chance Seedling	1 $\frac{3}{5}$	3

APPLES.—*W. H. Dempsey, Experimenter, Bay of Quinte Station, Trenton, Ont.*

Varieties.	Origin.	Habit of tree.	Fruit.									
			Size in inches of length and breadth.	Form.	Skin.	Stem.	Cavity.	Calyx.	Basin.	Flesh.		
										Color.	Texture.	Flavor.
Adam's Pearmain.	England, Herefordshire	U.S	2½, 2½.	r. ov ...	y., partly rus. st., str. with r.	⅓ in....	sh ..	open ...	pl.......	yh ..	crisp, juicy, rich	sub-acid, aromatic.
Antonovka	Russia	S ..	2¼, 2½.	ov. c ...	wh., dark red in sun, sprinkled thinly with rus. d, covered with a rich ph. bloom.	¼, often a mere nob.	b. s	open ...	pl., even.	w ...	crisp, juicy	sub-acid.
Cayuga Red Streak (20-ounce).	Connecticut, U.S	S. D	3, 3¼	rh	gh. yel. str. and sp. with r.	¼ to ½ heavy.	d. w	small, closed.	ang	w ...	coarse	brisk, sub-acid
Cellini	England (T. Phillips, Vaux Hall)	U S	3, 3..	rh. ob ...	y., nearly covered with br. r. in shade with str. mot., da.c. in sun.	¼	d ...	open ...	pl.......	w ...	tender, juicy	brisk, pleasant sub-acid.
Colvert	America	S ..	2⅓, 2..	ob. con..	gh. y. str., sp. with dull r. in sun.	½	d ...	p. closed	w	gh. w	tender......	sub-acid.
Cox's Orange Pippin.	Mr. Cox, Colnbrook Lawn, Eng., supposed to be from seed of Ribston Pippin in 1830.	U.S	2, 2¼.	rh. ov....	y. str. and nearly covered with da. r. in the sun, rus. in cav.	⅓, fleshy.	n. d.	open ...	pl., sh...	yh ..	tender, crisp	juicy, rich, sub-acid, aromatic.
Cranberry Pippin.	Hudson, N.Y., U.S ..	S ..	3, 3½.	rh. ob ...	y., br. r. with str. and sp. of da. r.	½ to ¾ ...	b ...	closed .	wr	w ...	coarse	sub-acid.
Early Harvest..	America	S ..	2, 2¼.	rh	y. or br. straw color, a few dots.	½ to ¾, slender	sh ..	closed .	even, sh.	w ...	tender	crisp, sprightly. sub-acid.
Early Joe	America	U.S	2⅓, 2¼.	rh. ...	yh, str., st. with r.	½ to ¾ ...	n ...	closed .	even ..	wh..	tender	sub-acid.
English Codling.	England	S ..	3, 3¼.	ov	lemon y., some times flush cheek in sun.	½	d ...	closed .	ang., fur	w ...	tender	pleasant, sub-acid.
Fall Jenneting .	America	S ..	3, 3¼.	ob. slightly ribbed	gh. y., with a dull blush on side next the sun.	¾	d ...	closed .	even	wh .	tender	sub-acid.
Haas (Fall Queen).	America	U.S	2½, 3..	ob slightly con.	y., nearly covered with light r., with sp. and st. of darker r., nu. w. dots, g. around cavity.	¼........	d ...	closed .	even ...	wh., stn. with r. next skin.	tender	sub-acid.

Habit.
D.—Drooping.
S.—Spreading.
U.—Upright.

Form.
Ac.—Acute. An.—Angular. Con.—Conical. Cor.—Corrugated. Ob.—Oblate. Ov.—Ovate. Obo.—Obovate. Obl.—Oblong. Obt.—Obtuse. Pyr.—Pyriform. R.—Round. Rh.—Roundish. Tur.—Turbinate.

Cavity.
B.—Broad. D.—Deep. N.—Narrow. Sh.—Shallow.

Basin.
Ab.—Abrupt. Ang.—Angular. D.—Distinct. Ev.—Even. Fur.—Furrowed. Pl.—Plaited. Rib.—Ribbed. Wr.—Wrinkled. W.—Waved.

Color.
A.—Amber. B.—Brown. Bh.—Brownish. Bl.—Blush. Blo.—Bloom. Blot.—Blotched. Br.—Bright. C.—Crimson. Clo.—Clouded. D.—Dots. Da.—Dark. F.—Fawn. G.—Green. Gh.—Greenish. Mar.—Marbled. Mot.—Mottled. Nu.—Numerous. O.—Orange. P.—Purple. Ph.—Purplish. Pa.—Pale. R.—Red. Rus.—Russet. Sp.—Splashed or Splashes. St.—Striped. St.—Streaked. Sta.—Stained. Sun.—Sunny Side. Spo.—Spotted. V.—Violet. W.—White. Wh.—Whitish. Y.—Yellow. Yh.—Yellowish.

APPLES.—Annual yield and selling price of varieties of apples at Bay of Quinte Station, 1898.

Varieties.	Age.	Thinning—per cent. by hand or accident.	Time of blooming.	Date of maturity.	Date of gathering.	Yield.	Grade, per cent. Class 1.	Class 2.	Class 3.	Storage. Place.	Temperature	Date of decay.	Average price.	Remarks. On conditions of cultivation, spraying, manuring, etc.
	years.	%				bush					°		bbl.	
Adam's Pearmain	18	1	May 8	Jan.	Oct. 18	2	1½	¼	¼	Fruit house	30 to 15.	March 28	$2 00	Dwarf tree growing in sod.
Antonovka	18	5	" 7	Feb.	" 18	2	1	¾	¼	"	"	May 15	1 50	"
Cayuga Red Streak (20-ounce)	25	5	" 8	Nov.	" 7	7	5	1	1	Ship. to Montreal.	......	......	1 25	Well cultivated.
Cellini	20	2	" 9	Nov.	Sep.	7	6	1	...	"	......	......	2 00	Dwarf tree growing in sod.
Calvert	25	5	" 8	Oct	Sep 28	15	12	2	1	"	......	......	1 50	Well cultivated.
Cox's Orange Pippin.	8 yrs topgraft	2	" 7	Jan.	Oct. 6	5	4	¾	¼	"	......	......	3 00	Well cultivated and manured with stable, bones & ashes.
Cranberry Pippin.	22	5	" 8	Feb	Oct	7	6	1	....	Fruit house.	30 to 45.	March 28	3 50	Well cultivated, stable manure.
Early Harvest	35	5	" 6	July, Aug	July, Aug	8	6	1	1	"	......	......	75	
Early Joe	30	10	" 6	"	"	15	9	4	2	......	......	......	75	
English Codling	25	5	" 7	Aug., Sep.	Aug. 20, Sep.	8	7	½	½	......	......	......	75	
Fall Jenneting	15	5	" 7	Sep., Oct.	Sep., Oct.	6	4	1	1	......	......	......	75	Well cultivated; manured with stable and ashes
Haas	15	2	" 8	Sep., Oct	20 Sep	6	4	1	1	......	......	......	75	"

APPLES.

Yield and selling price of varieties of Apples at East Central Station, 1898.

Varieties tested by R. L. Huggard, Whitby.	Age.	Time of blooming.	Date of maturity.	Date of gathering.	Yield.	Grade. Per cent. Class 1.	Class 2.	Class 3.	Storage. Place.	Temperature.	Average price.	Remarks on conditions of cultivation, spraying, manuring, etc.
											$	
American Golden Russet	22 years.	....	Jan., May	Oct. 19	4½ bush	85	10	5	....	....	2 00	Hardy and profitable.
Astrachan	22 "	....	Aug. and Sept.	Aug. 16	6½ "	65	20	15	....	....	1 25	No good demand for the stock
Baldwin	22 "	....	Dec., March	Nov. 1	15 "	80	15	5	....	....	2 00	A splendid kind.
Bell Flower	22 "	....	Dec., Feb	Nov. 1	15 "	70	20	10	....	....	2 00	Good cooker and keeper.
Blue Pearmain	14 "	....	Nov., April	Nov. 3	1½ "	75	15	10	....	....	2 00	
Boston Star	22 "	....	Nov., Dec	Sept. 20	16 "	85	10	5	....	....	2 00	Best yielder in orchard.
Canada Red	18 "	....	Dec., April	Nov. 5	3 "	60	25	15	....	....	2 00	Poor cropper this season.
Chenango Strawberry	14 "	....	Sept	Aug. 27	6 "	70	20	10	....	....	1 25	Not much sale for this kind of stock
Duchess of Oldenburg	18 "	....	Sept	Aug. 24	6 "	90	10		....	....	1 25	A profitable apple.
Early Harvest	22 "	....	Aug. and Sept	Sept. 4	4½ "	60	20	15	....	....	1 00	Slow growing and poor bearing trees.
Fameuse	22 "	....	Oct., Dec	Sept. 29	7 "	70	15	15	....	....	2 00	Subject to fungus.
Fall Pippin	22 "	....	Oct., Dec	Oct. 3	3 "	70	15	15	....	....	2 00	No use to plant largely.
Grime's Golden	22 "	....	Dec., March	Oct. 14	½ "	50	10	40	....	....	....	
Holland Pippin	22 "	....	Oct., Dec	Oct. 29	4½ "	70	10	20	....	....	2 00	Very subject to fungus.
Kentish Fillbasket	19 "	....	Sept. and Oct	Sept. 12	½ "	60	5	35	....	....	....	A very fancy stock, not profitable.
King of Tompkins Co.	22 "	....	Oct. and Nov	Oct. 15	5 "	80	15	5	....	....	2 00	A1 variety.
Haas	22 "	....	Sept and Dec	Sept. 29	15 "	75	15	10	....	....	1 50	A rampant bearer.
Minkler	19 "	....	Jan., April	Nov. 4	12 "	85	10	5	....	....	2 00	A very hardy, profitable variety.
McMahon's White	18 "	....	....	....	....	....	....	....	....	....	....	Top grafted in 1895, makes good growth.
Maiden's Blush	18 "	....	Oct., Dec	Oct. 24	3 bush.	75	10	15	....	....	2 00	A nice fancy apple.
Northern Spy	22 "	....	Jan., March	Nov. 3	16 "	80	15	5	....	....	3 00	A splendid apple, but slow bearer.
Ontario	18 "	....	"	Nov. 4	6 "	80	....	....	....	....	2 50	A splendid apple and profitable.
Pewaukee	18 "	May 21	"	Oct. 15	5 "	70	25	5	....	....	2 00	Dropped prematurely.
Princess Louise	10 "	" 20	Dec., Feb	" 10	4 "	60	35	5	....	....	2 00	Fruit variable.
Rhode Island Greening	22 "	" 24	Jan., March	" 10	6 "	95	5	....	....	....	2 00	Good for general planting.
Ribston Pippin	18 "	" 20	Nov., March	" 8	3½ "	60	40	....	....	....	2 00	Dropped prematurely.
Salome	9 "	" 24	Jan., May	" 28	6 "	80	15	5	Barn cellar	40° F.	....	A good profitable variety.
Seek No Further	9 "	" 24	Oct., March	" 20	2½ "	80	10	10	....	....	2 00	A medium variety.
Swaze Pomme Gris	19 "	" 20	Nov., Jan	" 25	5½ "	75	10	15	....	....	2 00	Too small for market, but A1 for dessert.
Swaar	10 "	" 20	Dec., March	" 29	3 "	80	12	8	....	....	2 00	A first-rate grower.
Twenty Ounce	22 "	" 24	"	" 10	5 "	70	20	10	....	....	2 00	Not a very vigorous grower but bears well.
Talman Sweet	22 "	" 26	Oct., March	" 15	3 "	60	30	10	....	....	2 00	Not a profitable apple to plant.
Wagener	22 "	" 24	"	" 12	6 "	75	20	5	....	....	2 00	Too slow a grower.
Wealthy	12 "	" 20	Sept. and Dec	" 8	7½ "	70	20	10	....	....	2 00	Too abundant; fruit small.

APPLES.

Results of experiments in cultivation, pruning, spraying, at Bay of Quinte Station, 1898.

Varieties.	When planted.	Soil and cultivation.	Fertilizers used.	Pruning. Date, method & percentage of wood growth removed.	Results. Growth in inches.	Results. Vigor, scale 1-10.
Downing's Winter Maiden's Blush	May, 1896	Sandy loam with clay subsoil; cultivated till July 12th then sowed to buckwheat.	One quart bone meal to each tree.	Apl., pd.	24	8
Shackleford	"			"	20	8
Barry	"		" "	"	25	8
Western Beauty	"		" "	"	23	8
Walbridge	"	" "	" "	"	26	9
Sultan's Beauty	"	" "	" "	"	16	7
Star	"	" "	" "	"	13	6
Walter Pease	"	" "	" "	"	30	9
Beauty of Bath	"	" "	" "	"	30	9
Dudley's Winter	"	" "	" "	"	32	9
Talman Sweet	"	" "	" "	"	20	8
Bismarck	"	" "	" "	"	12	6
Boiken	May, 1897	" "	" "	"	20	8
Peter	"	" "	" "	"	17	7
Newtown Pippin	"	" "	" "	"	14	6
Lankford	"	" "	" "	"	18	7
Aiken's Red	"	" "	" "	"	17	7
Milding	"	" "	" "	"	16	7
Yates' Red	"	" "	" "	"	26	9
Scarlet Cranberry	May, 1898	" "	" "		5	
Gano	"	" "	" "		8	

APPLES (Crabs). Tested at Simcoe Experiment Station.

Varieties.	When planted.	Soil and cultivation.	Fertilizers used.	Pruning. Date, method and percentage of wood growth removed.	Insects. Name.	Insects. Treatment.	Growth in inches.	Vigor, scale 1-10.
Crab Apples.								
Telfer Sweet	95	Loam clean.	Stable and ashes.	June; about one-fifth removed.	Tent caterpillar, web worm.	Bordeaux & Paris grreen	13	6
Martha	95	"					14	7
Whitney	95	"	"	....		....	18	9
Paul's Imperial	95	"	"	....	....	....	14	7
Minnesota Winter	95	"	"	....	....	....	15	7
Van Wycke	95	"	"	....	....	....	11	5
Picta Stricta	95	"	"	....	....	....	13	6
Quaker Beauty	95	"	"	....	....	....	18	9
Orion	95	"	"	....	....	....	15	7
Apricots.								
Apricots	96	Loam clean.	Stable and ashes.	....	....	....	....	....
Purple	96	"		....	....	....	15	7
Alexander	96	"	"	....	....	....	16	8
Alexis	96	"	"	....	....	....	22	10
Gibb	96	"	"	....	....	....	21	10
Nicholas	96	"	"	....	....	....	22	10

Apricots not troubled with either insects or fungi.

APPLES.

Tested at Simcoe Station.

HABIT.—D., drooping; S., spreading; U., upright. SUTURE.—D., distinct; L., large; Ob., Obscure; Obs., obsolete. FORM.—Ac., acute; An., angular; Con., conical; Cor., corrugated; Ob., oblate; Ov., Ovate; Obo., obovate; Obl., oblong; Obt., obtuse; Pyr., pyriform; R., round; Rh., roundish; Tur., turbinate. CAVITY.—Ac., acute; Acu., acuminate; B., broad; D., deep; N., narrow; Sh., shallow. BASIN.—Ab., abrupt; Ang., angular; D., distinct; Ev., Even; Fur., furrowed; Pl., plaited; Rib., Ribbed; Wr., wrinkled; W., Waved. COLOR.—A., amber; B., brown; Bh., brownish; Bl., blush; Blo., bloom; Blot., blotched; Br., bright; C., crimson; Clo., Clouded; D., dots; Da., dark; F., fawn; G., green; Gh., greenish; Mar., marbled; Mot., mottled; Nu., numerous; O., orange; P., purple; Ph., purplish; Pa., pale; R., red; Rus., russett; Sp., splashed or splashes; St., striped; Str., streaked; Sta., stained; Sun., sunny side; Spo., spotted; V., violet; W., white; Wh., Whitish; Y., yellow; Yh., yellowish.

Varieties.	Origin.	Habit of tree.	Fruit.			
			Size in inches of length and breadth.	Form.	Skin	Stem.
Duchavoe	Russia	S	3 x 3½	Con	Yellow, overspread with red.	Short, stout.
McIntosh Red	Canada	S	2½ x 3	Rh., Ob	Da. R.	Short
Okabina	Russia	S	2¼ x 2½	R	Light yellow, splashed with red	Long, slender.
Magog Red Streak	Vermont, U.S.	U	3 x 3½	Con. Obl	Gh. Y., shaded and streaked with red.	Sh
Wolf River	Wisconsin, U.S.	S	3¼ x 4½	Rh. Ob.	Gh. Y., overspread with crimson.	Sh

Tested at Simcoe Station.—*Continued.*

Varieties.	Fruit.						
	Cavity.	Calyx.	Basin.	Core, stone, seeds.	Flesh.		
					Color.	Texture.	Flavor.
Duchavoe	D., N.	P. C	Pl	Med	White	Coarse	Sub-acid.
McIntosh Red	Sh	C	Small	Small	W	Tender, juicy	Mild, sub-acid.
Okabina	Sh	C	Sh	M	White	Tender, pleasant	Sub-acid.
Magog Red Streak	Sh, N.	C	Deep	M	Yh. W	Coarse, moderately juicy.	Sub-acid.
Wolf River	D	Partly closed	Large deep rib	M	W	Coarse	Mild, sub-acid.

APPLES.

Results of experiments in cultivation, pruning, spraying, at Simcoe Station, 1898.

Variety.	When planted.	Soil and cultivation.	Fertilizers used.	Pruning.	Insects.		Fungi.		Results.	Growth in inches.	Vigor, scale 1-10.
				Date, method and percentage of wood growth removed.	Name.	Treatment.	Name.	Treatment.			
Anisim	95	Warm, rich loam, with a retentive sub-soil, originally very stoney; small fruits and other hoecrops are grown between rows of trees.	Stable and ashes.	June; pyramid forms; about ⅓, afterwards a few twigs annually.	Tent caterpiller. Aphis.	Bordeaux with Paris green.	Fusciladium slight	Bordeaux	Healthy foliage; no damage from Tent Caterpillar or other leaf-eating insects; slight damage from aphis.	17	9
Bogandoff	94									18	9
Barry	94									18	8
Boiken	97									18	8
Belle De Boskoop	94									17	8
Cooper's Market	96									18	8
Duchavoe	94								Bore a few samples of very fine, clean fruit.	22	10
Enormous	94									23	10
Fallawater	96								A very strong grower.	20	10
Gravenstein	96									20	10
Gideon	95									20	10
Gano	95									15	8
Haas	94									20	10
Hastings	95									16	8
Lubsk Queen	95									20	9
McIntosh Red	94									15	8
Longfield	94									20	9
Orel Not (Russian)	94									20	9
Ontario	95									20	9
Primate	95									14	7
Peerless	95									18	8
Romanskoe	94									19	10
Sweet Bough	95									16	8
Salome	95									14	8
Sherwood's Favorite	95									16	8
Shackleford	95									18	9
Stark	94									18	9
Shiawassee Beauty	94									15	8
Sutton's Beauty	24									12	6
St. Lawrence Winter	94									13	6
Titovka (Russian)	94									20	10
Vandevere	95									13	6
Wolf River	95									20	10
Yellow Transparent	94									20	10

An experiment showing comparative results with three leading varieties of apples

Four trees of each variety were selected, the Duchess as the leading early apple, the
Though I could not get them all of the same age, for the obvious reason that the Spy
them. Still it serves to show something of the comparative merits of the varieties.

APPLES.—Yield and selling price of three

Variety.	Age.	Thinning—per cent. by hand or accident.	Time of blooming.	Date of maturity.	Date of gathering.	Yield.	Grade per cent. Class 1.	Class 2.	Class 3.
Four trees, Duchess	11 yrs., planted in '87.	....	May 18...	Aug. 20.	Aug. 20.	4 bbls.	95%	5%	....
" " Wealthy ...	10 " " '88.	....	May 25...	Sept. 25.	Sept. 25.	4 bbls.	50%	25%	25%
" " Northern Spy	17 " " '81.	....	May 30...	Oct. 15.	Oct. 15	8 bbls.	90%	10%	....

All received same treatment as to

CHERRIES.

HABIT.—D., Drooping; S., Spreading; U., Upright. SUTURE.—D., Distinct; L., Large; Ob., Ob-
Oblate; Ov., Ovate; Obo., Obovate; Obl., Oblong; Obt., Obtuse; Pyr., Pyriform; R., Round; Rh.,
row; Sh., Shallow. BASIN.—Ab., Abrupt; Ang., Angular; D., Distinct; Ev., Even; Fur., Furrowed;
Brownish; Bl., Blush; Blo., Bloom; Blot., Blotched; Br., Bright; C., Crimson; Clo., Clouded; D.,
ous; O., Orange; P., Purple; Ph., Purplish; Pa., Pale; R., Red; Rus., Russet; Sp., Splashed or
W., White; Wh., Whitish; Y., Yellow; Yh., Yellowish.

Varieties tested at Simcoe Station.	Origin.	Fruit. Habit.	Size in inches of length and breadth.	Form.	Suture.	Skin.
Grenner Glass	Russia	S	$\frac{5}{8}$	R	Ob.	Da. R.
Shattan Amarelle	"	S	$\frac{9}{16}$	R	"	R.
Litham	"	S	$\frac{1}{2}$x$\frac{5}{8}$	Ob	"	Da. R., nearly black
Vladimir	"	S	$\frac{1}{2}$x$\frac{9}{16}$	R	"	" "
English Morello	..	D	$\frac{5}{8}$	Slightly con.	"	Br. Red
Ostheim	Germany	D	$\frac{5}{8}$x$\frac{9}{16}$	R	"	Da. R.
Bessarabian	Russia	S	$\frac{5}{8}$x$\frac{11}{16}$	R	"	Red
Orel 24	"	D	$\frac{3}{4}$x$\frac{11}{16}$	R	"	Red
Dye-House		S	$\frac{11}{16}$	Slightly con.	"	Red

was made this year.

Wealthy as the leading fall apple and the Northern Spy as the leading winter variety. would not be in bearing at the same age as the others, and I had to take them as I had The results will be found in the tabulated statement. *G. C. Caston, Craighurst.*

varieties of Apples at Simcoe Station, 1898.

Storage.				
Place.	Temperature.	Date of delivery.	Average price.	Remarks on condition of cultivation, spraying, manuring, etc.
shipped in refrigerator car	....	....	$1.25, net $1 per bbl.	sprayed with Bourdeaux, cultivated, manured with clover and ashes.
shipped	....	....	net, $1.25 per bbl...	trees over'oaded, and half the fruit too small to be salable.
shipped in October..........	....	....	net, $2.00 per bbl ...	very fine samples of fruit, very clean and large.

cultivation, fertilizing, etc., etc.

CHERRIES.

scure; Obs, Obsolete. FORM.—Ac., Acute; An., Angular; Con, Conical; Cor., Corrugated; Ob., Roundish; Tur., Turbinate. CAVITY—Ac., Acute; Acu., Acuminate; B., Broad; D., Deep; N., Nar- Pl., Plaited; Rib., Ribbed; Wr., Wrinkled; W., Waved. COLOR.—A., Amber; B., Brown; Bh., Dots; Da., Dark; F., Fawn; G., Green; Gh., Greenish; Mar., Marbled; Mot., Mottled; Nu., Numer- Sp'ashes; St, Striped; Str., Streaked; Sta., Stained; Sun., Sunny Side; Spo., Spotted; V., Violet;

Fruit.							
					Flesh.		
Stem.	Cavity.	Calyx.	Basin.	Stone.	Color.	Texture.	Flavor.
$1\frac{1}{2}$	Sh ...	. ...	......	M ...	Da. R..	Juicy	Sour.
$1\frac{3}{4}$	" ...	......	...	M ...	Da. R..	Red, juice........... ..	"
$1\frac{1}{3}$	" ...	.....	......	Sm ..	Da. R.	" "	Pleasant.
$1\frac{1}{4}$	" ...	.....	.. ..	Sm ..	Da. R..	" "	Fair to small.
$1\frac{1}{2}$	" ...	......	.. .	M ...	R . ..	Firm	Juicy, sour.
$1\frac{1}{4}$	" ...	......	......	M ...	R......	"	Pleasant when fully ripe.
$1\frac{1}{2}$	" ...	.....	......	M ...	Wh	"	Mild sub-acid.
$1\frac{1}{2}$	" ...	.....	......	Sm ..	R......	"	Firm, mildly acid.
$1\frac{1}{2}$	" ...	......	.....	M ...	Wh. R .	"	Sub-acid.

APPLES.

Results of experiments in cultivation, pruning, spraying, at East Central Station, 1898.

Varieties under test by R. L. Huggard, Whitby.	When planted.	Soil cultivation.	Vigor, scale 1—10.	Pruning. Date, method and percentage of wood growth removed.	Treatment.	Results.
American Golden Russet	1876	clay loam ; clean cultivation		Pruned in March. Cut out suckers and interfering branches.	Sprayed May 2, copperas and lime. " 12, Bordeaux mixture. " 23, " " " June 10, " "	
Astrachan	1876	" "	8			4½ bushels per tree.
Baldwin	1876	" "	7			6⅓ " "
Bell Flower	1876	" "	10			15 " "
Blue Pearmain	1884	" "	6			15 " "
Boston Star	1876	" "	10			1½ " "
Canada Red	1880	" "	7			16 " "
Chenango Strawberry	1884	" "	5			3 " "
Duchess of Oldenburg	1880	" "	6			6 " "
Early Harvest	1876	" "	6			6 " "
Fameuse	1876	" "	8			4½ " "
Fall Pippin	1876	" "	8			7 " "
Grime's Golden	1876	" "	7			3 " "
Holland Pippin	1876	" "	7			½ " "
Kentish Fillbasket	1879	" "	9			4½ " "
King of Tompkins Co.	1876	" "	9			½ " "
Haas	1876	" "	10			5 " "
Minkler	1879	" "	9			15 " "
McMahon's White	1880	" "	*			12 " "
Maiden's Blush	1880	" "	7			3 " "
Northern Spy	1876	" "	9			16 " "
Ontario	1880	" "	6			6 " "
Pewaukee	1880	" "	8			5 " "
Princess Louise	1888	" "	6			4 " "
Rhode Island Greening	1876	" "	8			6 " "
Ribston Pippin	1880	" "	8			2½ " "
Salome	1889	" "	8			6 " "
Seek No Further	1889	" "	7			2½ " "
Swazie Pomme Gris	1879	" "	6			5½ " "
Swaar	1898	" "	8			3 " "
Twenty Ounce	1876	" "	7			5 " "
Talman Sweet	1876	" "	8			3 " "
Wagner	1876	" "	7			6 " "
Wealthy	1886	" "	9			7½ " "

* Top grafted in 1895.

BLACKBERRIES.

Descriptive table of blackberries, Burlington Station, 1898.

SIZE.—S., small; M., medium; L., large. FORM.—R., round; C., conical; O., ovate. COLOR.—D., dark; R., red; P., purple; O., orange; B., bright; Bl., black. FLESH.—F., firm; S., soft. SEASON.—E., early; M., medium; L., late.

Varieties.	Plant.									Berry.							Remarks.
	Canes.																
	Origin.	Habit of growth.	Color.	Freedom from disease 1-10.	Propagation by tips or suckers.	Foliage.	Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Size.	Form.	Color.	Flesh.	Flavor.	Season.	Size, inches.	
Agawam	....	up. spr.	r. br.	9	S	Healthy	9	10	8	M.	O. R.	Black	Firm.	Poor	M.	7/8 x 3/4	
Ancient Briton	....	up. spr.	br	9	S	"	7	9	7	M.	C.	"	"	Good	M.	7/8 x 3/4	
Child's Tree	....	spr. up.	br	9	S	"	7	9	7	S.	O. C.	"	"	Sweet, spr	M.	3/4 x 1/2	
Dorchester	....	up. spr.	r. br.	9	S	"	9	9	7	L.	O. R.	"	"	Sweet, spr	M.	1 1/8 x 3/4	
Early Cluster	....	up	br	9	S	Fair	9	10	7	M.	O. R.	"	"	Good	M.	7/8 x 3/4	
Early Harvest	....	up	r. br.	9	S	Healthy	7	7	9	L.	O. C.	"	"	Poor	E.	1 x 3/4	Good.
Early King	....	up. spr	br	9	S	"	7	9	8	S.	O. R.	"	"	Good	E[M	5/8 x 5/8	Offers well.
Eldorado	Eldorado, Ohio.	up. spr.	r. br.	9	S	"	8	8	7	M.	O. C.	"	"	Good, spr	M.	7/8 x 3/4	
Erie	....	up. spr.	br	9	S	"	9	10	7	M.	R. C.	"	"	Sweet	M.	7/8 x 3/4	Good.
Gainor	....	up	br	9	S	"	9	10	9	L.	O. R.	"	"	Fine, spr	M.	1 1/4 x 7/8	Very promising.
Kittatinny	....	up	r. br.	9	S	Strong, healthy.	10	9	10	L.	O. C.	"	M. fi'm	The best	L.	1 1/8 x 3/4	Hardy so far.
Lovett's Best	Lovett, N.J.	up	r. br.	9	S	Healthy	8	10	8	S.	O. R.	"	"	Fair	L.	3/4 x 5/8	
Maxwell	....	weak, spr.	r. br.	9	S	"	8	7	5	L.	O. R.	"	"	Poor	M.	1 x 3/4	Too weak.
Minnewaski	....	up. spr.	br	9	S	"	9	8	6	M.	O. R.	"	"	Good	M.	7/8 x 3/4	
Ohmer	Ohio	up. spr.	r. br.	10	S	"	7	10	7	L.	O. C.	"	"	Good, spr	M.	1 1/4 x 3/4	Very large.
Snyder	Indiana	up	r. br.	10	S	"	7	10	8	M.	O. C.	"	"	Good, sw't	M.	3/4 x 5/8	One of the best.
Stone's Hardy	Wisconsin	up. spr.	r. br.	9	S	"	7	10	8	S.	O. C.	"	Firm.	Good	M.	3/4 x 5/8	
Taylor	Indiana	up	r. br.	10	S	"	9	10	7	M.	O. C.	"	"	Fine	M.	7/8 x 3/4	
Wachusetts	....	up	r. br.	9	S	"	9	10	6	S.	O. R.	"	M. F.	Fine, sw't	M.	3/4 x 5/8	Very few thorns.
Western Triumph	....	up	r. br.	10	S	"	10	10	8	M.	O. R.	"	Firm.	Good	M.	7/8 x 3/4	Very thorny.
Wilson's Early	....	up	br	9	S	"	7	9	7	L.	O. R.	"	M.	Pleasant	E. M.	1 x	
Wilson Junior	....	spr., trailing	r. br.	9	T. & S.	"	See note	8	6	M.	O. C.	"	Firm.	Sweet	M.	7/8 x 3/4	Some canes 11 feet long.

BLACKBERRIES.

Results of experiments in cultivation, pruning, spraying, at Burlington Station, 1898.

A. W. Peart, Experimenter.

Varieties.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in feet	Vigor, scale 1-10.	Pruning, date, method and percentage of wood growth removed.	Results.
Agawam	1895	Gravelly loam plowed in spring, then frequent cultivation and hoeing until fruit is ripe. Banked up for the winter.	Stable manure.	7	9	Summer pruning of new canes late in July to 3½ to 6 feet long, according to vigor of variety; annual pruning, removing old canes and shortening laterals in March or early April.	A very short crop on account of the drought.
Ancient Briton	1897			5	7		
Child's Tree	1897			5	7		
Dorchester	1896			7	9		
Early Cluster	1895			7	9		
Early Harvest	1895			5	7		
Early King	1896			5	7		
Eldorado	1896			6	8		
Erie	1895			7	9		
Gainor	1895			7½	9		
Kittatinny	1895			8	10		
Lovett's Best	1895			6	8		
Maxwell	1895			3½	5		
Minnewaski	1897			6	8		
Ohmer	1895			7	9		
Snyder	1895			5	7		
Stone's Hardy	1895			5½	7		
Taylor	1895			7	9		
Wachusetts	1895			7	9		
Western Triumph	1895			7½	9		
Wilson's Early	1896			5	7		
Wilson Junior	1897			8	10		

Yield and selling price of varietie of blackberries at Burlington Station, 1898.

Varieties.	Planted.	Time of blooming.	Date of maturity.	Date of gathering be (first an	Yield per hill.	Average price.	Remarks on conditions of cultivation, spraying, manuring, etc.
Agawam	1895	June 8	July 27	July 27—Aug. 10	⅔ lb.	6	There was practically no rain in this district from early in June until September—three months—so that the general blackberry crop was very short. The berries of many varieties dried up on the bushes. The Early Harvest, Early King, Kittatinny, Agawam, Eldorado, Gainor and Stone's Hardy seemed to have the most vitality and fruited the best; not more than 40 per cent. of a full crop.
Ancient Briton	1897	" 8	" 27	" 21— " 5	very few	....	
Child's Tree	1897	" 8	" 20	" 20— " 6	"	....	
Dorchester	1896	" 7	" 23	" 23— " 5	¼	....	
Early cluster	1895	" 11	" 25	" 25— " 10	1/20	....	
Early Harvest	1895	" 11	" 13	" 13— " 1	1	7	
Early King	1896	" 8	" 12	" 12— " 1	5/6	7	
Eldorado	1896	" 6	" 23	" 23— " 5	⅔	....	
Erie	1895	" 13	" 23	" 23— " 5	1/6	....	
Gainor	1895	" 13	" 23	" 23— " 5	⅔	8	
Kittatinny	1895	" 10	" 23	" 23— " 15	⅔	8	
Lovett's Best	1895	" 11	" 30	" 30— " 10	1/20	....	
Maxwell	1895	" 11	" 20	" 20— " 1	very few	....	
Minnewaski	1897	" 10	" 25	" 25— " 5	"	....	
Ohmer	1897	" 11	" 23	" 23— " 5	⅓	..	
Snyder	1897	" 9	" 18	" 18— " 1	1/6	6	
Stone's Hardy	1897	" 8	" 23	" 23— " 5	⅔	...	
Taylor	1897	" 8	" 23	" 23— " 5	⅔	....	
Wachusetts	1897	" 8	" 23	" 23— " 10	1/20	....	
Western Triumph	1897	" 6	" 23	" 23— " 5	½	7	
Wilson's Early	1896	" 13	" 20	" 20— " 5	1/20	....	
Wilson Junior	1897	" 4	" 20	" 20— " 5	very few	....	

CHERRIES.

Results of experiments in cultivation, pruning, spraying, at Simcoe Station, 1898

Variety Dwarf Cherries.	When planted.	Soil and cultivation.	Fertilizers used.	Pruning. Date, method and percentage of wood growth removed.	Growth in inches.	Vigor, scale 1—10.
Bessarabian	1894	Clay loam	Stable and ashes.	May; dwarf; thinned out about 1/6th	18	9
Brusseler Braun	1894	"	" "		18	9
Griotte Du Nord	1894	"	" "		20	0
Lustovka	1894	"	" "		19	9
Orel 24	1894	"	" "			9
Half Standard Cherries.						
Dye House	1894	"		May; dwarf; thinned out about 1/6th	16	8
Ostheim	1894	"			15	7
Vladimir	1894	"			18	9
English Morello	1896	"			15	7
Litham	1896	"			16	8
Orel	1896	"			17	8

CHERRIES—

HABIT—D., Drooping; S., Spreading; U., Upright; St., Stout; Sl., Slender. SUTURE—D., Distinct; rugated; H., Heartshaped; Ob., Oblate; Ov., Ovate; Obo., Obovate; Obl., Oblong; Obt., Obtuse; B., Broad; D., Deep; N., Narrow; Sh., Shallow. BASIN—Ab., Abrupt; Ang., Angular; D., COLOR—A., Amber; B., Brown; Bh., Brownish; Bl., Blush; Blo., Bloom; Blot., Blotched; Br., Moroon; Mar., Marbled; Mot., Mottled; Nu., Numerous; O., Orange; P., Purple; Ph., Purplish; Sun., Sunny Side; Spo., Spotted; V., Violet; W., White; Wh., Whitish; Y., Yellow; Yh., Yel-

Varieties tested at Maplehurst.	Origin and class.	Habit of tree.	Fruit.		
			Size in inches of length and breadth.	Form.	Suture.
Centennial					
Choisy	1; Duke	up., fas.		ob., h.	ob
Cleveland	Ohio; Big	st., sp.	$\frac{7}{8}$ x 15-16	h., sides unequal	d
Coe		r., sp.		r., reg'r	obs
Dwarf Rocky Mt					
Dye House					
Eagle	England; Big		13-16 x 15-16	obt., h.	
Early Purple	Europe; B.	u., s.	$\frac{7}{8}$ x $\frac{3}{4}$	acute, h.	
Elkhorn	Eur.; Big	u., st.	$\frac{3}{4}$ x $\frac{7}{8}$	h., hollowed at apex.	obs
Elton					
Eugenie		u., fas.	$\frac{5}{8}$ x 3-16	h., irreg.	d
Governor Wood	Cleveland, Ohio	r., reg.	$\frac{3}{4}$ x $\frac{7}{8}$	obt., h.	d
Hortense					
Kentish (late)		s.	s. to m.	r., flattened	
Koslov Morello					
Late Duke					
Magnifique					
May Duke		u., fas.		r., obt., h	ob
Mazzard	England or France			r., h	
Mezel	Bigarreau (of Mezel), Europe.	u., s.	15-16 x 1	obt., h., uneven	
Montmorency	Montmorency, France	s.	m. to l	r., flattened at base.	
Montmorency, Ordinaire					
Napoleon		u., s.	1 x 1	obt., h.	trac'able
Ohio					
Olivet		sl., sp.	11-16 x $\frac{3}{4}$	r., slightly flattened.	obs
Ostheim	Russia	Morello bush	s. to m.	r., obt.	
Philippe					
Richmond	Europe	s.		r.	obs
Rockport					
Royal Duke					
Schmidt					
Spanish	Europe to America, 1800	sp.	$\frac{7}{8}$ x 1 1-16	r., obt., h	ob.
Tartarian					
Windsor	Ontario, Canada		15-16 x 1	r., obt., h	
Wragg	Waukee, Iowa		m.	r.	obs

DESCRIPTIVE TABLES.

L., Large; Ob., Obscure; Obs., Obsolete. FORM—Ac., Acute; An., Angular; Con., Conical; Cor., Cor-
Pyr, Pyriform; R., Round; Rh., Roundish; Tur., Turbinate. CAVITY—Ac., Acute; Acu., Acuminate;
Distinct; Ev, Even; Fur., Furrowed; Pl., Plaited; Rib., Ribbed; Wr., Wrinkled; W., Waved.
Bright; C., Crimson; Clo., Clouded; D., Dots; Da, Dark; F, Fawn; G., Green; Gh., Greenish; M.,
Pa., Pale; R., Red; Rus, Russet; Sp, Splashed or Splashes; St., Striped; Str., Streaked; Sta., Stained;
lowish.

Fruit.

Skin.	Stem.	Cavity.	Flesh.		
			Color.	Texture.	Flavor.
car		d.	l. r.	soft, juicy	sweet, very rich, with delicate aroma, most delicious.
br. r. m., dark rich red in sun.	st. 1¼ to 1½	b. d. corr.	l. cream	tender, juicy	sweet, delicious.
b. shining a., nearly covered, b. r. blotched.	1½	m. b.	pale yh	soft, juicy	sweet, excellent.
d. r., becoming almost blk.	1½ to 1¾		d. p.	tender and juicy	very sweet, rich, and delicious.
d r. to b	2½	s.	r. to purple	tender, juicy	sweet and pleasant.
dark moroon	1¼	large, even	dark crimson	firm, juicy	sweet, rich, pleasant.
br. carmine	st 1½	d	l. r.	soft, juicy	mild, acid, agr'able.
l. y. marbled and shaded with l. to d. r.	1 to 1½	b	yh.	tender, juicy	sweet, aromatic, delicious.
b. r.		m		tender, juicy	very acid.
b. r. to d. r.	1½ to 2		r.	tender, very juicy	sub-acid, very good.
b	long and slender.	sh			
d. r. to b.	1½ to 2	m. d.	r.	firm, breaking juicy.	sweet and good.
b. to d. r.	1¼ to 1½, stout.	m. d.	yh.	soft, very juicy	sprightly, tart, mild when very ripe.
a., blotched or suffused with bright r.	1½		very pale yellow	firm, meaty, fairly juicy.	sweet, agreeable.
dark rich crimson	1⅛	b	l. r.	soft, juicy	mild, acid, agreeable.
red to dark r.	1½ to 1¾		d. r. cling	tender, juicy, melting.	almost sweet when ripe, agreeable.
b. to d. r	1		yh.	soft, very juicy	sprightly, tart.
clear waxen a., nearly covered with r. sun.	1½ to 2	b.	pa. y.	firm, breaking juicy.	sweet, pleasant, delicious.
d. r. to b.	1½	m. d.	yh. with rh. tint	very firm, moderately juicy.	rich, sweet, excellent.
b. r. growing almost b. at maturity.	1¾ to 2		d. r.		

CHERRIES.—Results of cultivation, pruning, spraying, etc., at Maplehurst, 1898.

Varieties.	When planted.	Soil and cultivation.	Fertilizers used.	Insects. Name.	Insects. Treatment.	Fungi. Name.	Fungi. Treatment.	Results. Notes.	Results. Height in feet.	Results. Diameter of trunk in inches 1 foot from ground.
Cleveland	1896								10	2
Choisy	1896	Sand ; best	Ashes	Aphis	Kerosene			Cleared	$10\frac{1}{6}$	$2\frac{1}{8}$
Downer's Late	189								$9\frac{2}{3}$	2
Eagle	1896	Sand ; sod	Ashes	Aphis	Kerosene			Leaves burned with kerosene too strong ; ripened unevenly on account of aphis	8	$2\frac{1}{4}$
Elkhorn	1896	Sand ; sod	Ashes	Curculio	Paris green	Rot	Bordeaux.	Badly stung	12	$2\frac{1}{2}$
Elton	1896								11	$2\frac{1}{4}$
Early Purple	1896	Sandy loam ; best cult.	Ashes	Aphis, curculio.	Kerosene	Rot	Bordeaux.	Cleared of aphis, but fruit ripened unevenly ; leaves burned with kerosene	10	$2\frac{1}{4}$
Empress Eugenie	1896								11	$2\frac{1}{2}$
Ida	1896								$9\frac{3}{4}$	2
Koslov	1889	Sandy loam ; best cult.	Ashes	None		None.		A bush ; quite productive		
Late Duke	1896								$8\frac{1}{3}$	2
Magnifique	1896								7	$2\frac{1}{8}$
May Duke	1896								$11\frac{1}{4}$	$2\frac{3}{4}$
Mezel	1868	Sandy loam ; best	Barn manure	Aphis, curculio.	Paris green, kerosene.			Ripened very unevenly on account of aphis		
Montmorency	1896	Sandy loam ; best	Barn manure and ashes	Curculio	Paris green			Healthy in foliage and in fruit.	$7\frac{2}{3}$	2
M. Ordinaire										
Napoleon	1863			Curculio	Paris green.	Rot	Bordeaux.	Worthless from rot and curculio		
Ohio	1896								10	$2\frac{1}{8}$
Olivet	1896								$7\frac{3}{4}$	2
Reine Hortense	1896	Sandy loam ; best	Barn manure and ashes					Rotted badly as soon as ripe	9	$2\frac{1}{5}$
Rockport	1896								13	3
Royal Duke	1896							No insects or fungi	$9\frac{1}{4}$	$2\frac{1}{2}$
Schmidt	1896								$10\frac{1}{2}$	$2\frac{5}{8}$
Spanish	1896	Sandy loam ; sod		Aphis, curculio.		Rot	Bordeaux.	Two-thirds rotten ; large number wormy ; almost worthless		
Tartarian	1896	Sandy loam		Aphis		Rot	Bordeaux.	Fruit blighted ; ripened unevenly ; very poor yield	9	2
Tartarian Improved.	1896								$9\frac{1}{3}$	$2\frac{1}{4}$
Windsor	1896								10	$2\frac{1}{2}$
Wood	1896	Sandy loam ; sod	Ashes							
Wragg	1896								$7\frac{1}{6}$	$2\frac{1}{4}$

MATURITY, SEASON AND YIELD OF CHERRIES AT MAPLEHURST, 1898.

Varieties.	Age since planting.	Maturity.	Season.	Yield.	Grade per cent. Class 1.	Class 2.	Average price.	Remarks on conditions of cultivation, spraying, manuring, etc.
Cleveland	2 yrs.....	......	June 15 to 25.......	......	....	....	8	
Choisy	2 yrs.....	......	June 22 to July 2 or 4	......	....	....	....	
Dyehouse	3 yrs.....	......	June 20 to.	......	....	....	....	
Eagle	....	July 8	July 4 to....... ...	......	....	....	....	
Elkhorn........	40 yrs....	" 15	July 11 to..	......	....	....	....	
Early Purple ...	$20\frac{2}{3}$ yrs...	......	June 12 to 20 . ..	12 qts	8	4	....	With cultivation and spraying, one of the best late varieties for market.
Knight's Early .	....	......	....	......	....	....	....	$\frac{1}{3}$ taken by bugs, $\frac{1}{3}$ by birds and rot.
Late Duke	3 yrs.....	......	June 26 to July 10 (no worms)	......	....	....	....	
May Duke	2 yrs	......	July 15 to July 6 ...	......	....	....	....	
Mezel	30 yrs ...	......	July 2 to 15	108	100	8	....	A grand cherry if well cultivated and enriched.
Montmorency ..	....	.. ..	July 2 or 3	......	....	....	....	
M. Ordinaire ..	....	......	July 2 or 3	......	....	....	....	
Ohio	3 yrs.....	.....	June 16 to July 4 ...	......	....	. ..	....	
Olivet..	3 yrs.....	... ..	June 24 to July 5 ...	......	....	....	....	
Richmond	3 yrs.....	.....	June 24 to July 4...	......	....	....	....	
Royal Duke....	....	......	June 30	......	....	....	.. .	
Tartarian	3 yrs	......	June 28 to July 6 ...	......	....	....	9	
Windsor	30 yrs....	......	July 6	.....	....	....	....	
Wood	$30\frac{1}{3}$ yrs...	......	June 20 to 30.......	... ..	....	....	....	$\frac{1}{3}$ thinned by cherry rot while very small; controlled by Bordeaux.

VIGOR OF CHERRY TREES.

As shown after three season's growth at Maplehurst, 1898.

Varieties.	Height in feet.	Caliper measure in inches one foot from the ground.
Rockport Bigarreau	13	3
Elkhorn	12	2¼
Elton	11	2¼
Yellow Spanish	11	2¾
Empress Eugenie	11	2½
May Duke	11¼	2¾
Schmitz Bigarreau	10½	2⅜
Early Purple	10	2¼
Governor Wood	10½	2½
Windsor	10	2½
Cleveland	10	2
Ohio Beauty	10	2⅜
Belle de Choisy	10⅙	2⅜
Ida	9¼	2
Black Tartarian	9	[illegible]
Black Tartarian Improved	9⅓	2¼
Downer's Late	9⅔	2
Reine Hortense	9	2⅝
Royal Duke	9¼	2½
Late Duke	8⅓	2
Black Eagle	8	2⅛
Montmorency	7⅔	2
Olivet	7¾	2
English Morello	7⅓	1¾
Wragg	7⅛	2¼
Belle Magnifique	7	2⅛
Centennial	7½	1¼
Montmorency Ordinaire	6¼	1½

AGE OF BEARING FRUIT.

First fruitage of cherry trees in the experimental orchard at Maplehurst.

Two years planted.	Three years planted.
Cleveland.	Black Tartarian.
Eyehouse.	Black Eagle.
English Morello.	Belle Magnifique.
German Ostheim.	Belle de Choisy.
King's Amarelle.	Empress Eugenie.
Sudds Hardy.	Elton
Spate Amarelle.	Governor Wood.
Wragg.	Late Duke.
	Montmorency.
	May Duke.
	Ohio Beauty.
	Olivet.
	Purple.
	Reine Hortense.
	Royal Duke.

CURRANTS.

Descriptive table of currants, Burlington Station, 1898.

SIZE.—S., small ; M., medium ; L., large. FORM.—L., long ; S., short ; Sh., shouldered. COMPACTNESS.—C., close ; L., loose ; St., straggling. FORM OF BERRY.—R., round ; Ov., oval ; Ob., oblong. COLOR.—R., red ; B., black ; W., white ; G., green ; Y., yellow. SEASON.—E., early ; M. medium ; L., late.

Varieties.	Plant.					Berry.						Value. Scale 1-10.		Remarks.
	Origin.	Foliage.	Vigor, scale 1-10.	Productiveness, scale 1-10.	Freedom from mildew, scale 1-10.	Diameter.	Form.	Size.	Color.	Flavor. (See Thomas.)	Season.	Dessert.	Market.	
Belle de St. Giles		Healthy, medium	7	5	8	½ inch	R	L	R	Fine	M	See catalogue of fruits.		
Black Victoria		Strong, healthy	9	6	8	½ "	"	L	B	Sweet	L			
Brayley's Seedling		Healthy	7	8	8	⅜ "	"	M	R	Very acid	E M			
Champion		Vigorous, healthy	10	9	8	⅝ "	"	V L	B	Acid	L			One of the best.
Cherry		Strong, healthy	8	9	8	½ "	"	L	R	Fine	M			Probably the best.
Collin's Prolific		Rank, healthy	10	5	8	⅝ "	"	V L	B	Very acid	L			
Fay's Prolific	Portland, N.Y., probably a cross, Cherry + Victoria	Healthy	6	7	8	½ "	"	L	R	Acid	M			Good.
Lee's Prolific	England	Healthy, medium	8	8	9	⅝ "	"	V L	B	Acid	M L			Excellent.
Naples		Healthy	9	9	8	½ "	"	L	"	Acid	M L		"	Very largely grown here.
New Victoria		"	7	6	8	⅜ "	"	M	R	Good	M			
North Star		Healthy, medium	7	7	8	½ "	"	L	"	Spr., good	E M			
Pomona		Healthy	7	5	8	½ "	"	L	"	Good	M		"	
Raby Castle	Canada	Strong, vigorous	8	10	8	⅜ "	"	M	"	Acid, good	M			Promising well.
Red Cross	N. Y., cross, Cherry + White Grape	Healthy	7	7	8	½ "	"	M	"	Good	M		"	
Red Dutch		"	8	7	8	⅜ "	"	M	"	Very good	M			
Red Victoria		Good, healthy	8	9	8	⅜ "	"	M	"	Fine	M			Offers well.
Saunders		Healthy	9	6	9	½ "	"	L	B	Acid, good	L			
Versailles		"	7	6	8	⅜ "	"	M	R	Acid, good	M			
White Grape		Healthy, medium	8	8	8	⅝ "	"	V L	W	Acid	E M			Very large berry.
White Imperial		Healthy	8	7	8	½ "	"	L	W	Fine	E M			
Wilder	Irvington, Indiana, seedling of Versailles	Healthy, Medium	8	8	9	½ "	"	L	R	Good	M			

CURRANTS.

Results of experiments in cultivation, pruning, spraying, at Burlington Station, 1898.

A. W. Peart, Experimenter.

Variety.	When planted.	Soil and cultivation.	Fertilizers used.	Pruning, date, method and percentage of wood growth removed.	Insects. Name	Insects. Treatment.	Fungi. Name	Fungi. Treatment.	Results.	Growth in inches	Vigor, scale 1-10.
Belle de St. Giles	1896	Gravelly loam; bushes plowed to in the fall and from in the spring, then frequent cultivation and hoeing until fruit is nearly ripe; no cultivation after middle of August.	Stable manure.	Late in March; the branches of red and white currants so tened so as to throw out laterals and fruit spears; the wood of black currants thinned out about 30 per cent.	Currant worm and borer in red and white currants; borer in black.	For currant worm, paris green for first wood, hellebore for second; for borer, cutting out and burning injured stems.	Naples slightly injured by mildew.	Bordeaux.	Light crop save on two or three varieties (see table) but quality good.	12	7
Black Victoria	1896									16	9
Brayley's Seedling	1896									12	7
Champion	1895									18	10
Cherry	1896									14	8
Collin's Prolific	1896									18	10
Fay's Prolific	1896									10	6
Lee's Prolific	1896									14	8
Naples	1895									16	9
New Victoria	1897									12	7
North Star	1896									12	7
Pomona	1897									12	7
Raby Castle	1896									14	8
Red Cross	1896									12	7
Red Dutch	1897									14	8
Red Victoria	1896									14	8
Saunders	1897									16	9
Versailles	1896									12	7
White Grape	1896									14	8
White Imperial	1896									14	8
Wilder	1896									14	8

Yield and selling price of varieties of currants at Burlington Station, 1898.

Variety.	Planted	Time of blooming.	Date of maturity.	Date of gathering berries (first and last).	Yield per hill.	Average price.
Belle de St. Giles	1896	May 10	July 8	July 8—13	⅓ lb.	Red currants, 4c. per qt., black, 5c.
Black Victoria	1896	" 16	" 8	" 8—20	½ "	
Brayley's Seedling	1896	" 10	" 8	" 8—13	1½ "	
Champion	1895	" 11	" 20	" 20—31	2 "	
Cherry	1896	" 9	" 6	" 6—12	1 "	
Collin's Prolific	1896	" 17	" 20	" 20—31	very few	
Fay's Prolific	1896	" 10	" 7	" 7—12	1 lb.	
Lee's Prolific	1896	" 12	" 12	" 12—20	⅛ "	
Naples	1895	" 12	" 12	" 12—20	2 "	
New Victoria	1897	" 12	" 4	" 4— 8	very few	
North Star	1896	" 10	" 7	" 7—12	¼ lb.	
Pomona	1897	" 10	" 4	" 4— 8	very few	
Raby Castle	1896	" 10	" 11	" 11—16	4 lb.	
Red Cross	1896	" 10	" 7	" 7—12	⅛ "	
Red Dutch	1897	" 10	" 4	" 4— 8	very few	
Red Victoria	1896	" 11	" 7	" 7—12	3 lb.	
Saunders	1897	" 16	" 12	" 12—20	very few	
Versailles	1896	" 11	" 7	" 7—12	⅓ lb.	
White Grape	1896	" 10	" 7	" 7—12	¾ "	
White Imperial	1896	" 10	" 7	" 7—12	½ "	
Wilder	1896	" 10	" 7	" 7—12	¾ "	

GOOSEBERRIES. TESTED AT GOOSEBERRY STATION. S. SPILLETT, NANTYR, EXPERIMENTER.

SIZE.—S., small; M., medium; L., large. FORM.—L., long; S., short; Sh., shouldered. COMPACTNESS.—C., close; L., loose; St., straggling. FORM OF BERRY.—R., round; Ov., oval; Ob., oblong. COLOR.—R., red; B., black; W., white; G., green; Y., yellow. SEASON.—E., early; M., medium; L., late.

Varieties.	Plant. Origin.	Plant. Foliage.	Plant. Vigor.	Plant. Productiveness.	Plant. Freedom from mildew.	Berry. Size.	Berry. Form.	Berry. Color.	Berry. Flavor.	Berry. Season.	Value. Scale 1-10. Dessert.	Value. Scale 1-10. Market.	Remarks.
Autocrat	Eng	Fair	7	8	8	L	O. B	G	V. G	L	10	10	
Champion	American	Good	9	10	7	M	O. V	G. W	Fair	M	6	7	
Chautauqua	Eng	Fair	3		8	L	O. V	G. W	G	M	9	10	
Carnie's Golden	Foreign	Good	9		7	L	O. B	G. Y	G		9	10	
Crosby's Seedling	Foreign	Good	9	9	8	V. L	O. V	R	G	M	10	10	
Crown Bob	Eng	Good	8		8	L	O. B				9	10	
Columbus	Eng	Fair	8		8								
Cook's Eagle	Eng	Fair	8	8	8	L	O. B	G. Y	G	M	9	10	
Downing	American	V. Good	8	9	9	M	R	G. Y	G	M	9	8	
Dominion	Eng	Fair	8		8								
Golden Prolific	Foreign	Fair	8		8								
Green Chisel	Eng	Good	8	8	8	L	O. B	G. W	G	M	9	10	
Ingram's Ocean	Eng	Fair	8		8	L	O. B	G. Y	G	M	9	10	
Keepsake	Eng	Good	8		1								
Lancashire Lad	Eng	Fair	7		8	L	O. B	R	V. G	E	10	10	
Large Golden Prolific	Eng	Fair	8		8								
London	Eng	Fair	8		8	L	O. B	G. Y	G	L	9	10	
Lanceolet	Eng	Fair	8		8	L	O. B	G. Y	G	M	9	10	
Mrs. Whittaker	Eng	Fair	8		8								
Oregon Jumbo	American	Good	9	8	9	M	R	R	G	M	9	9	Oregon J. and Red Jacket are similar in every respect.
Ontario	Foreign	Good	8	8	8	M	O. V	R	G	M	8	9	
Pearl	American	Good	9	9	9	M	R	G. W	G	M	9	9	
Phoenix	Foreign	Fair	8		8								
Queen	Foreign	Fair	8		8	L	O. V	G. W	G	M	9	10	
Red Jacket	American	Good	9	8	9	M	R	R	G	M	9	9	
Red Champagne	Eng	Fair	8	8	8	S	O. V	R	G	M	7	6	Hairy, very.
Success	American	Good	9	8	9	S	R	G. V	G	M	7	6	Not up in size, but in other respects a Downing.
Triumph	Foreign	Fair	7	8	8	V. L	O. V	G. W	G	M	9	10	
Whitesmith	Eng	Fair	8	8	7	V. L	O. B	G. W	G	M	9	10	
White Crystal	American	Good	9	9	9	S	O. V	G. W	Fair	M	6	6	Too small.
Whinham's Industry	Eng	Fair	8		8	L	O. V	G. Y	G	M	9	9	
Yellow Scotch	Eng	Fair	8		8								

GOOSEBERRIES. Results of experiments in cultivation, pruning, spraying at Gooseberry Station, 1898.

STANLEY SPILLETT, NANTYR, EXPERIMENTER.

Varieties.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in inches.	Vigor, scale 1-10.	Pruning. Date, method and percentage of wood growth removed.	Insects. Name.	Insects. Treatment.	Fungi. Name.	Fungi. Treatment.	Results.
Autocrat	1890	Clay soil, which was stirred between rows every seven days with Jr. Horse Hoe and always as soon as practicable after a shower. Bushes are set 6x4, between bushes is stirred as rows with a long handle shovel.	Stable manure and ashes dug in plant in fall, ashes in summer.	15	8	No cutting back any wood that is cut. is cut clean out.	Gooseberry worm.	Paris Green used in Bordeaux mixture, 8 ozs. to 40 gals. of mixture.	Mildew.	Bordeaux and liver of sulphur.	I can only report spraying for mildew a partial success. I can detect no difference in results between the two fungicides used. No fruit destroyed this year with mildew, but foliage effected in August.
Champion	1893			20	9						
Chautauqua	1894			11	7						
Carnie's Golden	1895			10	6						
Crosby's Seedling	1895			15	8						
Crown Bob	1895			12	7						
Columbus	1895			12	7	Pruned in November, 1897.					
Cook's Eagles	1896			2	4						
Downing	1896			18	8	Method, the shrub system, about 6 stems allowed to grow which are renewed every three years. The old wood is replaced by good, strong, new wood.					
Dominion	1896			10	6						
Golden Prolific	1895			10	6						
Green Chisel	1896			10	6						
Ingram's Ocean	1896			11	7						
Keepsake	1895			10	6						
Lancashire Lad	1896			11	6						
Large Golden Prolific	1895			10	6						
London	1896		Stable manure dug in the fall, ashes worked in during summer.	9	6	November 20th, 1897		Paris Green, 8 ozs. to 4 gals. of Bordeaux mixture.		Bordeaux and lour of sulphur sprayed 25th March with 4 lbs. of blue stone to 40 gals water. Afterwards every ten days with fungicides. Always after a shower.	No fruit destroyed by mildew during year.
Lanceolet	1896			11	7	Shrub system, about 6 stems allowed to grow, renewed every 3 years.					Most of the large varieties bore but little or no fruit, so grew more vigorously. Autocrat and Whitesmith are easily the most vigorous of large roots, with Crosby's seedling close second. Red Jacket and Champion are ahead in medium, with Pearl a close second. Autocrat grew a fine crop on small bushes.
Mrs. Whittaker	1895			11	7						
Oregon Jumbo	1896			24	9						
Ontario	1896			12	7						
Pearl	1892			21	8						
Phoenix	1895			10	7						
Queen	1894			11	7						
Red Jacket	1895			24	9						
Red Champagne	1896			6	6						
Success	1896			21	8						
Triumph	1894			14	7						
Whitesmith	1892			17	8						
White Crystal	1894			18	8						
Whinham's Industry	1896			3	3						
Yellow Scotch	....			12	7						

GOOSEBERRIES. **Annual Record, showing yield and selling price of varieties at Gooseberry Station, 1898.**

Varieties.	Age.	Time of blooming.	Date of maturity.	Date of gathering. (Berries, 1st and last).	Yield.	Average price.	Remarks. On conditions of cultivation, spraying, manuring, etc.
	Years.	May	Aug.	Aug.		cents.	
Autocrat	8	15	12	10 to 15	2 qts. per bush	7	Plants set 6x4 ft. between rows, ground was stirred every week with Planet Jr. Wheel Hoe; between bushes with shovel hoe, but always as soon as possible after a shower. First spraying March 82th with blue stone water, 6 lbs. to 40 gals, afterwards every 10 days and after heavy showers. Manure dug in in fall, hard wood ashes worked in during summer about each bush.
Champion	5	10	10	10 to 15	few berries; winter killed		
Chautauqua	4	15	12	10 to 15	few berries		
Carrie's Golden	4						
Crosby's Seedling	4	15	12	to 15	2 qts. to bush	8	
Crown Bob	4	18	15		only few berries		
Columbus	4						
Cook's Eagle	2	15	15	10 to 20	a few berries		
Downing	12	10	10	10 to 15	6 qts	5	
Dominion	2						
Gol[illegible] Prolific	3						
Green [illegible]	2	15	18	20	few berries		
Ingram's Ocean	2	18	15	15	"		
Keepsake	2						
Lancashire Lad	2	18	18	20	few berries		
Large Golden Prolific	3						
London	2	15	18	20	few berries		
Lanceolet	2	18	15	20	"		
Mrs. Whittaker	3						
Oregon Jumbo	3	10	12	15	1 qt. to bush		
Ontario	3	15	18	20	only few berries		
Pearl	6	10	12	10 to 15	6 qts. to bush	5	
Phoenix	3						
Queen	4	15	15	20	few berries		
Red Jacket	4	10	12	10 to 15	2 qts		
Red Champagne	2	12	15	15	few berries		
Success	3	10	12	15	"		
Triumph	4						
Whitesmith	6	12	15	15	few berries		
White Crysta	5	10	12	15	1 at	5	
Whinham's Industry	7	15	18	20	few berries		
Yellow Scotch							

GRAPES. Yield and selling price of varieties of Grapes at Wentworth Station, 1898.

TESTED BY M. PETTIT, EXPERIMENTER, WINONA.

Varieties.	Age.	Thinned, per cent. by hand or accident.	Time of blooming.	Date of maturity.	Date of gathering. 1st and last.	Yield.	Grade, per cent. Class 1.	Grade, per cent. Class 2.	Average price.	Remarks. On conditions of cultivation, spraying, manuring, etc.
						lb.			cents.	
Agawam	11 years	Not thinned ..	The last three days of June	October 15..	October 15-25....	17½	All sold as one grade	Those not carried out sold for wine at $15 per ton.	2½	Ploughed in May and kept clean and mellow by frequent cultivation until August.
Beacon.........	3 "	"	" ..	Sept'mber 15..	September 28.....	6	"		Sold for wine.	Some stable manure and ashes used.
Brill ant........	3 "	" ...	" ..	" 15..	" 28.....	4½	"			Sulphur applied last week of June.
Black Delaware	3 "	"	" ..	" 15..	" 28.....	4	"			
Brighton	16 "	"	" ..	" 10..	" 10.....	15½	"		1½	
Carman	3 "	"	" ..	" 15..	" 28.....	7	"		Sold for wine.	
Cambridge	3 "	"	" ..	" 10..	" 28.....	8½	"			
Colerain	3 "	"	" ..	" 10..	" 28.....	6	"			
Concord........	24 "	"	" ..	" 15..	" 20.....	20½	"		1	
Catawba	15 "	"	" ..	October 20..	October 24.....	18½	"		2	
Dr. Collier	3 "	"	" ..	Sept'mber 15..	September 28....	9	"		....	
Delaware......	24 "	"	" ..	" 15..	" 20.....	17	"		2¾	
Early Ohio	3 "	"	" ..	" 1..	" 3.....	8	"		....	
Lutie	3 "	"	" ..	" 10..	" 28.....	10½	"		....	
Lindley	11 "	" ..	" ..	" 10..	" 12.....	16½	"		2	
Mills	3 "	" ...	" ..	October 20..	October 24.....	7½	"		....	
Moyer	12 "	"	" ..	Sept'mber 5..	September 5....	6¾	"		3	
Niagara	15 "	"	" ..	" 22..	" 22.....	23½	"		1	
Opal	2 "	"	" ..	October 10..	October 20.....	8	"		....	
Olita..........	3 "	"	" ..	" 15..	" 20.....	5	"		....	
Oriental........	3 "	"	" ..	" 1..	" 20....	6½	"		....	
Presley	2 "	"	" ..	Sept'mber 5..	September 28....	4	"		....	
Rochester	2 "	" ...	" ..	" 15..	" 28.....	3½	"		....	
Salem..........	16 "	"	" ..	" 25..	" 29.....	19½	"		2	
Ulster Prolific..	3 "	"	" ..	October 15..	October 24.....	7	"		....	
Wilder	16 "	"	" ..	" 15..	" 24....	16½	"		1¾	
Worden	16 "	"	" ..	Sept'mber 8..	" 10.....	20	"		1½	
Watt	3 "	"	" ..	October 20..	" 24.....	4½	"		....	

TABLE OF VIGOR. Grape Vines, tested by M. Pettit, Winona, Experimenter.

Size.—T., thick; sl., slender. Form of Joint.—S., short; M., medium.

Varieties.	Length, feet.	Size.	Form of joint.	Vigor.	Varieties.	Length, feet.	Size.	Form of joint.	Vigor.
Planted in 1894									
Aminia	8 to 12	T	S	8	Maxatawney	10 " 15	T	S	10
Amber Queen	6 " 10	M	M	7	Montgomery	6 " 8	Sl	S	7
August Giant	8 " 10	T	S	9	Marion	10 " 12	Sl	S	9
America	10 " 15	T	L	10	Montefiore	10 " 15	Sl	M	9
Arnolds	10 " 14	T	S	9	Mason Seedling	4 " 6	Sl	S	5
Black Eagle	10 " 15	M	S	10	New Haven	5 " 8	M	S	5
Beacon	4 " 6	Sl	S	4	Olite	6 " 10	M	S	6
Bell	7 " 10	M	S	8	Oriental	5 " 8	Sl	M	5
Berckmans	10 " 15	T	L	10	Requa	6 " 8	M	S	6
Bacchus	10 " 12	M	S	10	Rockwood	7 " 10	M	L	6
Croton	4 " 6	Sl	M	4	Transparent	7 " 10	Sl	L	7
Colerain	6 " 7	Sl	M	5	Victoria	4 " 6	Sl	S	4
Concord Muscat	7 " 9	T	S	8	Watt	5 " 7	Sl	S	4
Cottage	6 " 7	Sl	S	5	Woodruff Red	7 " 19	T	S	5
Cynthiana	12 " 15	T	S	9	Winchell	8 " 10	Sl	S	5
Carman	7 " 9	Sl	L	6	Planted in 1895.				
Cambridge	6 " 8	Sl	M	6	Opal	10 to 12	Sl	S	8
Dr. Collier	5 " 7	T	S	5	Presley	10 " 12	T	L	8
Elvira	8 " 8	Sl	S	8	Rommel	6 " 8	T	S	6
Early Victor	5 " 6	M	M	6	Brilliant	6 " 8	M	L	6
Elmicand	8 " 12	T	M	8	Planted in 1896.				
Early Ohio	4 " 6	M	M	5	Black July	4 to 5	T	S	8
Early Golden	3 " 4	Sl	S	3	Black Hawk	8 " 10	Sl	L	8
Eumelan	4 " 5	M	L	6	Beauty	2 " 3	Sl	S	5
Eldorado	6 " 8	T	S	5	Faith	3 " 5	M	S	4
Eaton	4 " 6	Sl	S	6	Grein's Favourite	4 " 6	T	S	6
Esther	3 " 5	Sl	S	3	Herbemont	8 " 10	Sl	S	8
Etta	6 " 8	Sl	S	6	Newhaven	4 " 6	Sl	M	6
Green Mountain	5 " 9	Sl	L	5	Norton's Virginia	2 " 3	M	S	5
Grein's Golden	8 " 10	T	L	8	Alice	3 " 4	T	S	7
Gaertner	7 " 9	T	S	8	Hayes	2 " 3	Sl	..	
Golden Drop	3 " 5	Sl	S	3	Cunningham	4 " 6	Sl	S	6
Geneva	4 " 6	T	S	3	Kensington	3 " 5	Sl	M	5
Grayson	6 " 7	Sl	S	4	Rommel	8 " 10	Sl	M	8
Hermann	3 " 4	Sl	M	2					
Hayes	4 " 8	Sl	S	4	Planted in 1897				
Ives	10 " 12	Sl	L	8	Campbell's Early	4 to 6	T	S	8
Lutie	5 " 7	Sl	S	5	Canada	2 " 3	T	S	6
Mo Riesling	6 " 8	M	L	5	Delauba	3 " 4	T	S	5
Mills	6 " 8	M	M	7	Gazelle	4 " 6	T	S	8
Moore's Diamond	4 " 6	T	S	9	Upland	3 " 5	M	M	5

PEACHES.

Varieties tested at South-western Station. W. W. Hilborn, experimenter.	Origin.	Tree.					
		Vigor Scale 1-10.	Hardiness Scale 1-10.	Productiveness, Scale 1-10.	Age of bearing.	Size by scale 1-10.	Form.
Alexander	Ill	9	9	10		5-6	R
Barnard	Ill	8	9	10		5-6	R
Brigden	?	8	8	8		8-10	O
Boyle's Yellow	Mich	8	9	10		5-6	R
Banner	Ont	9	9	9		8-9	R
Crane's Yellow	Mich	8	8	9		7-8	R Ov.
Canada Early	Ont	9	9	10		5-6	
Crawford Early	N. J.	9	8	8		8-9	R Ov.
Crawford Late	N. J.	9	8	5		9-10	R Ov.
Crosby	Mass	8	9	10		5-8	R
Champion	Ill	8	7	6		6-8	R
Dumont	?	8	8	9		4 6	R
Engols Mammoth	Mich	9	9	10		6-8	R
Elberta	Ga.	7	5	6		8-9	O
Frankford	?	8	8	8		4 5	R
Fitzgerald	Ont	8	9	9		8-9	R Ov.
Golden Drop	Mich	8	10	10		5-6	
Hinman	?	9	9	9		8-9	R
Hale's Early	Ohio	8	9	10		4-5	
Hill's Chili	N. Y.	7	10	10		5-8	O V'C
Jersey Pride	N. J.	8	6	7		8-9	R Ov.
Jacques Rareripe	Mass	9	9	9		7 8	
Longhurst	Ont	8	10	10		5-8	O V C
Lemon Free	Ohio	9	10	10		3-10	R O V
Lewis	Mich	8	9	9		5-6	R
Moore's Favorite	Mass	8	8	7		7-8	R
Marshall's Late		9	8	8		7-8	B
Mt. Rose	N. J.	8	8	7		6-7	R
New Prolific	Mich	8	9	9		8-9	R
Oldmixon Free	Am	8	6	4		7-9	R
River's Early	Eng	8	9	10		7-9	R
Smock Free	N. J.	9	9	8		8-10	O V
Smock Beer's	N. J.	9	9	8		8-9	O V
Salway	Eng	9	9	10		7-8	R
Snow's Orange	Mich	7	8	8		5-6	R
St. John	Am	8	8	9		6-8	R
Stump	N. Y.	8	8	7		7-9	R
Tyhurst	Ont	8	10	10		5-6	R
Toledo Early	Ohio	8	9	10		4-5	R
Yellow Rareripe	Am	8	7	6		7-9	R
Wager	N. Y	8	9	10		5-7	O V
Wheatland	N. Y	9	7	1		8-9	O V

PEACHES.—*Con.*

Fruit.					Quality. Scale 1-10.		Value. Scale 1.10.	
Skin.	Seeds or stone.	Flesh.		Season.	Dessert.	Cooking.	Home market.	Foreign market.
Color.		Color.	Flavor.	Begin to ripen.				
W R	Cling	W	Medium	July 23	3-6	3	3	2
Y R	Free	Y	Good	Aug. 29	7-8	9	7	7
Y R	Free	Y	Good	" 18	9	9	10	10
Y R	Free	Y	Good	" 25	6-7	9	7	8
Y R	Free	Y	Very good	Oct. 1	8-10	10	10	10
Y R	Free	Y	Good	Aug. 14	8-9	9	9	9
W R	Cling	W	Medium	July 23	3-6	3	3	2
Y R	Free	Y	Good	Aug. 24	9	9	9	9
Y R	Free	Y	Good	Sept 15	9	9	10	10
Y R	Free	Y	Good	" 10	8	9	9	9
W R	S Cling	W	Good	" 5	8-10	5	5	3
Y	Free	Y	Good	" 8	5-6	8	6	7
Y R	Free	Y	Good	" 8	8-9	10	10	10
Y R	Free	Y	Good	" 12	7-8	9	10	10
Y R	Free	Y	Good	" 4	5-6	7	5	5
Y R	Free	Y	Very good	Aug. 28	10	10	10	10
Y	Free	Y	Med to good	Sept. 19	6-7	9	7	7
Y Y	Free	Y	Good	" 4	8-9	9	10	10
G W R	S Cling	W	Medium	Aug. 14	5-6	5	4	4
Y R	Free	Y R	Med to good	Sept. 12	5-8	8	8	8
Y R	Free	Y	Good	" 6	8-9	9	10	10
Y R	Free	Y	Medium	" 12	5-6	7	8	8
Y R	Free	Y	Med to good	" 12	5-8	8	8	8
Y	Free	Y	Med to good	" 28	5-7	9	8	8
W R	S Cling	W	Medium	Aug. 15	3	3	3	4
W	Free	W	Good	Sept. 12	7-8	8	6	6
Y R	Free	Y	Good	Oct. 5	7-8	9	8	8
W R	Free	W	Good	Aug. 24	7-8	8	6	6
Y R	Free	Y	Very good	Sept. 6	9-10	10	10	10
W R	Free	W	Very good	" 1	8-10	8	6-8	5-8
C W	S Cling	W	Good	Aug. 5	6-8	6	6	5
Y R	Free	Y	Medium	Sept. 30	5-7	8	9	9
Y R	Free	Y	Medium	Oct. 2	6-8	8	9	9
Y R	Free	Y	Good	" 10	7-8	9	9	9
Y R	Free	Y	Good	Sept. 3	6-7	8	6	6
Y R	Free	Y	Very good	Aug. 14	10	10	10	8
W R	Free	W	Medium	Sept. 28	5-6	8	6	6
Y	Free	Y	Good	" 8	8	9	7	7
G W R	S Cling	W	Medium	Aug. 15	5-6	5	4	4
Y R	Free	Y	Good	Sept. 6	8-9	10	10	9
Y	Free	Y	Good	" 8	5-7	8	6	6
Y R	Free	Y	Good	" 1	9-10	10	10	10

PEARS.

TESTED BY E. C. BEMAN,

Habit.	*Form.*	*Cavity.*	*Basin.*
D.—Drooping.	A.—Acute.	B.—Broad.	Ab.—Abrupt.
S.—Spreading.	An.—Angular.	D.—Deep.	Ang.—Angular.
U.—Upright.	Con.—Conical.	N.—Narrow.	D.—Distinct.
	Cor.—Corrugated.	Sh.—Shallow.	Ev.—Even.
	Fla.—Flattened.		Fur.—Furrowed.
	Ob.—Oblate.		Pl.—Plaited
	Ov.—Ovate.		Rib.—Ribbed.
	Obo.—Obovate.		Sh.—Shallow.
	Obl.—Oblong.		Sm.—Smooth.
	Obt.—Obtuse.		Wr.—Wrinkled.
	Pyr.—Pyriform.		W.—Waved.
	R.—Round.		
	Rh.—Roundish.		
	Tur.—Turbinate.		

Varieties.	Origin.	Habit of tree.	Fruit.		
			Size.	Form.	Skin.
Ananas d'Ete	Holland	S	Large	obt., pyr	y., bl
Bartlett	England	U	L	obl., pyr	y
Bergamot, Gansel's	England	S	L	obl., fla	y., b
Bergamot, Gansel's, late	England	S	Med	obl., r	g., rough
Belle Lucrative	Belgium	U	M	obv., obt., pyr	yh., g
Beurre Assomption	France	U	L	obl., pyr	y. and r
Beurre Bosc	Belgium	S	L	pyr., long neck	da., y. and rus
Beurre Bachelier	France	S	M	obo., pyr	gh., y
Beurre Baltet Pere	France	U	L	obo., obt., pyr	gh., y. with b. cheek.
Beurre Clairgeau	Nantes, France	U	L	pyr	yh., b. and r
Beurre d'Amanlis	Belgium	S	M	obo	dull yh., g
Beurre d'Anjou	France	S	L	obt., pyr	gh. rus., red'ish cheek
Beurre d'Aremberg	Belgium	S	M	short, pyr	gh., y
Beurre de Mortillet	France	U	L	obt., pyr	y., c. cheek
Beurre Diel	Belgium	S	L	thick, pyr	y., some rus
Beurre Gris	France	S	M	obl., obo	yh., some rus
Beurre Golden of Bilboa	Spain	S	M	obo., pyr	golden y
Beurre Goubalt	France	S	Sm	round, obo	gh., y
Beurre Hardy		S	M	obo., pyr	gh., b. and rus
Beurre Oswego	Oswego, N.Y	S	M	obt., obo	gh., y. and rus
Beurre Robin	Angers, France	S	M	r., obl	gh., y. and rus
Beurre Superfine	France	S	M	rh., pyr	gh., y
Blanc Perne		S	M	obo., pyr	gh., y
Black Worserter	England	D	L	obo., pyr	d., russety g
Bloodgood	Long Island, N.Y	U	Sm	tur., obo	y., some rus
Bonne d'Egee	France	S	M	obt., pyr	gh., y. and rus
Bon Chretien, Summer	France	S	L	obl., pyr	y., o., bl
Brandywine	Pennsylvania	U	M	pyr	gh., y
British Queen	England	S	M	obo., pyr	y. and rus
Buffum	Rhode Island	U	Sm	obl., obo	deep y and r
Catillac	France	S	L	broad, tur	y., b. cheek
Calixte Magnet	France	S	M	obo., pyr	gh., y
Church	New York	S	M	r., obl	gh., y
Clapp's Favorite	Dorchester, Mass	S	L	obo., ov	pa.; y. and r
Comet		U	M	obo., pyr	rich y. and r
Dana's Hovey	Roxbury, Mass	U	S	obo., pyr	gh., y. and rus
Dearborn's Seedling	Boston, Mass	S	S	r., pyr	light y
Dix	Boston, Mass	U	L	obl., pyr	y. and rus
Doyenne Boussock	Belgium	S	L	r., obo	deep y. and r
Doyenne d'Ete	Belgium	U	S	r., obo	y. and r
Doyenne Goubalt	France	S	M	obo., pyr	pa., y. and rus
Doyenne Gris	France	S	M	ov., obo	cinnamon rus
Doyenne White	France	U	M	obt., obo	pa., y. and red
Duchesse d'Angouleme	France	U	L	obl., obo	gh., y. and rus
Duchesse de Bordeaux	France	S	M	obt., pyr	y. and rus
Duchesse Precoce	France	U	L	pyr	lemon, y. and r

PEARS.

Newcastle, Ont.

Color.

A.—Amber.
B.—Brown.
Bh.—Brownish.
Bl.—Blush.
Blo.—Bloom.
Blot.—Blotched
Br.—Bright.
C.—Crimson.
Clo.—Clouded.
D.—Dots.
Da.—Dark.
F.—Fawn.
G.—Green.
Gh.—Greenish.
Mar.—Marbled.
Mot.—Mottled.
Nu.—Numerous.
O.—Orange.
P.—Purple.
Ph.—Purplish.
Pa.—Pale.
R.—Red.
Rus.—Russet.
Sh.—Shaded.
Sp.—Splashed or Splashes.
St.—Striped.
Str.—Streaked.
Sta.—Stained.
Sun.—Sunny Side.
Spo.—Spotted.
V.—Violet.
W.—White.
Wh.—Whitish.
Y.—Yellow.
Yh.—Yellowish.

Fruit.

Stem.	Cavity.	Calyx.	Basin.	Flesh. Color.	Flesh. Texture.	Flesh. Flavor.
$1\frac{1}{4}$	Sh	open	sh		buttery and melting	sweet, high flavor.
$1\frac{1}{4}$ stout	Sh	open	sh., pl	w	fine grained, buttery	sweet, aromatic.
$\frac{3}{4}$ stout	B	open, small	br., sh	w	melting, juicy	sweet, rich.
1	D	large, open	sh		juicy, granular	vinous, astringent.
$1\frac{1}{4}$	N	short, open	med. depth		very juicy, melting	sugary, rich.
$\frac{3}{4}$	N	large, open	me	w	juicy, half melting	vinous, acid.
$1\frac{1}{2}$	no cavity	small	sh	w	juicy, buttery	rich, sweet, aromatic.
1	Sh	partly closed	sh		juicy, melting	vinous.
$\frac{3}{4}$	N	large, open	med. depth		juicy, breaking	sweet.
1 stout	no cavity	open, short	sh	yh	juicy, granular	vinous, variable.
$1\frac{1}{4}$	Sh	open, broad	sh	yh	juicy, melting	sweet, variable.
$\frac{1}{2}$ stout	Sh	small, open	sh., smooth	wh	juicy, melting	rich, vinous.
$\frac{3}{4}$ stout	Sh	short, small	d., n	w	buttery, melting	vinous, sub-acid.
1 stout	Sh	open	sh	w	juicy, melting	sweet, aromatic.
$1\frac{1}{4}$ stout	B	closed	sh., br	yh., w	coarse grained, juicy	sweet, rich.
$1\frac{1}{4}$ stout	no cavity	closed	sh	gh., w	melting, juicy	vinous, acid.
$1\frac{1}{2}$	Sh	small, closed	sh	w	fine grained, melting	vinous, acid.
$1\frac{1}{2}$	Sh	large	sm		melting, juicy	sweet, not rich.
1 stout	Sh	large, open	sh		melting, juicy	sugary, vinous.
$\frac{3}{4}$ stout	D	closed	h		melting, juicy	sweetish, vinous.
$1\frac{1}{2}$	B	partly closed	b	wh	coarse, juicy	vinous, aromatic.
$1\frac{1}{4}$ stout	no cavity	partly closed	sm		juicy, melting	vinous, sub-acid.
$1\frac{1}{4}$	Sh	large	sh	yh., w	crisp, juicy	sweetish.
$1\frac{1}{2}$	no cavity	erect	sm		hard and coarse	astringent.
$1\frac{1}{4}$	no cavity	open	very sm	yh., w	buttery, melting	rich, aromatic.
$1\frac{1}{4}$ stout	B	small, open	sh	w	juicy, melting	sugary, rich.
$1\frac{3}{4}$	Sh	large	sh	yh	coarse, juicy	sweet, musky.
1	Sh	open	sh	w	juicy, melting	sugary, vinous.
1 stout	N	small	sh	yh., w	fine grained	sugary.
1	Sh	small	sm	w	buttery, rather dry	sweet.
1	N	small	wide, deep	reddish	hard, coarse	very poor.
$1\frac{1}{4}$	Sh	open	sh	w	juicy, melting	insipid.
$1\frac{1}{4}$	N	small	b., sh	w	juicy, melting	sweet, rich.
$\frac{3}{4}$	S	closed	sh., pl	w	juicy, melting	sweetish, vinous.
1	S				juicy, melting	very poor.
1	S	open	sm	yh	juicy, melting	sugary, aromatic.
$1\frac{1}{4}$	S	open	sh	w	juicy, melting	sweet, sprightly.
$1\frac{1}{4}$	S	small	sh		juicy, granular	rich, sweet.
1 stout	B	open	sh		buttery, juicy	sweet, aromatic.
$1\frac{1}{4}$	S	small, open	sh	w	juicy, melting	sweet, pleasant.
$\frac{3}{4}$	S	small	sh		juicy, melting	sweet
$\frac{3}{4}$	N	small, closed	sh	w	fine grained, melting	rich, perfumed.
1	S	small, closed	sh	w	fine grained, melting	rich, high flavor.
$1\frac{1}{2}$ stout	D	small	uneven	yh., w	buttery, juicy	usually poor.
$1\frac{1}{2}$	none	open	med	w	moderately juicy	sweet, pleasant.
1	S	small	sh	w	juicy, melting	sub-acid.

PEARS.—*Continued.*

Varieties.	Origin.	Habit of tree.	Fruit. Size.	Form.	Skin.
Flemish Beauty	Belgium	S	L	obt., pyr	pa., y. and red b
Forelle	Germany	U	M	obl., ov	y. and r
Fondante de Malines	Belgium	U	M	obo., pyr	pa., y. and vh. rus.
Garber	United States	S	L	ov	lemon y., sh. with r.
Glout Morceau	Belgium	S	L	obt., pyr	gh., y
Goodale	Saco, Maine	U	L	obl., obo., pyr	pa., y. and bh. r
Graslin	France	S	M	obo., ov., pyr	gh., y. and rus
Harvard	Cambridge, Mass	U	M	obl., pyr	olive, y. and rus
Howell	New Haven, Conn	U	L	rh., pyr	light y and r
Idaho	Idaho, U. S	U	M	ob	gh., y
Jaminette	Metz, France	S	L	obo	gh., y. and rus
Jargonelle English	France	S	L	long, pyr	gh., y. and b
Jones	Pennsylvania	U	S	obo., pyr	y and rus
Josephine de Malines	Belgium	S	M	r., obl	gh., y. and rus
Kieffer	Pennsylvania	U	M	ov	deep y
Kirtland	Ohio	S	M	obt., obo	y and rus
King Sessing	Pennsylvania	U	L	obt., pyr	gh. and y
Lawrence	Long Island	S	M	obt., pyr	pa. y.
Louise Bonne de Jersey	France	U	L	obl., pyr	yh., g. and b
Madeline	France	U	M	obo., pyr	yh., g
Marshall	U. S	S	M	r., obo	deep y. and rus
Madame Eliza	Belgium	S	L	pyr	pa., yh., g.
Mons. Herberlin		U	L	obt., pyr	y. and r
Mount Vernon	Roxbury, Mass	S	M	obt., pyr	y., ph., rus
Nouveau Porteau	Belgium	S	L	obo., pyr	g. and rus
Onondaga	Conn	S	L	obt., oval, pyr	rich y
Osband's Summer	New York	U	S	obo., pyr	y. and r
Ott	Pennsylvania	U	S	r., obo	gh., y. and rus
Passe Colmar	Belgium	S	M	obt., pyr	yh., s. and rus
Paradise d'Antomne	Belgium	S	L	pyr	rich, y. and rus
Pitmaston	Pitmaston, England	S	L	obl., obo	y. and rus
Pound		S	L	pyr	yh., g. and b
Pratt	Rhode Island	U	M	obt., pyr	gh., y
Rostiezer		S	S	obl., pyr	dull y. and b
Rutter	Pennsylvania	S	M	r., pyr	gh., y. and rus
Seckel	Philadelphia, Pa	U	S	obo	yh., b
Sheldon	Wayne Co., N.Y	U	M	obt., obo	gh., y. and b
Souvenier du Congress	France	U	L	obt., pyr	y. and r
Steven's Genesee	Livingston Co., N.Y.	S	M	obt., obo	y
St. Germain	France	S	L	long, pyr	yh., g. and b
St. Ghislain	Belgium	U	M	pyr	y
Triomphe de Vienne		S	L	pyr	yh., rus
Tyson	Pennsylvania	S	S	acute, pyr	deep y. and r
Urbaniste	Belgium	S	M	obo., pyr	pa., y. and rus
Vicar of Winkfield	France	S	L	long, pyr	pa., y. and b
Washington	Delaware	S	M	obo	pa., y. and red dots.
Winter Nelis	Belgium	S	S	r. pyr	yh., g. and grey rus.
Wilmot	Newcastle, Ont	S	M	obo	y. and some rus

PEARS —*Continued.*

Fruit.						
				Flesh.		
Stem.	Cavity.	Calyx.	Basin.	Color.	Texture.	Flavor.
1½	N	short, open.	small, round	yh., w.	juicy, melting	sweet, rich.
1 slender	S	small	n	w	buttery, melting	vinous, not rich.
1½	Sh	large, open	sm	w	juicy, melting	sweet, perfumed.
1¼	D	large, open	deep	w	juicy, granular	sub-acid.
1¼	Sh	large, open	irr	w	fine grained, melting	sweet, variable.
¾ stout	D	small, closed	deep	w	juicy, melting	sweet, vinous.
1½	Sh	open	sm	yh	juicy, buttery	sweet.
1 stout	none	small	n	w	juicy, melting	sweet, variable.
1¼ stout	Sh	open	uneven	w	juicy, melting	brisk, vinous.
1 stout	Sh	open	sh	wh	juicy, buttery	sweet, perfumed.
1 stout	none	open, small.	med	w	juicy, granular	sweet, pleasant.
1¾	none	open	sm	yh., w.	juicy, granular	sub-acid, variable.
1¼	none	open	sh	yh	buttery, granular	sweet, brisk.
1¼	Sh	small, open.	b	pink'h w	juicy, buttery	sweet, aromatic.
¾	N	open	n., pla	w	juicy, granular	sub-acid.
¾	Sh	open	sh		juicy, melting	sweet, aromatic.
1¼	B	closed	sh	wh	melting, granular	sweet, perfumed.
1¼	Sh	open	b	w	juicy, melting	sweet, aromatic.
1½	none	open	sh	yh., w	juicy, melting	rich, sub-acid.
1¾	N	small	sh	w	juicy, melting	sweet.
1¾	B	open	sh	wh	juicy, buttery.	sweet, variable.
1¾	none	small	sh	w	buttery, melting	sweet.
1¼	N	open	sh	w	juicy, buttery	sweet, perfumed.
1	none	small, closed	sh	yh	juicy, granulated	vinous, aromatic.
¾	Sh	closed	n	w	buttery, juicy	sweet, vinous.
1¼ stout	Sh	small, closed	n	wh	juicy, granular	rich, vinous.
1	N	partly closed	b., sh	w	juicy, melting	sweet, pleasant.
1¼	Sh	open	sh	wh	juicy, melting	sweet, rich, aromatic.
1½	Sh	open	sh	yh., w.	juicy, buttery	sweet, aromatic.
1½	none	open	sm	w	juicy, buttery	vinous, aromatic.
1½	N	open	sh	w	juicy, buttery	sub-acid, pleasant.
2	none	crumpled	sh	wh	firm, solid	harsh, astringent.
1¼	N	open	sh	w	juicy, melting	sweet, vinous.
1¾	none	open	sm	wh	juicy, melting	rich, sweet, perfumed.
1¼	Sh	closed	sh	w	juicy, granular	sweet, vinous.
1¾	Sh	small	sh	wh	juicy, buttery	sweet, spicy, rich.
¾	D	open	b	wh	juicy, melting	sweet, vinous, rich.
1¼	Sh	open	sh., pl	w	juicy, melting	sweet, musky.
1	Sh	open	sh	w	half melting	sweet, aromatic.
1	none	open	sh	w	juicy, granular	sub-acid, variable.
1½	none	open	sh	w	juicy, buttery	sprightly, variable.
1¼	none		sh	wh	juicy, buttery	sweet, aromatic.
1¾	none	open	sh	w	juicy, melting	rich, sweet, aromatic.
1	B	closed	n	w	juicy, melting	rich, sub-acid.
1¼	none	large, open	sh	gh., w.	juicy, buttery	sub-acid, astringent.
1¼	Sh	small	sh	w	juicy, melting	sweet, perfumed.
1½	N	open	sh	yh., w.	juicy, melting	sweet, aromatic.
1¼	Sh	open	sh	w	juicy, breaking	sweet, brisk, vinous.

PEARS.

Results of experiments in Cultivation, Pruning,

Varieties under test by R. L. Huggard, Whitby.	When planted.	Soil and cultivation.	Fertilizers used.
Bartlett	1887	clay loam	none
Buffum	1889	"	"
Belle Lucrative	1889	"	stable manure
Beurre Clairgeau	1891	clover sod	
Beurre d'Anjou	1889	clean cultivation	
Beurre Superfine	1887	"	stable manure
Beurre Antoine	1889	"	
Brockworth Park	1889	"	stable manure
Clapp's Favorite	1887	clover sod	
Doyenne d'Ete	1889	clean cultivation	stable manure
Duchess d'Angouleme	1887	"	ashes
Flemish Beauty	1887	"	stable manure
Glout Morceau	18-7	"	none
Grey Doyenne	1889	"	"
Graslin	1889	clover sod	"
Goodale	1889	"	"
Howell	1889	"	ashes
*Idaho	*	clean cultivation	stable manure
Josephine d'Malines	1890	"	"
Keiffer	1887	clover sod	none
King Sessing	1889	clean cultivation	stable manure
Louise Bonne d'Jersey	1887	"	"
Lawrence	1889	clover sod	none.
Mt. Vernon	1889	clean cultivation	ashes
Laconte	1890	"	stable manure
Pres. Drouard	1889	"	"
Ritson	1892	clean cultivation	stable manure
Rostiezer	1887	"	"
Sheldon	1876	"	none
Souvenir de Congres	1887	"	stable manure
Seckel	1894	"	"
Winter Nelis	1889	clover sod	none

*Top grafted in 1894.

PEARS.

Results of experiments in cultivation, pruning, spraying, at East Central Station, 1898.

New varieties planted 1896 that fruited this season, having from three to a dozen samples each.

Varieties tested by R. L. Huggard, Whitby.	When planted.	Soil and cultivation.	Fertilizers used.	Pruning. Date, method & percentage of wood growth removed.	Treatment.	Remarks.
Rutter	1896	Clay loam; land was root cropped.	Stable manure.	March. Cutting out interfering branches.	Sprayed twice well. May 12, Bordeaux mixt. May 23, Bordeaux mixt.	large deep green, excellent.
Krull	1896					resembles Keiffer's.
Comice	1896					large yellow and fine.
Winter Nelis	1896					small and dark color.
Idaho	1896					very fine and large.
Japan Gold Russet	1896					beautiful russet flavor, quality only medium, not No. 1.
Easter Beurre	1896					
P. Barry	1896					disappointingly small.

PEARS.

Spraying, at East Central Station, 1898.

Pruning. Date, method and percentage of wood growth removed.	Treatment.	Results.
March	Sprayed May 2nd, copperas and lime. " " 12th, Bordeaux mixture. " " 23rd, " " " June 10th, " "	good, clean fruit.
"		light crop.
"		"
"		fair crop.
"		no crop.
"		1½ bushels to tree.
"		1½ " "
"		medium crop.
young wood cut out		3½ bushels to tree.
no pruning		2 bushels.
cutting back		2 "
young sprouts cut out		2½ "
no pruning needed		1½ "
" "		2 "
none		½ bushel.
cutting back		½ "
no pruning required		4 bushels.
thinning sprouts		1½ bushels per tree.
cutting back		1¼ " "
no pruning done		5 " "
cutting back		no crop.
no pruning done		4 bushels per tree.
"		½ bushel "
thinning		no crop.
cutting back		½ bushel.
none required		2 bushels per tree.
"		no crop.
thinning		½ bushel.
none required		3 bushels.
cutting back		½ bushel.
no pruning		1¼ bushels.
thinning shoots		¾ bushel.
none		½ "

PEARS.

Yield and selling price of Pears at East Central Station, 1898.

Varieties under test by R. L. Huggard, Whitby.	Age.	Date of maturity.	Date of gathering.	Yield.	Grade. Per. cent. Class 1.	Class 2.	Class 3.	Storage. Place.	Temperature.	Average price.
Bartlett	11 years	Sept	Sept. 16	3 bush.	90	10				$1 50 per bushel.
Buffum	9 "	Oct	Oct. 4	½ "	100					$1.20 "
Belle Lucrative	9 "	Oct. and Nov	Oct. 26							
Beurre Clairgeau	7 "	Oct. to Jan	" 26	½ bush.	70	20	10			$1.25 "
Beurre d'Anjou	9 "	Nov. 1 to 15	" 27							
Beurre Superfine	11 "	Oct., Dec	" 28	1½ bush.	80	20		Barn cellar	40° F.	
Beurre Antoine	9 "	Dec	" 24	1½ "	80	20				$1 00 "
Brockworth Park	9 "	Dec., Jan	" 28	½ "	75	25				$1.00 "
Clapp's Favorite	11 "	Aug. and Sept	Aug. 18 and 19	3½ "	100					75c "
Doyenne d'Ete	9 "	July	July 10	2 "	80	20				
Duchess d'Angouleme	11 "	Nov	Oct. 28	2 "	80	10	10			$1 50 "
Flemish Beauty	11 "	Nov	Sept. 20	1½ "	70		30			$1.50 "
Glout Morceau	11 "	Dec	Oct. 27	1½ "	75	25				$1.50 "
Grey Doyenne	9 "	July and Aug	July 12	½ "	90		10			
Graslin	9 "	Oct., Nov	Oct. 20		60	40				$1 15 "
Goodale	9 "	Oct., Nov	" 20	½ bush.	90	10				$1.50 "
Howell	9 "	Oct., Nov	Sept. 28	4 "	70	10	20			$1.40 "
Idaho		Dec	Oct. 18	1½ "	85	15				$1 25 "
Josephine d'Malines	8 "	Dec., Jan	" 27	1¼ "	95	5		Barn cellar	40° F.	
Keiffer	11 "	Dec	" 17	5 "	60	20				$1.00 "
King Sessing	9 "	Nov	" 28					No crop		
Louise Bonne de Jersey	11 "	Oct., Nov	Sept. 20	4 bush.	90	10				$1.65 "
Lawrence	9 "	Jan., Feb	Oct. 27	½ "	50	50				
Mount Vernon	9 "							No fruit		
Le Conte	8 "	Oct., Nov	Oct. 16	½ bush.	75	15	10			
Pres Drouard	9 "	Dec, Jan	" 27	2 "	65	25	10	Barn cellar	40° F.	
President	9 "							No fruit		
Ritson	6 "	Nov	Oct. 7	½ bush.	100					$1.50 "
Rostiezer	11 "	Sept	Aug. 16	3 "	80	20				$1.20 "
Sheldon	22 "	Oct	Sept. 20	½ "	70	30				$2.00 "
Souvenir du Congres	11 "	Oct	" 30	1¼ "	95	5				$1.50 "
Seckel	4 "	Dec., Jan	Oct. 26	¾ "	45	55				
Winter Nelis	9 "	Jan., March	" 29	½ "	75	25				

PEARS.

Results of expertments in cultivation, pruning, spraying at Bay of Quinte Station, 1898.

Varieties tested by W. H. Dempsey, experimenter, Trenton.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in inches.	Vigor, scale 1—10.	Pruning. Date, method and percentage of wood growth removed.
White Doyenne	1895	Sandy loam, with some clay and clay sub-soil; cultivated. Planted to potatoes.	Stable and ashes.	17	7	April.
Giffard	1895			23	7	
Duchess d'Angouleme	1895			14	6	
Louise	1895			12	6	
Dorset	1895			10	6	
Ansault	1895			14	6	
Lady Duke	1895			36	10	
Pound	1895			14	9	
Fred Clapp	1895			18	7	
Souvenir d'Esperen	1895			26	9	
Andre Desportes	1895			13	6	
Summer Doyenne	1895			12	6	
Kieffer	1895	Sandy loam with clay sub-soil, cultivated.		36	10	
Easter Beurre	1895			14	6	
Manning's Elizabeth	1895			12	6	
Brandywine	1895			15	7	
Dr. Jules Guyot	1895			16	7	
Barry	1895			14	6	
Fred Beaudy	1895			16	7	
Lady Clapp	1895			16	7	
Winter Nelis	1895			20	8	
Duchess Precoce	1895			16	7	
Lincoln	1895			30	9	
Wilder	1897			21	8	
Koonce	1897			20	8	
Seneca	1897			22	8	
Margaret	1898			22	8	
Petite Margaret	1898			3	2	
Bartlett Seckel	died	.....	.....	.....	.....	

PEARS.

R sult of experiments in Cultivation, Pruning, Spraying, at St. Lawrence Station, 1898.

By Harold Jones, Maitland, Ont.

Varieties.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in inches.	Pruning. Date, method & percentage of wood growth removed.	Insects. Name.	Insects. Treatment.	Fungi. Name.	Fungi. Treatment.	Results.
Baba	1897	Soil clay loam. Planted to strawberries and potatoes, and given clean cultivation.	Barn- Barnyard manure when planted to potatoes. yard manure and ashes when in strawberries.	36	April, thinned ont and cut back ¾ new wood	....	....	None	......	Healthy.
Beurre Clairgeau	1896			3	No trimming	None	....	"	......	Blight has affected all three trees.
Bess mianka	1896			18	"	"	....	"	......	Healthy.
Bergamot	1896			6	"	"	....	"	......	Very little growth.
Beurre Hardy	1896			26	Cut back ¼ new wood	"	....	"	......	Healthy.
Clapp's Favorite	1896			20	" "	"	....	"	......	"
Dempsey	1896			27	" ⅓ "	"	....	"	......	"
Flemish Beauty	1896			16	No trimming	"	....	Fungi spots on leaf	None	
Goodale	1896			15	"	"	....	None	......	
Golden Russett	1897			8	"	"	....	"	......	Fruit buds and twigs injured last winter.
Howell	1896			20	Cut back ½ new wood	"	....	"	......	Healthy.
Idaho	1896			6	No trimming	......	....	"	......	One tree affected by blight.
Kieffer's Hybrid	1896			28	Cut back ½ new wood	None	....	"	......	Healthy.
Lincoln	1896			24	" ¼ "	"	....	"	......	Inclined to blight.
Lincoln Coreless	1896			30	No trimming	"	....	"	......	Healthy.
Le Lecteur	1897			5	"	"	....	"	......	One tree died in July possibly blight.
Ritson	1896			19	Cut back ⅓ new wood	Slug	Paris green	"	......	Healthy.
Sudduth	1896			16	No trimming	None	....	"	......	"
Victoria	1896			13	"	"	....	"	......	"
Vermont Beauty	1896			24	Cut back ¼ new wood	"	....	"	......	One tree killed with blight.
Winter Pear	1897			32	" "	"	....	"	......	Healthy.

PEARS.

Result of experiments in Cultivation, Pruning and Spraying, at Burlington Station, 1898.

By A. W. Peart, Experimenter.

Varieties.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in inches.	Vigor, Scale 1—10.	Pruning. Date, meth'd and percentage of wood growth removed.	Insects. Name.	Insects. Treatment.	Fungi. Name.	Fungi. Treatment.	Results.
1. Anjou	1880	Gravel'y loam. Ploughed in fall or spring, then clean cultivation until last of July. In young orchard, potatoes or root crop grown, with liberal manuring and clean cultivation.	Stable Manure.	10	5	March—Heading back young trees up to five or six years old, to make them stocky, and compact in the top, and cutting out cross branches. 20 per cent.	Slug, codling moth and curculio.	Paris green and lime, two pounds of lime to one of Paris green, to prevent injury to the leaves, these in 200 gallons of water.	Pear blight and scab, the former affected the Duchess, Bartlett and Clapp's Favorite; the latter the Flemish Beauty.	Cutting out and burning for blight. For scab the Bordeaux mixture.	A light crop of pears of rather inferior quality.
2. Bartlett	1880			10	5						
3. Beurre Bosc	1896			20	9						
4. Beurre Giffard	1896			20	9						
5. Buffum	1897			10	5						
6. Clairgeau	1896			15	7						
7. Clapp's Favorite	1889			15	7						
8. Doyenne Boussock	1896			20	9						
9. Duchess	1889			10	5						
10. Easter Beurre	1897			15	7						
11. Flemish Beauty	1880			11	6						
12. Howell	1896			18	8						
13. Idaho	1896			18	8						
14. Josephine d'Malines	1896			20	9						
15. Kieffer	1896			24	10						
16. Lawrence	1896			24	10						
17. Lawson	1896			20	9						
18. Louise Bonne	1897			15	7						
19. Osband's Summer	1897			14	7						
20. Petite Marguerite	1896			24	10						
21. President Drouard	1897			15	7						
22. Seckel	1897			20	9						
23. Sheldon	1889			18	8						
24. Souvenir de Congress	1896			15	7						
25. Sudduth	1897			12	6						
26. Summer Doyenne	1896			15	7						
27. Tyson	1897			20	9						
28. Vermont Beauty	1896			20	9						
29. Wilder	1896			18	8						
30. Winter Nelis	1896			18	8						

Yield and selling price of varieties of Pears at Burlington Station, 1898.

By A. W. Peart, Experimenter.

Varieties.	Age.	Time of blooming.	Date of maturity.	Date of gathering. (Berries, 1st and last).	Yield per tree.	Grade per cent. Class 1.	Class 2.	Class 3.	Average price.
1. Anjou	18 years	May 13	Nov., Dec.	Oct. 5	½ bush	50	30	20	$3.50 per bbl.
2. Bartlett	18 "	" 16	Sept.	Sept. 5	½ "	45	30	25	3.00 "
3. Clairgeau	2 "	" 16	Nov.	Oct. 6					
4. Clapp's Favorite	9 "	" 18	Aug.	Aug. 25	½ bush	70	30	..	45c. per bkt.
5. Duchess	9 "	" 14	Oct., Nov.	Oct. 1	¼ "	50	35	15	$2.50 per bbl.
6. Flemish Beauty	18 "	" 16	Sept.	Sept. 6	¾ "	10	40	50	25c. per bkt.
7. Howell	2 "	" 13	Oct	Oct. 7	....	..	..	..	
8. Kieffer	2 "	" 13	Oct., Nov.	Oct. 7	....	..	..	..	
9. Lawrence	2 "	" 17	Dec.	Oct. 15	....	..	..	..	
10. Petite Marguerite	2 "	" 16	Aug.	......	....	..	..	..	
11. Sheldon	9 "	" 13	Oct., Nov.	Oct. 5	¼ bush	..	..	..	
12. Winter Nelis	2 "	" 17	Dec.	Oct. 15	....	..	..	..	

PEARS.

Vigor of Pear Trees tested at St. Lawrence Station.

Varieties.	Year of planting.	Inches of new growth and habit.	Vigor, scale 1-10.	Diameters of leaf.	Color of foliage.	Young growth.	Condition.
Baba	1897	36—U	5	4 x $2\frac{3}{4}$	D.G.	Strong	Healthy.
Winter Pear	1897	32—U	4	3 x $1\frac{3}{4}$	D.G.	"	"
L. Lecteur	1897	5—U	3	3 x $1\frac{3}{4}$	D.G.	Poor	Blight.
Sudduth	1896	16—Up	5	2 x $\frac{3}{4}$	Pale green	Medium	Healthy.
Ritson	1896	19—U.S.	$4\frac{3}{4}$	2 x $1\frac{1}{2}$	L.G.	Strong	"
Lincoln Conless	1896	30—S	$4\frac{1}{2}$	$2\frac{1}{2}$ x $1\frac{1}{2}$	D.G.	"	One tree healthy, 2 died in 1897 blight.
Victorina	1896	13—U	$1\frac{1}{2}$	$1\frac{1}{2}$ x 1	D.G.	Medium	Healthy, 3 years from the graft.
Lincoln	1896	24—U.S.	$3\frac{3}{4}$	$2\frac{1}{4}$ x $1\frac{1}{4}$	L.G.	"	Blight.
Bessemianka	1896	18—S	$3\frac{3}{4}$	2 x 2	L.G.	"	Healthy.
Kieffer	1896	28—U.	$4\frac{1}{4}$	$3\frac{1}{2}$ x 2	D.G.	Strong	"
Golden Russett	1897	8—U	$2\frac{1}{2}$	5 x $3\frac{1}{2}$	L.G.	Poor	Blight and tender.
Bergamot	1896	6—S.D.	$4\frac{3}{4}$	$2\frac{1}{4}$ x $1\frac{1}{4}$	Pale green	"	Blight.
Vermont Beauty	1896	24—U.	$3\frac{3}{4}$	$2\frac{1}{2}$ x $1\frac{1}{2}$	L.G.	Medium.	"
Howell	1896	20—U.S.	5	3 x $1\frac{1}{2}$	D.G.	Strong	Healthy.
Dempsey	1896	27—U	$3\frac{3}{4}$	3 x $1\frac{1}{2}$	L.G.	"	"
B. Hardy	1896	26—U.S.	5	$2\frac{1}{4}$ x $1\frac{1}{2}$	D.G.	"	"
Clapp's Favorite	1896	20—U.S.	$4\frac{1}{4}$	$3\frac{1}{2}$ x 2	D.G.	"	"
F. Beauty	1896	16—U.S.	$6\frac{1}{4}$	$2\frac{1}{2}$ x $1\frac{1}{4}$	L.G.	"	Healthy, fungi.
Goodale	1896	15—U.	$4\frac{1}{2}$	$2\frac{3}{4}$ x $1\frac{1}{2}$	D.G.	Medium	Healthy.
Idaho	1896	6—U.S.	$3\frac{3}{4}$	$2\frac{1}{2}$ x $1\frac{1}{2}$	D.G.	"	Blight.
B. Clairgeau	1896	1—	3	$2\frac{1}{2}$ x $1\frac{1}{2}$	L.G.	Poor	Blight all 3 trees.

PEARS.

Results of experiments in cultivation, pruning, spraying at Simcoe Station, 1898.

Varieties tested by G. C. Gaston, Craighurst.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in inches.	Vigor, scale 1—10.
Baba (Russian)	1895	Warm loam, originally very strong. Hoe crops grown between rows of trees.	Stable and ashes.	20	10
Bergamott (Russian)	1895			17	9
Kieffer	1895			22	10
Bessemianka	1895			18	10
Flemish Beauty	1895			18	10
Sudduth	1896			15	8
Bartlett on Flemish Beauty	Grafted spring of 1898.			32	10
Ogon do				20	10
Sheldon on Bessemianka Russian				35	10
Lawrence do do				25	10
Lawson do do				29	10
Winter Nelis do do				21	9

The trees were pruned in June on the pyramid style, about 1.7 per cent. of wood growth being removed.

Insects found: slugs; treatment: Bordeaux Paris Green; results: very healthy in both foliage and wood.

DESCRIPTIVE TABLE OF PLUMS.

Habit.
S.—Spreading.
U.—Upright.

Suture.
D.—Distinct.
Ob.—Obscure

Form.
Con.—Conical.
Ov.—Ovate.
Obl.—Oblong.
Pyr.—Pyriform.

Varieties tested by J. G. Mitchell, Huron Station, near Clarksburg.	Origin.	Habit of tree.	Fruit.						Flesh.		
			Size in inches of length and breadth.	Form.	Suture.	Skin.	Stem.	Core, Stone, Seeds.	Color.	Texture.	Flavor.
Arch Duke	English	U	2 x $1\frac{1}{4}$ in.	Obl.	D	Black	$\frac{3}{4}$ inch.	free	yellow	dry	fair.
Abundance	Japanese	U	2 x $1\frac{1}{3}$ in.	Con.	D	Amber		c ing	yellow	juicy	melon-like
Burbank	Japanese	S	2 x $1\frac{1}{2}$ in.	Ov.	D	Cherry red	$\frac{3}{4}$ inch.	cling	yellow	juicy	sweet.
Diamond	Japanese	U	2 x $1\frac{1}{4}$ in.	Obl.	D	Black	1 inch.	cling	yellow	coarse	fair.
Grand Duke	English	U	2 x $1\frac{1}{4}$ in.	Obl.	D	Deep purple.	$\frac{3}{4}$ inch.	cling	greenish yellow	juicy	fair.
Moore's Arctic	Aroostock Co., Maine	S	$1\frac{1}{2}$ x 1 in.	Ov.	D	Dark purple.	$\frac{3}{4}$ inch.	nearly free	yellow	firm.	fair.
Golden Prolific	European	U	$1\frac{3}{4}$ x $1\frac{1}{2}$ in.	Pyr.	D	Yellow	$\frac{3}{4}$ inch.	cling	greenish yellow	juicy	sweet.
Prune d'Agen	French	U to S	$1\frac{1}{2}$ x 1 in.	Ov.	Ob	Violet purple	$\frac{7}{8}$ inch.	slightly cling.	greenish yellow	juicy	rich.

PLUMS.

Results of experiments in Cultivation, Pruning

Varieties tested by Harold Jones, Experimenter, Maitland, Ont.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in inches.
Abundance	1897	Soil clay loam, planted to corn and potatoes, and given clean cultivation.	Barn yard manure when planted to potatoes. Barn yard manure and ashes when planted in strawberries.	42
Col. Wilder	"	"		56
Chas. Downing	1896	"		20
Communia	"	"		24
Deaton	1897	"		29
Field	"	"		40
Forest Rose	"	"		60
Forest Garden	"	"		36
Gneii	1896	"		39
Green Gage	1897	"		45
Grand Duke	"	"		36
Glass Seedling	"	"		18
Hugh's Seedling	1896	"		36
Lincoln	1897	"		24
Lombard	1896	"		31
Milton	"	"		36
Moore's Arctic	"	"		29
Montreal	"	"		24
Pond's Seedling	"	"		28
Prince of Wales	1897	"		30
Rockford	"	"		36
Shippers' Pride	"	"		34
Saunders	1896	"		18
Tatge	"	"		31
Whitaker	"	"		38
Weaver	"	"		40
Wolf	1897	"		24
Wyant	"	"		42
Yellow Egg	"	"		46
CHERRIES.				
Ostheim	"	"		21
Vladimir	"	"		20

PLUMS.

and Spraying at St. Lawrence Station.

Pruning.	Insects.		Fungi.	Results.
Date, method and percentage of wood growth removed.	Name.	Treatment.	Name.	
April, cut back ¾ of new wood.	None		None	healthy.
"		kerosene emulsion		"
Cut back ⅔ new wood	Aphis			Growth checked by aphis in early spring; one spraying removed the trouble.
" ¼ "			shot hole fungi.	Very slight attack of fungi; no treatment given.
" ¼ "			"	"
" ¼ "			"	"
" ¾ "				"
" ⅔ "			shot hole fungi.	healthy.
April, cut back ⅔ new wood			none	"
Cut back ¼ new wood			"	"
No trimming			"	"
Cut back ¼ new wood			"	"
" ¼ "			"	The aphis attacks this variety in the bud early in the spring and destroyed one tree before it was noticed; kerosene emulsion saved the others.
" ¾ "	Aphis	kerosene emulsion	"	healthy.
No trimming				
Cut back ½ new wood			shot hole fungi	"
" ¾ "			none	"
" ¼ "			"	"
No trimming			shot hole fungi.	
Cut back ½ new wood			"	
" ¼ "			none	"
" ¾ "			"	"
" ¼ "			"	
No trimming	Aphis	kerosene emulsion	"	
Cut back ½ new wood	"	"	"	
" ¾ "	"	"	Blight	
" ¾ "			none	healthy.
" ½ "			"	"
" ¾ "				"
" ½ "			"	
No trimming	Slug	Paris green	"	
"	"	"	"	

PLUMS.

Results of experiments in cultivation, pruning, spraying at Simcoe Station, 1898.

Varieties tested by G. C. Caston, Craighurst.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in inches.	Vigor, scale 1-10.	runing. Date, method and percentage of wood growth removed.	Insects. Name.	Insects. Treatment.	Results.
Burbank	1896	loam, clean	stable and ashes	32	10	June, slight	slugs	Bordeaux, Paris green.	foliage very healthy and uninjured by fungus or insects.
Willard	1896	"	"	22	10				
Shensi	1896	"	"	20	9	Kills back to some extent in winter.			
Satsuma	1896	"	"	15	8				
Abundance	1896	"	"	18	9				
Shippers' Pride	1896	"	"	16	8				
Ogon	1896	"	"	20	9				
Black Diamond	1894	"	"	24	10				
Union Purple	1894	"	"	18	9				
Prince of Wales	1894	"	"	20	9				
Prince's Gage	1894	"	"	18	9				
Peter's Yellow Gage	1894	"	"	20	9				
Grand Duke	1894	"	"	17	8				
Quackenbos	1894	"	"	19	9				
Staunton	1894	"	"	11	6				
Rochester German Prune	1894	"	"	24	10				
Yellow Egg	1894	"	"	13	6				
Hudson River Purple Egg	1894	"	"	11	6				
Middleburg	1894	"	"	22	10				
Gueii	1894	"	"	10	5				

PLUMS.

Results of experiments in cultivation, pruning, spraying at Bay of Quinte Station, 1898.

Varieties tested by W. H. Dempsey, Trenton, Ont.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in inches.	Vigor, scale 1-10.
Imperial Gage	1895	Sandy loam, clay sub-soil, cultivated till August.	Stable	16	7
Jefferson	"			16	7
Italian Prune	"			12	6
Victoria	"			20	7
Orange Prune	"			12	6
Yellow Gage	"			24	8
Smith's Orleans	"			16	7
Burbank	"			40	10
McLaughlin	"			30	9
Willard	"			24	8
Reine Claude	"			18	7
Wild Goose	"			36	10
DeSoto	"			36	10
Hulings Superb	"			24	8
Reine Claude Violette	"			18	7
Wickson	1897			36	10
Lincoln	"			7	4
Chabot	"			36	10
Spaulding	"			6	4
Grand Duke	"			15	7
Abundance	"			20	7
Gold	1898	Sandy loam cultivated	Stable	12	6
Harris (Apricot)	"		"	8	4
Yellow St. John (Peach)	"			20	7
Bessarabian (Cherry)	"			6	3

PLUMS.

Tables of Vigor, by H. Jones, St. Lawrence Station, Maitland.

Varieties.	When planted.	Average wood growth.	Habit.	Girth.	Leaf.		Vigor.	Notes on condition.
					Length, & width.	Color.		
		inches.		inches.	inches.			
Weaver	1896	40	S	$4\frac{1}{2}$	4 x 2	Light green	Fair, slender	subject to attacks of aphis and sometimes suffers from twig blight.
Lombard	1896	31	U S	$4\frac{1}{2}$	3 x $1\frac{1}{2}$	D G	strong	on black knot in 1897, aphis and shot hole fungi.
Gueii	1896	39	U	$6\frac{1}{4}$	4 x $2\frac{1}{2}$	D G	very strong	healthy.
Montreal	1896	24	U	5	3 x $2\frac{1}{2}$	L G	medium	healthy.
Ponds Seedling	1896	28	U	$6\frac{3}{4}$	$3\frac{1}{2}$ x 2	L G	strong	shot hole fungi.
Saunders	1896	24	S D	$5\frac{1}{2}$	3 x 2	L G	medium	aphis.
Hughes Seedling	1896	36	U	5	3 x $1\frac{3}{4}$	D G	strong	healthy.
Moore's Arctic	1896	28	S	$6\frac{1}{2}$	$3\frac{1}{2}$ x 3	D G	strong	healthy.
Milton	1896	36	S	6	$4\frac{1}{2}$ x $1\frac{1}{2}$	L G	strong	healthy.
Abundance	1897	44	U	5	$4\frac{1}{2}$ x $2\frac{3}{4}$	D G	strong	healthy.
Lincoln	1896	22	S	4	3 x 3	L G	poor	healthy.
Col. Wilder	1897	56	S D	$3\frac{3}{4}$	5 x 2	L G	strong	healthy.
Whitaker	1896	38	S	$7\frac{1}{2}$	4 x $1\frac{1}{2}$	D G	strong	healthy.
Tatge	1896	31	U S	7	$2\frac{1}{2}$ x $1\frac{3}{4}$	D G	strong	healthy.
Communia	1896	21	U S	$4\frac{1}{4}$	3 x $1\frac{1}{2}$	D G	medium	healthy.
Hammer	1896	36	U S	5	5 x 2	L G	strong	aphis, healthy.
Chas. Dowing	1896	20	S D	$5\frac{3}{4}$	4 x $1\frac{1}{2}$	D G	strong	aphis, healthy.
Rockford	1896	36	U S	$2\frac{1}{2}$	4 x 2	L G	strong	healthy.
Wyant	1897	42	U S	$2\frac{1}{2}$	4 x 2	L G	strong	healthy.
Forest Rose	1897	60	U S	$3\frac{1}{2}$	5 x $2\frac{1}{2}$	L G	strong	healthy.
Forest Garden	1897	36	U S	$2\frac{1}{2}$	$4\frac{1}{2}$ x 2	D G	medium	shot hole fungi.
Prince of Wales	1897	30	U	3	4 x $3\frac{3}{4}$	D G	poor	shot hole fungi.
Glass Seedling	1897	18	S	4	$2\frac{1}{2}$ x $1\frac{3}{4}$	D G	medium	healthy.
Wolf	1897	24	S	2	$3\frac{1}{2}$ x 2	L G	medium	healthy.
Grand Duke	1897	36	U	$3\frac{1}{4}$	3 x $2\frac{1}{2}$	D G	medium	healthy.
Field	1897	40	U	4	3 x $2\frac{1}{2}$	D G	medium	shot hole fungi.
Deaton	1897	29	U	$2\frac{3}{4}$	$2\frac{1}{2}$ x 2	D G	poor	shot hole fungi.
Green Gage	1897	45	U	5	4 x $2\frac{1}{2}$	D G	strong	healthy.
Yellow Egg	1897	46	U	$4\frac{1}{2}$	4 x $2\frac{1}{2}$	D G	strong	healthy.
Shippers' Pride	1897	34	U	4	$2\frac{1}{2}$ x $1\frac{3}{4}$	D G	strong	shot hole fungi.

STRAWBERRIES.

Yield and selling price of varieties of strawberries at St. Lawrence No. 10 Station, 1898.

Varieties tested at Maitland, Ont., by Harold Jones, Experimenter.	Age.	Time of blooming.	Date of gathering berries (first and last).		Yield from 12 plants in ozs.	Average price.	Remarks. On condition of cultivation, spraying, manuring, etc.
						cts.	
Aroma	1 year	May 19.	June 17,	July 4..	200	5½	The plants were set in April of 1897, and given clean cultivation during the summer, and plants allowed to grow in matted row. Ground was manured with well rotted barnyard manure in the spring of 1897, and in the spring of 1898 I applied a coating of wood ashes between the rows at the rate of forty bushel to the acre, and worked it into the surface soil early in April, when mulch was removed.
Beulah	1 "	" 15..	" 13,	June 24.	104	5½	
Brandywine	1 "	" 20.	" 17,	" 30..	179	5½	
Beauty	1 "	" 19..	" 20,	" 30..	110	5½	
Belle	1 "	" 19..	" 20,	" 30..	174	5½	
Beder Wood	1 "	" 13	" 13,	July 4..	205	5½	
Clyde	1 "	" 19..	" 15,	" 30..	87	5½	
Grenville	1 "	" 13..	" 15,	" 27..	85	5½	
Haverland	1 "	" 18..	" 15,	" 27..	76	5½	
Marshall	1 "	" 19..	" 15,	" 30..	64	5½	
Margaret	1 "	" 21..	" 17,	" 4..	40	5½	
Maple Bank	1 "	" 23..	" 20,	" 4..	....	5½	
Saunders	1 "	" 22..	" 17,	June 27..	94	5½	
Ten Prolific	1 "	" 21..	" 20,	" 30..	89	5½	
Wm. Belt	1 "	" 19..	" 20,	" 30..	132	5½	
Warfield	1 "	" 19..	" 15,	" 27..	38	5½	
Woolverton	1 "	" 20..	" 17,	" 30..	194	5½	
Williams	1 "	" 22..	" 17,	July 4..	282	5½	
Van Deman	1 "	" 14..	" 13,	" 22..	13	5½	

Aroma	gave	200	ounces from	12	plants,	200.				
Beulah	"	104	"	12	"	104.				
Brandywine	"	179	"	12	"					
Beauty	"	110	"	12	"	110.				
Belle	"	174	"	12	"	174.				
Beder Wood	"	205	"	11	"	or 223	ounces from	12	plants.	
Clyde	"	87	"	10	"	104	"	12	"	
Grenville	"	85	"	12	"	85	"	12	"	
Haverland	"	76	"	12	"	76	"	12	"	
Marshall	"	64	"	12	"	64	"	12	"	
Margaret	"	40	"	6	"	80	"	12	"	
Maple Bank	"	16	"	3	"	64	"	12	"	
Saunders	"	94	"	12	"	94	"	12	"	
Ten Prolific	"	89	"	5	"	212	"	12	"	
Wm. Belt	"	132	"	12	"	132	"	12	"	
Warfield	"	38	"	7	"	65	"	12	"	
Woolverton	"	194	"	12	"	194	"	12	"	
Williams	"	282	"	12	"	282	"	12	"	
Van Deman	"	13	"	5	"	30	"	12	"	

RASPBERRIES.

Results of experiments in cultivation, pruning, spraying, at Burlington Station, 1898.

A. W. PEART, EXPERIMENTER.

Varieties.	When planted.	Soil and cultivation.	Fertilizers used.	Growth in feet.	Vigor, scale 1-10.	Pruning. Date, method and percentage of wood growth removed.	Insects. Name.	Insects. Treatment.	Fungi. Name.	Fungi. Treatment.	Results.
1. All Summer	1895	Gravelly loam. Ploughed in the spring, then frequent cultivation until fruit is ripe. Banked up for the winter.	Stable manure.	3½	6	Annual pruning early in April, summer pruning early in August, of young canes to make them stocky and throw out laterals. Old canes removed at annual pruning.	The Marlboro' somewhat injured by the raspberry slug.	Hellebore.	Some anthracnose in Shaffer's Colossal, Columbian, Kansas and Hilborn.	Cutting out and burning after crop is gathered.	A light crop on account of the great drought.
2. Columbian	1895			6½	9						
3. Cuthbert	1894			8	10						
4. Golden Queen	1896			5½	8						
5. Gregg	1896			6	9						
6. Hilborn	1895			5	8						
7. Japan Wine	1896			6	8						
8. Kansas	1895			6½	9						
9. Kenyon	1897			4	7						
10. Lottie	1897			5½	8						
11. London	1896			5	8						
12. Lovett	1895			4¼	7						
13. Marlboro	1894			4	7						
14. Miller	1897			3½	6						
15. Mills	1897			5½	8						
16. Ohio	1896			7	9						
17. Older	1895			5½	8						
18. Palmer	1895			6	8						
19. Phœnix	1897			3	5						
20. Progress	1895			5½	8						
21. Redfield	1896			5	8						
22. Reliance	1896			4½	8						
23. Royal Church	1897			8½	6						
24. Shaffer's Colossal	1895			6	9						
25. Smith's Giant	1896			7½	10						
26. Souhegan	1896			4¼	7						
27. Thompson	1895			3½	6						
28. Winant	1897			3	5						

Yield and selling price of Raspberries at Burlington Station, 1898.

Variety.	When planted.	Date of blooming.	Date of maturity.	Date of gathering. (Berries 1st and last.)	Yield per hill.	Average price.	Remarks On conditions of cultivation, spraying, manuring, etc.
1. All Summer	1895	June 6	July 8	July 8—Oct. 15	Very few	9 cents per quart.	In comparing yields of varieties with those of 1897, the general crop this year was short by at least 50 per cent. Some varieties which cropped heavily last year, gave little or no fruit this season, as notably the Palmer; the drought was so severe that the fruit dried upon the bushes. The black and purple varieties suffered more than the red.
2. Columbian	1895	" 15	" 13	" 13— " 28	1½ lb.		
3. Cuthbert	1894	" 13	" 13	" 13— " 31	1 lb.		
4. Golden Queen	1896	" 10	" 5	" 5— " 20	½ lb.		
5. Gregg	1896	" 7	" 13	" 13— " 31	Very few		
6. Hilborn	1895	" 9	" 5	" 5— " 20	1¼ lb.		
7. Japan Wine	1896	" 23	" 25	" 25— " 31	Very few		
8. Kansas	1895	" 6	" 5	" 5— " 20	1⅔ lb.		
9. Kenyon	1897	" 13	" 12	" 12— " 25	Very few		
10. Lotta	1897	" 6	" 10	" 10— " 25	"		
11. London	1896	" 13	" 13	" 13— " 31	½ lb.		
12. Lovett	1895	" 10	" 10	" 10— " 25	Very few		
13. Marlboro	1894	" 6	" 5	" 5— " 25	2 lb.		
14. Miller	1897	" 13	" 12	" 12— " 23	Very few		
15. Mills	1897	" 10	" 9	" 9— " 20	"		
16. Ohio	1896	" 6	" 3	" 3— " 31	¼ lb.		
17. Older	1895	" 6	" 8	" 8— " 25	Very few		
18. Palmer	1895	" 4	" 1	" 1— " 20	Dried up		
19. Phœnix	1897	" 13	" 12	" 12— " 25	Very few		
20. Progress	1895	" 3	" 3	" 3 - " 20	Dried up		
21. Redfield	1896	" 13	" 10	" 10— " 20	Very few		
22. Reliance	1896	" 8	" 3	" 3— " 31	½ lb.		
23. Royal Church	1897	" 15	" 13	" 13— " 31	Very few		
24. Shaffer's Colossal	1895	" 15	" 10	" 10— " 25	1 lb.		
25. Smith's Giant	1896	" 6	" 13	" 13— " 31	½ lb.		
26. Souhegan	1896	" 4	" 8	" 8— " 26	Dried up		
27. Thompson	1895	" 9	" 8	" 8— " 91	½ lb.		
28. Winant	1897	" 9	" 10	" 10— " 25	Very few		

RASP

SIZE.
S—Small.
M—Medium.
L—Large.

FORM.
R - Round.
C—Conical.
O—Ovate.

COLOR.
D—Dark.
R—Red.
P—Purple.
O—Orange.
B—Bright.

Varieties tested by A. E. Sherrington, Walkerton, Ont.	Plant.					
	Origin.	Canes.				Foliage.
		Habit of growth.	Color.	Freedom from disease, 1-10.	Propagation by tips or suckers.	
All Summer		up	l. green	10	S	rank, healthy.
Brandywine		up	d. red	10	S	good
Brinckles Orange		up	purple.	10	S	heavy
Cuthbert	Riverdale, N.Y.	strong, up	d. red	10	S	good, healthy.
Caroline		up	r	10	S	plenty
Conrath		strong, up	brown.	10	tips	good, healthy.
Columbian	Oneida, N.Y	up	red	10	tips	fair
Golden Queen	New Jersey	up	red	10	S	rank
Gregg	Indiana	strong, up	d. red.	9	tips	good
Gault	Ohio	up	p	8	tips	fair
Hilborn	Leamington, Ont.	up	b	8	tips	fair
Hansell		up	red	10	S	good
Johnston Sweet		up	d. red	4	tips	poor
Kansas	Kansas	up	d. red	10	tips	good, healthy.
Lovett	New Jersey	up	d. red	10	tips	good
Lottie		up	d. red	10	tips	fine
Louden	Janesville, Wis.	up	d. red	10	S	healthy
Marlboro	Marlboro', N.Y.	up	red	10	S	heavy, healthy
Mammoth Cluster		up	d. red	3	tips	poor
Miller		up	red	10	S	good, healthy.
Ohio	Ohio	up	brown.	9	tips	fair
Pioneer		up	d. red	9	tips	good
Phœnix		up	d. red	10	S	good, healthy.
Reliance	New Jersey	up	brown.	9	S	fair
Rancocos		up	red	9	S	good
Redfield		up	d. red	10	S & tips	rank
Shaffer's Colossal	Monroe Co., N.Y.	strong, up.	brown.	7	tips	good
Smith's Giant	St. Catharines, Ont.	up, strong.	d. red	10	tips	good, healthy.
Superlative		up	brown.	7	S	large
Strawberry Raspberry		dwarf		10	S	good, healthy.
Turner		up	red	10	S	large, healthy.
Tangier		up	d. red	9	tips	good
Thompson	Ohio	up	d. red	10	S	good
White Champlain		up	o	9	S	fair
Zettler		up	d. red	10	S	good, healthy.

BERRIES.

FLESH.
F.—Firm.
S.—Soft.

SEASON.
E.—Early.
M.—Medium.
L.—Late.

Berry.							Value Scale 1-10.	
Size.	Form.	Color.	Tenacity (*i.e.* to calyx or receptacle).	Flesh.	Flavor.	Season.	Market.	Remarks.
....	....	....	....	....	....	....	....	has never fruited.
M	R	R	free	S	4-5	E	7-8	
M	SC	Y	M	S	6-7	M to L	4-6	
L	C	R	M to good	F	10	L	9-10	best red berry.
M	R	Y	F	S	2-3	M to E	1-3	
L	R	D	good	F	8-9	M	9-10	very promising.
L	R	P	good	F	8-9	L	7-8	
L	C	Y	M	M	5-7	L	4-6	best yellow berry.
L	R	D	F	F	10	L	9-10	
L	R	D	M	F	6-7	L	7-8	
M	R	D	M	F	6-7	M	9-10	
M	R	R	M	M	6-7	E	4-6	
S	R	D	F	F	1	M	1-3	useless.
L	R	D	M	F	8-9	M	9-10	best blackcap.
M	R	D	F	F	6-7	M	4-6	
M	R	D	M	F	8-9	M	4-6	
L	R	R	G	F	8-9	M	7-8	
L	R	B	free	F	8-9	E	7-8	
S	R	D	F	M	2-3	M	1-3	no good.
M L	R	R	M	M to F.	6-7	M	7-8	
M	R	D	F	F	4-5	M	7-8	
S	R	D	F	F	6-7	M	7-8	
M S	R	R	F	F	8-9	E L	9-10	
M	R	R	F	M	4-5	E	4-6	
S M	R	R	M	S	6-7	E	4-6	
S	R	P	F	S	1	L	1-3	
VL	SC	P	F	M F	6-7	M	4-6	
L	R	D	M	F	10	L	9-10	a good one.
L	C	R	M	M	8-9	M	9-10	
L	R	R	G	F	2-3	M L	1-3	
S	R	R	F	S	8-9	E	7-8	
S	R	D	F	S	4-5	E	4-6	
S	R	R	F	S	4-5	E	4-6	
M	R	O	M	S	6-7	M	4-6	
L	C	R	G	F	6-7	M L	7-8	very promising red

CATALOGUE

OF THE VALUES OF

THE FRUITS AND FRUIT TREES OF ONTARIO

ALSO SHOWING

THEIR ADAPTABILITY TO THE VARIOUS PARTS OF THE PROVINCE.

DESIGNED TO AID PLANTERS IN SELECTING SUITABLE VARIETIES.

SUBJECT TO ANNUAL REVISION.

COMPILED BY THE SECRETARY OF THE FRUIT EXPERIMENT STATIONS

AND

PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.

APPLES.

Key to Quality:

1 Very Poor
2—3 Poor.
4—5 Fair.
6—7 Good.
8—9 Very Good.
10 — First Class.

Key to Market Value:

1—3 4th Rate.
4—6 3rd Rate.
7—8 2nd Rate.
9—10 1st Rate.

Key to Adaptation:

*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Key to Stations:

1. Southwestern.
2. Niagara.
3. Wentworth.
4. Burlington.
5. Lake Huron.
6. Georgian Bay.
7. Simcoe.
8. East Central.
9. Bay of Quinte.
10. St. Lawrence.
13. The Secretary's Fruit Farm.
14. Algoma.

Varieties tested at Bay of Quinte Station. — W. H. Dempsey, Trenton.	Season in use.	Tree.				Fruit.					Adaptation.											
						Quality, scale 1-10.		Value, scale 1-10.			Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Total value of Tree.	Dessert.	Cooking.	Home market	Foreign market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
APPLES.																						
Adams Pearmain	Jan.-Feb	7	8	8	23	9	9	9	9	36									*			
Albury	Aug.-Sept.	8	10	6	24	6	6	4	...	16				*					*	0		
Alexander	Aug.-Oct	10	10	8	28	4	9	9	9	31				0	*	*	*	*	*	**	*	
American Golden Russet	Jan.-Mar.	8	10	6	24	8	8	7	9	32				*	*	*	*	**	0	*	*	
American Pippin	...	...	...	...	...	...	...	...	...	...								*				
Antonovka	Feb.-Mar.	8	8	8	24	7	7	4	4	22									0			
Astracan	Aug.-Sept.	9	10	8	27	8	8	7	1	24				*	**	*	**	*	0	0	*	
Bailey Sweet	Nov.-Mar.	6	8	8	22	4	8	4	4	20						0	*		0			
Baldwin	Jan.-Mar.	6	7	8	21	4	6	8	8	26				**	*	**	**	*	*	00	0	00
Beauty of Kent	Oct.-Nov	10	10	8	28	4	6	8	8	26					*	*		*		*		
Ben Davis	Mar.-May	8	10	10	28	4	6	6	9	25				*	*	*	**	**	**	**	*	
Benoni	July-Sept.	8	10	8	26	10	8	4	7	29							*		0			
Blenheim	Nov.-Mar.	10	10	10	30	6	7	9	9	31				*	**	*	*	*	*	**		
Blue Pearmain	Oct.-Feb	8	10	6	24	8	7	8	9	32					0			*		*		
Bogdanoff	Oct.-April	10	10	8	28	...	...	...	...	...												
Bonum	Dec.-Feb	8	10	10	28	8	8	7	7	38								**	0			
Boston Star	Oct.-Dec	9	10	10	29	6	9	7	8	30												
Bietigheimer	...	...	...	...	...	...	...	...	...	...										*	*	
Bismarck	...	...	...	...	...	...	...	...	...	...						*						
Brockville Beauty	Aug.-Sept.	7	8	10	25	9	9	7	...	25										*	0	
Cabashea	Oct.-Nov	10	10	5	25	2	6	6	6	20				*	0	*	*	0	0	0		
Canada Reinette	...	...	...	...	...	...	...	...	...	...										*		

Canada Red	Dec.-Mar.	8	9	10	27	6	8	8	....	22	....	....	....	....	*	*	*	*	0	0	*	....
Cayuga Red Streak	Dec.-Feb	7	4	8	19	4	8	7	6	25	....	....	....	....	*	....	**	**	0	*	....	....
Cellini	Oct.-Nov	7	7	7	21	6	7	6	7	26	....	....	....	..	....	....	....	....	*	....	....	....
Chenango Strawberry	Sept.-Oct.	6	7	7	20	9	7	7	...	23	....	....	....	0	*	*	*	*	0	*	....	....
Colvert	Oct.-Nov	7	10	9	26	4	8	7	6	25	....	....	....	*	*	*	**	*	*	**	....	....
Cox's Orange Pippin	Dec.-Jan.	4	7	7	18	10	9	9	9	37	....	....	....	....	...	....	....	....	*	....	....	....
Cranberry Pippin	Dec.-Feb	8	10	9	27	5	6	9	10	30	....	....	....	....	**	....	....	....	*	....	....	....
Early Harvest	July-Aug.	7	8	8	23	8	7	6	....	21	....	....	....	*	0	0	*	*	*	0	....	....
Early Joe	July-Aug	7	8	9	24	7	7	6	....	20	....	....	....	....	....	....	....	....	0	....	....	....
English Codling	Aug.-Sept.	7	8	8	23	7	8	6	....	21	....	....	....	..	....	....	.	....	0	....	....	....
Fallawater	Jan.-Mar.	10	10	5	25	6	8	8	9	31	....	....	....	0	*	*	*	....	0	*	....	....
Fall Jenneting	Sept.-Oct.	9	9	9	27	5	6	4	4	19	....	....	....	....	....	....	..	....	0	....	....	....
Fall Pippin	Oct.-Dec	10	10	8	28	6	10	6	6	28	....	....	....	0	0	0	*	*	0	*	....	....
Fameuse	Sept.-Dec.	8	8	10	26	10	8	10	8	36	....	....	....	0	0	*	**	**	*	**	**	..
Gideon	Oct.-Dec.	10	10	10	30	8	9	10	8	35	....	....	....	....	...	*	....	....	....	*	....	**
Golden Sweet	Aug.-Sept	10	10	10	30	2	4	1	....	7	....	....	....	*	0	....	....	0	0	...	....	....
Golden White	Aug.-Sept.	10	10	10	30	6	8	8	....	22	....	....	....	....	....	....	....	..	0	....	....	....
Grand Sultan	Aug.-Sept.	10	10	8	28	5	8	6	6	25	....	....	....	....	...	...	*	....	*	....	....	....
Gravenstein	Aug.-Sept.	10	10	10	30	10	10	10	10	40	....	....	....	*	**	0	**	*	**	*	....	....
Green Newtown Pippin	....	..	....	....	....	....	..	....	....	....	....	....	....	....	0	..	....	....	00	....	....	....
Grimes Golden	Oct.-Mar	7	5	8	20	....	....	....	....	....	....	....	....	....	....	*	*	*	0	00	....	...
Greening	Jan.-Mar	8	8	10	26	8	10	8	8	34	....	...	....	**	**	**	**	**	**	**	....	00
Haas	Sept.-Oct	9	9	9	27	5	6	6	4	21	....	....	....	...	....	0	*	**	0	*	*	....
Hare Pipka	Sept.-Oct	10	10	9	29	5	8	9	7	28	....	....	....	....	....	....	....	....	....	*	...	....
Hastings	Jan.-Feb	8	9	8	25	8	7	7	6	28	...	....	....	....	....	....	....	....	*	....	...	....
Hawthornden New	Oct.-Dec	8	8	8	24	7	7	8	8	30	....	....	....	....	....	....	....	....	*	...	....	....
Hawthornden Old	Sept.-Nov.	7	8	8	23	5	7	5	7	24	....	....	....	*	....	....	0	....	*	....	....	....
Highland Beauty	Jan.-Mar	6	9	8	22	9	7	7	7	30	....	....	....	....	....	....	....	....	....	....	....	....
Holland Pippen	Aug.-Oct	8	8	7	23	6	7	6	5	24	....	....	....	*	....	....	0	*	0	....	....	....
Horn	Dec.-Mar.	8	10	10	28	8	7	7	7	29	....	....	....	..	....	....	...	..	0	....	....	...
Hubbardston's Nonsuch	Dec.-Mar	8	10	9	27	6	7	8	8	29	....	....	....	.	....	....	....	0	*	..	...	....
Hurlbut	Dec.-Feb	7	9	7	23	8	8	8	8	32	....	...	....	....	....	...	....	....	**	**	....	....
Jonathan	Dec.-Mar.	8	8	9	25	10	7	8	9	34	....	....	....	....	†	....	*	...	...	..	....	....
Kean's Seedling	Sept.-Nov.	10	10	10	30	7	10	9	7	33	....	....	....	....	....	....	..	...	....	*	....	...
Kentish Fillbasket	Oct.-Jan.	9	9	9	26	4	9	7	....	20	....	....	....	....	...	*	*	*	0	*	....	...
King	Oct.-Feb	7	5	5	17	9	10	10	10	39	....	....	....	*	*	**	**	*	0	00	....	00
La Rue	Oct.-Dec	10	8	6	24	7	7	6	....	20	....	....	....	....	....	....	....	....	0	*	*	*
Lord Burleigh	Jan.-May	10	9	9	28	8	10	8	8	34	....	....	....	....	....	....	....	....	0	...	....	....
Lord Suffield	Aug.-Sept	6	8	9	23	4	7	5	3	21	....	....	....	....	..	....	...	....	0	....	....	....
Lowell	Sept	6	8	9	23	4	7	5	5	21	....	....	....	...	..	*	...	....	....	*	....	....
McIntosh Red	Nov.-Mar	9	10	10	29	10	8	8	7	32	....	....	....	..	†	....	*	0	*	*	*	....
Mann	Feb.-May	7	10	5	22	6	8	6	7	27	....	....	....	0	..	**	*	*	*	*	*	....
Maiden's Blush	Oct.-Dec	9	10	10	29	5	8	9	8	30	...	....	....	*	0	*	*	....	*	....	....	....
Margil	Nov.-Jan	6	7	9	22	10	8	7	7	32	....	....	....	....	....	....	....	....	*	....	....	....
Minkler	Jan.-April	9	10	8	27	6	7	8	8	29	....	....	....	....	....	...	....	**	0	....	...	....
Mother	Nov.-Jan	5	7	7	19	10	8	7	7	32	....	....	....	...	....	*	....	....	0	..	...	...
Mountain Beet	Sept.-Oct	8	9	8	25	6	6	5	....	17	....	....	...	....	....	....	....	....	0	....	...	...
Mountain Tulip	Sept.-Oct	7	8	8	23	6	6	6	....	18	....	....	....	....	....	0	....	...	0	....	....	....
Munson Sweet	Oct.-Dec	10	10	10	30	1	3	2	....	6	....	....	....	....	....	...	0	....	0	....	....	....
Northern Spy	Jan.-Mar.	10	8	10	28	9	9	9	9	36	....	....	....	**	**	**	**	...	*	**	0	00
Northfield Beauty	Sept.	8	9	9	26	9	8	9	....	26	....	....	....	....	....	....	....	....	*	....	....	....

CATALOGUE OF FRUITS.—APPLES.—*Continued.*

Varieties tested at Bay of Quinte Station. — W. H. Dempsey, Trenton.	Season in use.	Tree. Vigor, scale 1-10.	Tree. Hardiness, scale 1-10.	Tree. Productiveness, scale 1-10.	Tree. Total value of tree	Fruit. Quality, scale 1-10. Desert.	Fruit. Quality, scale 1-10. Cooking.	Fruit. Value, scale 1-10. Home market.	Fruit. Value, scale 1-10. Foreign market.	Fruit. Total value of fruit.	Adaptation. Southern Stations. No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	Middle Stations. No. 5.	No. 6.	No. 8.	No. 9.	Northern Stations. No. 7.	No. 10.	No. 14.
APPLES.—*Con.*																						
Oldenburg	Aug.-Sept.	10	10	10	30	6	9	10	9	34	....	....	....	*	*	**	**	*	**	**	*	**
Ontario	Jan.-Mar.	8	9	10	27	9	9	9	9	36	....	....	....	*	**	....	**	*	**	**	*	....
Pewaukee	Jan.-Mar.	10	10	8	28	7	8	8	8	31	....	....	....	*		*	0	*	**	0	*	....
Princess Louise	Dec.-Feb	6	7	9	22	8	6	8	9	31	....	....	....		*			*		*		....
Plumb Cider	Oct.-Dec	8	9	10	27	4	4	4	....	12	....	....	....	....	....	....	....	....	0	....	....	....
Rambo	Oct.-Jan.	9	10	10	29	5	5	5	....	15	....	....	....	*	0	0	0	....	0	....	....	....
Rawle's Janet	Feb.-June.	6	9	10	25	5	4	5	5	19	....	....	....	....	....	....	....	....	0	**	*	....
Ribston	Nov.-Mar.	7	7	6	20	10	8	9	10	37	....	....	....	**	*	0	*	*	0	....	....	....
Peter	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*	....
Roxbury	Jan.-May	7	7	8	22	6	7	8	8	29	....	....	....	**	*	*	*	....	*	*	....	....
Salome	Jan.-May	8	9	7	24	9	6	8	10	33	....	....	....	....	....	....	....	....	....	....	*	....
Sutton Beauty	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*	....	....	....	....	....	....
Stump	Sept.-Oct.	8	8	8	24	6	6	6	5	23	....	....	....	....	....	....	....	....	0	....	....	....
Scarlet Pippin	Sept.-Dec.	9	10	10	29	10	9	10	....	29	....	....	....	....	....	....	....	....	....	....	**	....
Seek No Farther	Dec.-Mar	8	8	8	24	7	7	8	8	30	....	....	....	*	*	0	....	0	*	*	*	....
Sops of Wine	Aug.-Sept.	8	9	7	24	4	4	4	....	12	....	....	....	....	....	0	0	....	0	....	....	....
Sour Bough	Aug.-Sept.	10	9	8	27	2	7	8	....	17	....	....	....	....	....	0	....	....	....	....	....	....
St. Lawrence	Sept.-Oct	10	10	10	30	8	9	9	6	32	....	....	....	*	....	*	**	....	0	*	*	....
Stuart's Golden	Dec.-Mar.	8	9	10	27	7	6	6	6	25	....	....	....	..	....	....	....	....	*	....	....	....
Stark	Feb.-May.	10	10	10	30	4	6	6	8	24	....	....	....	....	....	....	....	....	**	**	....	....
Spitzenburg	....	....	....	....	....	....	....	....	....	....	..	....	....	*	0	*	*	....	0	....	*	....
Swaar	Dec.-Mar.	8	8	7	23	8	7	8	9	32	....	....	....	....	0	..	....	*	0	....	....	....
Swazie	Nov.-Jan.	7	8	9	24	9	8	5	....	22	....	....	....	*	*	*	*	*	0	*	....	....
Sweet Bough	Aug.-Sept	7	9	8	24	8	....	5	....	13	....	....	....	*	*	*		....	....	*	....	....
Tolman Sweet	Dec.-April	10	10	9	29	6	6	4	4	20	....	....	....	*	*	*	*	*	*	*	....	....
Tetofsky	Aug.	9	10	5	24	7	9	6	....	22	....	....	....	....	....	*	0	....	....	0	....	....
Utters Red	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*	....	....	0	....	....	....
Wealthy	Sept.-Dec.	9	9	10	28	8	8	9	8	33	....	....	....	*	*	*	*	**	**	*	**	†
Wagener	Dec.-Feb	7	8	10	25	8	8	9	7	32	....	....	....	*	*	**	*	....	*	*	....	....
Winesap	Dec.-May	6	8	9	23	7	5	7	7	26	....	....	....	....	....	....	....	....	....	....	....	....
Wolf River	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*	*	†
Walbridge	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	0	0	....	....
Yellow Transparent	August	10	10	8	28	6	8	6	....	20	....	....	....	....	*	*	*	*	*	*	....	**
Yellow Newton	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*	00	....	....
Yellow Bellefleur	Dec.-Mar.		8	5	19	9	8	7	....	24	....	....	....	....	0	*	0	*	0	*	*	....

CATALOGUE OF FRUITS—BLACKBERRIES—RASPBERRIES.

Tested at Burlington Station.	Season in use.	Bush.				Fruit.					Adaptation.											
						Quality, scale 1-10.		Value, scale 1-10.			Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Total value of Tree.	Dessert.	Cooking.	Home market.	Foreign market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
BLACKBERRIES.																						
Agawam	July 27-Aug 10	9	10	8	27	6	...	6	...	12	...	...	...	*	*	...	...	...	...	...	...	...
Ancient Briton	" 21- " 5	7	9	7	23	...	...	...	...	...	...	...	...	0	...	...	...	...	...	...	...	...
Childs' Tree	" 20- " 6	7	9	7	23	...	...	...	...	...	...	...	...	0	...	...	...	...	...	...	...	...
Dorchester	" 23- " 5	9	9	7	25	7	...	7	...	14	...	...	...	0	...	...	...	...	...	...	...	...
Early Cluster	" 25- " 10	9	10	7	26	7	...	7	...	14	...	...	...	0	...	...	...	...	...	...	...	...
Early Harvest	" 13 " 1	7	7	9	23	6	...	8	...	14	...	...	...	*	*	...	...	...	...	...	...	...
Early King	" 12- " 1	7	9	8	24	8	...	8	...	16	...	...	...	+	...	...	...	...	...	...	...	...
Eldorado	" 23- " 5	8	8	7	23	9	...	8	...	17	...	...	...	0	...	...	...	...	...	...	...	...
Erie	" 23- " 5	9	10	7	26	7	...	8	...	15	...	...	...	*	*	...	...	...	...	...	...	...
Gainor	" 23- " 5	9	10	9	28	10	...	9	...	19	...	...	...	+	...	...	...	...	...	...	...	...
Kittatinny	" 23- " 15	10	9	10	29	10	...	10	...	20	...	...	...	*	*	...	...	...	...	...	...	...
Lovett's Best	" 30- " 10	8	10	8	26	6	...	5	...	11	...	...	...	0	...	...	...	...	...	...	...	...
Maxwell	" 20- " 1	5	7	5	...	5	...	8	...	13	...	...	...	0	...	...	...	...	...	...	...	...
Minnewaski	" 25- " 5	8	8	6	22	...	...	...	...	...	...	...	...	0	...	...	...	...	...	...	...	...
Ohmer	" 23- " 5	9	10	7	26	8	...	8	...	16	...	...	...	+	...	...	...	...	...	...	...	...
Snyder	" 18- " 1	7	10	8	25	8	...	8	...	16	...	...	...	*	*	...	...	...	...	...	...	...
Stone's Hardy	" 23- " 5	7	10	8	25	8	...	8	...	16	...	...	...	+	*	...	...	...	...	...	...	...
Taylor	" 23- " 5	9	10	7	26	9	...	7	...	16	...	...	...	*	*	...	...	...	...	...	...	...
Wachusetts	" 23- " 10	9	10	6	25	10	...	7	...	17	...	...	...	0	...	...	...	...	...	...	...	...
Western Triumph	" 23- " 5	10	10	8	28	8	...	9	...	17	...	...	...	*	...	...	...	...	...	...	...	...
Wilson's Early	" 20- " 5	7	9	7	23	8	...	9	...	17	...	...	...	0	...	...	...	...	...	...	...	...
Wilson, Jun	" 20- " 5	10	8	6	24	...	...	...	...	...	...	...	...	0	...	...	...	...	...	...	...	...
RASPBERRIES.																						
All Summer	July 8-Oct. 15	6	9	7	22	8	...	8	...	16	...	...	...	*	...	0	...	...	...	...	...	...
Columbia	" 13- " 28	9	10	9	28	7	...	8	...	15	...	...	...	*	...	...	...	...	...	...	...	...
Cuthbert	" 13- " 31	10	10	8	28	10	...	10	...	20	...	...	...	**	**	...	...	...	...	...	...	...
Golden Queen	" 5- " 20	8	10	7	25	9	...	6	...	15	...	...	...	*	*	...	...	...	...	...	...	...
Gregg	" 13- " 31	9	10	7	26	7	...	7	...	14	...	...	...	*	*	...	...	...	...	...	...	...
Hilborn	" 5- " 20	8	9	7	24	6	...	7	...	13	...	...	...	*	*	...	...	...	...	...	...	...
Japan Wine	" 25- " 31	8	6	4	18	5	...	5	...	10	...	...	...	0	...	...	...	...	...	...	...	...
Kansas	" 5- " 20	9	10	9	28	10	...	8	...	18	...	...	...	**	...	...	...	...	...	...	...	...
Kenyon	" 12- " 25	7	8	7	22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

CATALOGUE OF FRUITS—RASPBERRIES—CHERRIES.

Tested at Burlington Station.	Season in use.	Tree or bush.				Fruit.					Adaptation.											
						Quality, scale 1-10.		Value, scale 1-10.			Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Total value of Tree.	Dessert.	Cooking.	Home market.	Foreign market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
RASPBERRIES.—*Con.*																						
Lottie	July 10-Oct. 25	8	8	7	23																	
Loudon	" 13- " 31	8	10	8	26	8		8		16				†								
Lovett	" 10- " 25	7	9	7	23	6		8		14												
Marlboro	" 5- " 25	7	10	10	27	7		10		17				**	**							
Miller	" 12- " 23	6	9	7	22																	
Mills	" 9- " 20	8	9	7	24																	
Ohio	" 3- " 31	9	10	8	27	9		8		17				*								
Older	" 8- " 25	8	9	6	23	4		8		12				*								
Palmer	" 1- " 20	8	10	8	26	9		8		17				*								
Phœnix	" 11- " 25	5	9	7	21																	
Progess	" 3- " 20	8	10	5	23	8		8		16												
Redfield	" 10- " 20	8	10	7	25	9		8		17				†								
Reliance	" 3- " 31	8	10	8	26	9		9		18				†								
Royal Church	" 13- " 31	6	9	7	22																	
Shaffer's Colossal	" 10- " 25	9	8	7	24	5		8		13				*	*							
Smith's Giant	" 13- " 31	10	8	9	27	8		8		16				†	†							
Souhegan	" 8- " 20	7	10	7	24	7		8		15				*								
Thompson	" 8- " 31	6	10	6	22	5		7		12												
Winant	" 10- " 25	5	7	3	15									0								
CHERRIES. Tested at Maplehurst.																						
Choisy	June 24 to July 4	6	9	4	19	10	4	5	4	23					*							
Cleveland	June 15 to 25	9	8	8	25	10	5	9	8	32					**							
Coe	June 25 to July 6	10	8	6	24	6	5	6	2	19					0							
Dyehouse																				**		
Eagle	July 1 to 10	7	8	4	19	10	4	8	7	29					0					**		
Early Purple	June 15 to 25	9	9	5	23	8	2	8	8	26					*							
Elkhorn	July 10 to 20	8	8	10	26	5	6	10	10	31					**			*				
Elton															*							
English Morello																	*			*		
Eugenie	June 20 to	9	10	7	26	6	10	6	6	28					*			**				
Hortense																*						
Kentish (late)		4	10	4	18	2	7	6	6	21					*	*	*			*	*	
Knight	June 20 to 30	7	8	6	21	10	5	9	9	33		**			*							

Koslov Morello	July 10 to														†							
Late Duke																*						
Magnifique																		*				
May Duke	June 15 to 30.	8	9	7	24	7	10	9	8	34		**			**	*	*					
Mazzard	July 1 to 12	10	10	4	24		2	2		4					0							
Mezel	July 4 to 15	10	8	10	28	8	7	10	10	35					**							
Montmorency	July 1 to 10	6	10	8	24	3	9	7	7	26	**	**	**	*	**	*	**	**		*		
M. ordinaire																**	**					
Napoleon	July 4 to 12	9	8	10	27	5	8	9	9	31		*			**							
Olivet		8	10	7	25	4	10	7	7	28					**	*						
Orel 24																				*		
Ostheim	July 8 to 16	4	10	7	21	4	8	7	7	26					*					**	*	†
Philippe																						
Richmond	June 20 to 30	4	10	6	20	3	9	7	7	26					**		*			*	*	†
Rockport															0							
Spanish	July 4 to 12	10	8	6	24	8	8	8	8	32		*			**	*		*				
Tartarian		8	8	7	23	10	7	10	10	37		**			**		*	**		0		
Vladimir												*								0	*	
Windsor		8	10	8	26	8	5	10	10	33					**	*			**			
Wood	June 20 to July 4	7	8	8	23	10	5	8	7	30					**		*			0		
Wragg															*	*						
CURRANTS. Tested at Burlington.																						
Belle de St. Giles	July 8—13	7	All hardy thus far.	5	12	9		10														
Black Victoria	" 8—20	9		6	15			9														
Brayley's Seedling	" 8—13	7		8	15	6		8		14				†								
Champion	" 20—31	10		9	19			10						*								
Cherry	" 6—12	8		9	17	9		10		19				**	**							
Collins' Prolific	" 20—31	10		5	15			9														
Fay's Prolific	" 7—12	6		7	13	7		9		16				*	**							
Lee's Prolific	" 12—20	8		8	16			9						**	**							
Naples	" 12—20	9		9	18			9						**	*							
New Victoria r	" 4—8	7		6	13																	
North Star	" 7—12	7		7	14	7		9		16					00							
Pomona	" 4—8	7		5	12																	
Raby Castle	" 11—16	8		10	18	7		8		15				*	*							
Red Cross	" 7—12	7		7	14	8		6		14												
Red Dutch	" 4—8	8		7	15	7		7		14				*								
Red Victoria	" 7—12	8		9	17	9		9		18				*								
Saunders	" 12—20	9		6	15										**							
Versailles	" 7—12	7		6	13	7		8		15					*							
White Grape	" 7—12	8		8	16	7		7		14				†	0							
White Imperial	" 7—12	8		7	15	10		8		18												
Wilder	" 7—12	8		8	16	7		10		17				†								

(a) Those varieties left blank not as yet sufficiently tested.

CATALOGUE OF FRUITS—GRAPES.

Key to Quality:

1 Very Poor.
2—3 Poor.
4—5 Fair.
6—7 Good.
8—9 Very Good.
10 First Class.

Key to Market Value:

1— 3 4th Rate.
4— 6 3rd Rate.
7— 8 2nd Rate.
9—10 1st Rate.

Key to Adaptation:

*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Tested at Wentworth Experimental Station by M Pettit, Winona.	Season in use.	Tree.					Fruit.			Adaptation.										
										Southern Stations.					Middle Stations.				Northern Stations.	
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Freedom from disease, scale 1-10.	Total value of Vine, max. 40.	Quality, scale 1-10. Dessert.	Value, scale 1-10. Home market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10
Adirondac	September	3	2	2	2	9	9	2	11											
Agawam (Rog. 15)	Oct.-Nov.	9	9	8	4	30	9	9	18		**		*	**			**			
Alvey (Hagar)	October	7	8	6	8	29	2	2	4											
Amber	"	6	6	3	4	19	2	2	4											
Amber Queen	Oct.-Nov.	7	6	5	6	24	6	5	11								0			
Aminia	September	6	8	7	7	28	6													
America	October	8	9	6	7	30	2										*			
August Giant	September	8	8	7	8	31	5	5	10					0						
Bacchus	October	9	9	8	8	34	2							0						
Barry	"	9	9	8	7	33	7	7	14				*							
Eerckman's	September	6	6	5	7	24	7													
Black Delaware	"	4	7	4	7	22	8													
Black Eagle	"	7	5	6	6	24	8													
Black Pearl	"	9	9	9	9	36	2	2	4											
Brighton	"	8	10	7	6	31	8	7	15		*		0	**	*	**	*			
Brilliant	"	8	8	7	7	30	7													
Cambridge	October	8	8	8	6	30	8													
Catawba	Oct.-Nov.	8	10	8	5	31	10				*		0	*						
Colerain	September	7	7	8	8	30	8	10	20											
Concord	Sept.-Oct.	10	10	10	9	39	6	10	16		*		**	**	**	*	*			*
Cottage	September	6	8	3	8	25	4	4	8											
Clinton											*		0	0	**	0	*			
Crevelling	September	10	10	6	6	32	6	4	10					*						
Croton	"	6	7	6	6	25	8													
Cynthiana	October	7	8	5	6	26	2													

Delaware	September	5	8	8	6	27	10	10	20		*		**	**	*	*	**			*	
Diana	October	9	9	7	6	31	6	6	12					*							
Dracut Amber	September	6	9	7	6	28	2	4	6												
Dr. Collier	October	7	8	8	7	30	4														
Duchess	"	6	5	6	8	25	5	6	11					*			0				
Early Ohio	August	7	8	8	8	31	5										**				
Eldorado	September	8	8	6	7	29	9	6	15				0								
Empire State	"	7	8	4	7	26	4	4	8		0			*			†				
Eumelan	"	6	7	6	7	26	7	5	12												
Goethe (Rog. 1)	October	9	9	8	8	34	4	7	11					0							
Herbert											**						0				
Jefferson	Oct.-Nov.	4	5	5	7	21	6	6	12												
Janesville														*			**				
Jessica														*					*		
Lady	September	2	10	2	6	20	8	8	16				*	**			0				
Lady Washington	October	9	9	7	5	30	4	4	8		0			0							
Lindley (Rog. 9)	September	9	10	8	8	35	9	9	18		**		*	**	*		**				
Lutie	"	7	8	9	8	32	4														
Marion	October	8	8	7	8	31	2														
Martha	September	4	6	4	6	20	7	4	11								0			*	
Massassoit (Rog. 3)	"	10	9	6	6	31	8	7	15		0		*	*		*				*	
Mills	"	6	8	7	7	28	8							†							
Merrimac											*			*							
Missouri Reisling	October	7	8	7	5	29	4	3	7					0							
Moore's Diamond	September	6	8	6	7	27	7	7	14				*	*		**	**		*		
Moore's Early	"	5	9	4	9	27	7	8	15		*		*	**	**	*	*		*		
Moyer													**	0			*		*		
Niagara											**		*	**		**	**		*		
Noah	October	9	9	10	5	33	2	3	5					0							
Oneida	"	8	7	8	7	30	5														
Perkins	September	8	8	7	7	30	3	5	8					*							
Pocklington	October	5	8	6	8	27	7	6	13		0		*	*		*	*				
Poughkeepsie Red	"	7	6	5	6	24	8							†							
Prentiss	"	6	7	6	6	25	5	5	10												
Rebecca	September	3	4	3	3	13	8	5	13												
Requa (Rog. 28)	"	10	8	8	7	33	8	8	16												
Rockwood	October	7	8	9	6	30	8													*	
Salem	September	10	8	8	6	32	8	9	17		*		*	**		*	0			**	
Taylor	October	9	9	3	7	28	2	2	4												
Triumph	"	9	9	9	8	35	6							0							
Transparent	"	7	7	7	6	27	6							0							
Ulster Prolific	"	7	8	8	7	30	5							†							
Vergennes	Oct.-Nov.	7	7	6	7	27	6	8	14		**		*	**		*	0				
Victoria	September	7	6	6	7	26	6							*							
Wilder	"	7	9	7	7	30	7	8	15		*		*	**		*					
Woodruff Red		9	9	8	8	34	8							†							
Worden	September	7	10	7	8	32	9	8	17		**		**	**	**	*			*		
Wyoming Red	"	8	8	7	8	31	4	6	10		*		*	†							

CATALOGUE OF FRUITS.—PEARS.

Tested by E. C. Beman, Newcastle, Ont.	Season in use.	Tree. Vigor.	Hardiness.	Productiveness.	Total value of tree.	Fruit. Quality. Dessert.	Cooking.	Home market value.	Total value of fruit.	Remarks.
Ananas d'Ete	Sep., Oct.	7	6	7	20	8	6	8	22	Very subject to blight.
Bartlett	Sept	8	8	9	25	9	10	10	29	One of the best for market.
Bergamot Gansels	Sep., Oct.	6	9	5	20	8	5	5	18	
Bergamot Gansels, late	Jan., Mar.	6	8	8	22	2	5	4	11	Not worth growing.
Belle Lucrative	Sep., Oct.	7	6	7	20	8	6	6	20	Very good, subject to blight.
Beurre Assomption	Sep	7	5	6	18	6	7	8	21	Not sufficiently hardy
Beurre Bosc	Oct., Nov.	8	7	8	23	9	7	10	26	Very fine for market.
Beurre Bachelier	Oct., Nov.	7	8	8	23	5	5	6	16	Not valuable
Beurre Baltet Pere	Nov., Dec.	6	6	8	20	5	6	6	17	
Beurre Clairgeau	Nov., Dec.	6	5	8	19	5	6	8	19	Very showy.
Beurre d'Amanlis	Sep	8	9	9	26	5	5	4	14	
Beurre d'Anjou	Nov., Dec	9	10	4	23	9	6	10	25	Not productive
Beurre d'Aremburg	Dec., Jan.	8	8	7	23	6	6	5	17	Sometimes astringent.
Beurre de Martillet	Sep	7	6	7	20	7	5	7	19	Rots at core, handsome.
Beurre Diel	Nov., Dec.	7	8	6	21	8	7	7	22	Liable to rot.
Beurre Gris	Sep., Oct.	6	7	6	19	6	6	5	17	Very valuable, usually poor.
Beurre, Golden of Bilboa	Sep	7	5	6	18	5	6	6	17	Very showy, but poor.
Beurre Goubalt	Sep	5	5	7	17	4	5	3	12	Not worth growing.
Beurre Hardy	Oct	8	8	6	22	7	6	7	20	
Beurre Oswego	Oct., Nov.	8	9	8	25	6	5	5	16	Spots and cracks.
Beurre Robin	Sep	9	8	8	25	5	5	6	16	
Beurre Superfin	Oct	8	10	6	24	8	6	6	20	
Blanc Perne	Dec., Ap'l	6	7	8	21	2	6	4	12	Not worth growing.
Black Warserter	Dec., Mar.	9	8	10	27	1	4	2	7	Of no value.
Bloodgood	Aug.	5	7	7	19	9	5	5	19	Fine for home use.
Bonne d'Eyee	Sep, Oct.	5	6	6	17	8	6	5	19	Identical with Buckworth.
Bon Chretien, Summer	Sep	7	9	7	23	5	8	5	18	Spots and cracks.
Brandywine	Sep	8	8	5	21	7	4	5	16	Rots at core.
British Queen	Nov	7	6	5	18	7	6	6	19	
Buffum	Sep., Oct.	8	7	8	23	6	5	5	16	
Catillac	Dec., April	6	5	7	18	1	6	3	10	
Calite Mignot	Nov., Dec.	7	6	10	23	2	4	3	9	
Church	Sep., Oct.	7	8	6	21	7	5	6	18	
Clapp's Favorite	Sep	9	7	9	25	9	8	9	26	Subject to blight.
Comet	Aug	8	7	8	23	2	4	5	11	Beautiful but very poor.
Dana's Hovey	Nov,. Dec.	8	8	6	22	9	4	5	18	Very fine for home use.
Dearborn's Seedling	Aug.	7	8	7	22	8	6	5	19	
Dix	Oct., Nov.	8	8	6	22	7	6	6	19	Liab'e to spot and crack.
Doyenne Boussock	Sep., Oct.	9	8	7	24	7	6	9	22	
Doyenne d'Ete	July, Aug	7	7	8	22	7	4	4	15	
Doyenne Goubalt	Dec., Mar.	5	5	4	14	6	5	6	17	
Doyenne Gris	Oct., Nov.	6	7	7	20	8	6	4	18	Spots and cracks.
Doyenne White	Oct	7	8	8	23	8	6	5	19	Spots and cracks.
Duchess d'Angouleme	Oct., Nov.	5	5	8	18	4	6	6	16	Season too short.
Duchesse de Bordeaux	Jan., Mar.	7	7	6	20	7	6	5	18	Good for home use.
Duchess Precoce	Sep	7	8	10	25	6	10	10	26	Fine for market.
Flemish Beauty	Oct	10	8	9	27	8	7	8	23	Spots and cracks.
Foselle	Nov., Dec.	6	5	6	17	4	4	5	13	Beautiful but poor.
Fondante de Malines	Sept., Oct.	5	6	8	19	3	6	7	21	
Garber	Nov	10	7	10	27	4	8	7	19	
Glout Morceau	Dec	5	4	6	15	5	6	4	15	Subject to blight.
Goodale	Oct	8	9	9	26	7	7	8	22	
Graslin	Oct., Nov.	8	6	8	22	6	6	7	19	
Harvard	Sep	8	9	7	24	5	5	6	16	Rots at core.
Howell	Oct	7	7	9	23	6	7	8	21	
Idaho	Oct	8	7	8	23	7	8	5	20	Very subject to blight
Jaminette	Dec., Mar.	9	7	8	24	7	6	7	20	Good for long keeper
Jargonelle, English	Aug	7	6	7	20	6	5	3	14	Subject to blight and rots at core.
Jones	Oct., Nov.	8	8	10	26	8	5	7	20	
Josephine de Malines	Dec., Feb.	7	7	8	22	9	6	7	22	

PEARS.—*Continued.*

Tested by E. E. Beman, Newcastle, Ont.	Season in use.	Tree.				Fruit.				Remarks.
		Vigor.	Hardiness.	Productiveness.	Total value of tree.	Quality. Dessert.	Quality. Cooking.	Home market value.	Total value of fruit.	
Keiffer	Nov., Dec.	7	7	10	23	5	10	6	21	Rots at core.
Kirtland	Sep	8	6	7	22	7	6	5	18	Unproductive.
King Sessing	Sep	7	8	5	20	7	7	6	20	
Lawrence	Nov., Jan.	7	7	8	22	9	7	7	23	
Louise Bonne de Jersey	Sep., Oct.	7	7	9	23	7	9	7	23	Subject to blight.
Madeline	Aug	7	6	7	20	6	4	5	15	
Marshall	Sep	7	8	7	22	6	5	6	17	
Madame Eliza	Nov	9	8	8	25	5	6	5	16	Subject to blight.
Mons. Haberlin	Sep	7	6	5	18	7	6	6	19	
Mount Vernon	Nov., Dec.	8	8	7	23	8	6	7	21	
Nonreau Poiteau	Nov	7	6	8	21	6	7	7	20	Sometimes astringent.
Onondaga	Oct., Nov.	8	6	7	21	6	6	7	19	
Osband's Summer	Aug	6	7	6	19	7	5	4	16	
Ott	Aug	7	6	8	21	9	5	5	19	Variable in flavor.
Passe Colmar	Dec., Jan.	8	6	8	22	7	6	5	18	
Paradise d'Automne	Sep., Oct	8	7	9	24	8	6	7	21	Subject to blight.
Pitmaston	Oct., Nov.	7	6	8	21	6	8	8	22	
Pound	Dec., Mar.	7	7	6	20	1	6	4	11	
Pratt	Sep., Oct.	8	7	9	24	6	6	7	19	Very fine for home use.
Rostiezer	Aug., Sep.	8	7	6	21	9	5	6	20	
Rutter	Oct., Nov.	7	7	8	22	6	5	7	18	Best dessert pear grown.
Seckel	Sep., Oct.	7	9	8	24	10	6	7	23	
Sheldon	Oct	9	8	7	24	9	7	9	25	Subject to blight.
Souvenir du Congres	Sep	7	6	7	20	7	8	8	23	Subject to blight.
Steven's Genessee	Sep	7	7	8	22	6	5	6	17	
St. Germain	Nov., Dec.	6	7	7	20	6	7	5	18	
St. Ghislain	Sep., Oct.	7	7	8	22	7	5	5	17	
Triomphe de Vienne	Sep	8	8	9	25	8	7	8	23	
Tyson	Sep	10	9	7	26	10	5	5	20	Variable in quality.
Urbaniste	Sep., Oct.	7	7	6	20	8	7	8	23	
Vicar of Wakefield	Nov., Feb.	8	6	8	22	2	8	6	16	
Washington	Sep	7	7	9	23	8	5	6	19	
Winter Nelis	Dec. Jan.	6	7	8	21	9	5	9	23	Variable in flavor, some times astringent.
Wilmot	Sep., Oct.	10	10	10	30	8	6	8	22	

CATALOGUE OF FRUITS—PEARS.

Key to Quality.

1—Very Poor.
2-3—Poor.
3-4—Poor to Good.
5-6—Good to Very Good.
7-8—Very Good.
8-9—Very Good to Best.
10—Best.

Key to Adaptation.

*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Varieties tested at East Central Station. — R. L. Huggard, Whitby.	Season in use.	Tree.				Fruit.				Adaptation.											
						Quality, scale 1-10.				Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale, 1-10.	Productiveness, scale 1-10.	Total value of tree.	Dessert.	Cooking.	Value, scale 1-10. Home market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
Ananas d'Ete	September, October	8	6	4	48	4	4	5	13									0			
Bartlett	September	7	7	9	23	9	5	10	24		**		**	**	**	**	**	**	†	00	00
Belle Lucrative	September, October	6	7	8	21	8	4	7	26				*		*	*	**	0			
Beurre Antoine	October, December	7	7	7	21	8	4	6	25								*				
Beurre Bosc	September, October	....	....	....	....	....	....	....	....		**			**				**			
Beurre d'Anjou	October, December	8	9	6	23	7	6	8	34		**		**	**	**		†	*	†		
Beurre Diel	September, December	9	....	....	....	8	....	....	....					*							
Beurre Easter	....	....	....	....	....	....	....	....	....					*			*				
Beurre Giffard	August	7	7	7	21	10	6	9	25					**			*				
Beurre Hardy	September, October	10	10	10	30	8	8	9	25					*			*	**			
Beurre Clairgeau	October, January	9	8	9	26	8	7	8	32		**			**	*	*	*	*			
Beurre Superfine	October	7	8	8	23	8	4	6	26								*				
Brandywine	August, September	....	....	....	....	....	....	....	....								0				
Brockworth Park	December	8	8	7	23	7	6	6	19								*				
Buffum	Last of September	9	9	6	24	7	5	7	19					*			*	0			
Clapp's Favorite	August, September	10	7	9	26	10	7	9	26		*		**	**	**	*	**	*	*	†	
Doyenne d'Ete	July	9	7	8	24	8	....	8	....					*			*				
Dempsey	October, November	....	....	....	....	....	....	....	....									**			
Doyenne Boussock	September, October	10	10	10	30	8	9	9	26					**			*	**			
Duchess	October	8	8	7	23	8	8	8	24		*		**	*	*	*	**	*	**		
Duchess de Bordeaux	December, February	....	....	....	....	....	....	....	....		*						*	0			
Duchess Precoce	....	....	....	....	....	....	....	....	....								**	†			
Dorset	....	....	....	....	....	....	....	....	....									†			

D'Jules Guyot																			†		
Eastern Belle																				†	
*Flemish Beauty	September	9	9	8	26	8	9	7	24		0		0	0	*	**	*	0		*	
Gooda'e	October	8	8	7	23	8	7	8	23					*	*	*	0	*			
Glout Morceau	December	8	8	6	22	6	6	8	20								*	0			
Graslin	December	8	7	8	23	8	7	7	22								[illegible]				
Grey Doyenne	July	7	6	6	19	8	2	8	18								0				
Howell	October, November	8	6	7	21	9		8					*	**		*	**	*			
Idaho	October, November	8	9	7	24	7	8	8	23					*			*	0			
Josephine de Malines	December, January	7	7	8	22	8		7						*	*		*	*	†		
**Kieffer	November	10	10	10	30	8	9	7	24		*		*	*	*	*	**	0	*	†	†
Lawrence	December	6	8	5	19	8		8			*			*	*		*	*			
Louise Bonne	September, October	7	8	9	24	10	7	8	25		*			*		*	**	0			
Lawson																	*		†		
Le conte	October													0			0				
Manning's Elizabeth																	0	0			
Mount Vernon	November, December	9	7	8	24	8	6	7	21					*			*	0			
Margaret														*							
Osband's Summer	August													*			0				
P. Barry	December													+							
Petite Marguerite	August													*							
President Druard	December, January	7	9	7	23	6	8	5	19								*				
Ritson	October, November	9	10	8	27	8		6									*				
Rostiezer	August, September	10	8	8	26	10								*			**	*		†	
Sheldon	October	9	7	7	23	10	7	8	25		*		*	*	*		**	0			
Souvenir du Congres	August, September	8	7	8	23	7	8	9	24		0		*				*	0	†		
Tyson	August, September	7	10	8	25	9	8	8	25		*			*		*	*	0			
Seckel	August, October										*		*	*		*	*	0	*		
Vicar of Wakefield	November, January													0		*	*	0			
*White Doyenne	September													0			0	*			
Winter Seckel	January, March	6	7	6	19	7		7													
Winter Nelis	December, January	8	10	9	27	8		7						*			**		†		

* Scabs badly at Southern Stations. ** The Secretary does not agree with Mr. Huggard's value of Kieffer for dessert. All these values will be revised next year.

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.

PLUMS.

Key to Quality:
1 Very poor.
2—3 Poor.
4—5 Fair.
6—7 Good.
9—9 Very Good.
10— First Class.

Key to Market Value:
1—3 4th Rate.
4—6 3rd Rate.
7—8 2nd Rate.
9—10 1st Rate.

Key to Adaptation:
*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Varieties tested at Georgian Bay Station. — J. G. Mitchell, Clarksburg.	Season in use.	Tree.				Fruit.					Adaptation.											
						Quality, scale 1-10.		Value, scale 1-10.			Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardness, scale 1-10.	Productiveness, scale 1-10.	Total value of tree.	Dessert	Cooking.	Home market.	Foreign market.	Total value of fruit	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. —
Abundance												**		*	*	†	*	**		†	†	†
Arch Duke	Last of Sept	8	10			6	8					**					**			†		
Bradshaw	Aug	9	8	8	25	8	9	10		27		**		*	**	*	**	*		†		†
Burbank	Sept	10												*	**	†	*			**		
Bleeker's Gage																	*					
Bingham																						
Chabot																						
Coe's Golden Drop	Sept.-Oct	4	8	8	20	7	10	10		24		**		*	*	*	**	*		†		
Columbia	Sept	10	8	10	28	8	9	10		27		*			**		*					
Damson	August	9	10	10	29		7	4		11		**		*		*	*					
Duane's Purple	August	9	8	5	22	7	7	7		21		*		*	*		*					
De Doto																				†	*	
Fellemberg												*		*			*	*				
General Hand	Sept	10	9	6	25	7	8	10		25		0		0	*	*	0	*		*		
Glass	Sept	10	10	9	29	4	8	7		19		*		*			**	*		*		
Goliath	Aug	8	7	8	23	6	7	7		20		*										
German Prune	Sept.-Oct	7	7	7	20		9	8		17		**		*		*	**	**		†		
Grand Duke												†				†	**					
Gueii	Aug	10	10	8	28	5	7	7		19		*		0			*	*		*		
Howard's Favorite	Sept.-Oct	8	10	8	26	6	9	6		24							*					
Huling's Superb												**					*	**				
Imperial Gage	Aug	10	8	9	27	10	10	10		30		**		**	**	**	*	**		*		
Jefferson	Early Sept	7	6	6	19	10	10	10		30		*		*	*		*					

Lawrence's Favorite	Aug	10	8	8	26	10	10	7	...	27	...	...	...	...	...	...	...	...	...	...	...	...
Lincoln	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lombard	Sept	10	10	10	30	8	9	8	...	25	...	*	...	**	*	**	*	**	...	**	*	...
McLaughlin	Aug	8	7	6	21	10	10	9	...	29	...	*	...	...	*	...	*	**	...	...	...	...
Moore's Arctic	Early Aug	7	10	10	27	2	5	7	...	14	...	*	...	...	0	**	*	*	...	...	...	**
New Goderich	Sept	9	9	10	28	5	8	8	...	21	...	...	...	...	...	...	*	...	...	...	...	...
Niagara	...	...	...	...	...	...	...	...	...	...	...	*	...	...	...	...	...	...	...	...	...	...
Ouillin's Golden Gage	...	...	...	...	...	...	...	...	...	...	...	**	...	...	...	...	...	...	...	...	...	...
Orange	Aug	9	8	8	25	4	6	8	...	18	...	*	...	...	...	...	...	...	...	...	...	...
Prince of Wales	Sept	6	7	6	19	8	9	10	...	27	...	**	...	*	*	...	*	*	...	†	...	...
Peach	Aug	7	6	4	17	8	8	8		24	...	...	...	...	...	...	*	...	...	...	...	...
Pond Seedling	Last of Sept	10	10	8	28	4	7	10	...	21	...		...	0	*	*	*	**	...	*	†	...
Peter's Yellow Gage	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	*	*	...	†	...	...
Prince's Yellow Gage	Early August	9	10	8	27	6	6	7	...	19	...	**	...	...	...	...	*	...	...	**	...	...
Purple Egg	...	...	...	...	...	...	...	...	...	...	...	**	...	...	...	...	...	...	...	...	...	...
Quackenbos	Sept	10	10	9	29	4	8	7	...	19	...	*	...	*	*	...	**	*	...	*	...	...
Reine Claude	Sept.-Oct	10	10	8	28	10	10	10	...	30	...	**	...	**	*	...	**	*	...	*	...	...
Reine Claude Violette	...	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Red Magnum Bonum	...	...	...	...	...	...	...	...	...	...	...	*	...	...	...	...	...	*	...	...	...	...
Saunders	...	...	...	...	...	...	...	...	...	...	...	*	...	...	...	...	...	...	...	...	...	...
Smith's Orleans	Aug.-Sept	10	10	9	29	6	9	9	...	24	...	*	...	*	...	**	*	*	...	...	...	...
Spaulding	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0	...	...	...	...
St. Catharine	September	8	8	8	24	10	10	9	...	29	...	*	...	...	...	...	...	...	...	...	...	...
Victoria	...	...	...	...	...	...	...	...	...	...	...	*	...	...	...	...	*	*	...	...	...	...
Washington	Aug.-Sept	9	7	8	24	10	10	10	...	30	...	**	...	*	*	*	**	**	...	0	...	
Willard	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wild Goose	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wickson	...	...	...	...	...	...	...	...	...	...	...	...	...	...	†	†	...	...	...	†	...	...
Yellow Egg	Sept	8	8	6	22	.	8	10	...	18	...	*	...	*	*	*	**	**	...	*	*	...
Yellow Gage	Aug	6	7	8	21	7	10	7	...	24	...	...	...	**	...	*	0	...	...	...	...	...

CATALOGUE OF FRUITS FOR THE USE OF PLANTERS.—RASPBERRIES.

Varieties tested at Lake Huron Station. B A. E. Sherrington.	Season in use.	Tree.				Fruit.			Adaptation.												Remarks.
									Southern Stations.					Middle Stations.				Northern Stations.			
		Vigor.	Hardiness.	Productiveness.	Total value of Tree.	Quality, Dessert.	Value, Home market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.	
All Summer	....	4	10	....	14	....	....	0	....	....	....	....	....	0	....	....	....	....	....	....	
Brandywine	July 5-July 28	8	10	10	28	9	8	17	....	....	....	....	....	*	....	....	....	....	....	....	
Brinckle's Orange	" 11-Aug. 4	7	10	5	22	7	4	11	....	....	....	....	....	*	....	....	....	....	....	....	
Cuthbert	" 11- " 6	10	9	10	29	10	10	20	....	....	....	....	....	*	....	....	....	....	....	....	
Caroline	" 11- " 8	10	10	10	30	4	4	8	....	....	....	....	....	*	....	....	....	....	....	....	
Conrath	" 13-July 28	10	10	10	30	9	10	19	....	....	....	....	....	†	....	....	....	....	....	....	
Columbian	" 22-Aug. 8	8	5	4	17	8	8	16	....	....	....	....	....	....	....	....	....	....	....	....	Badly winter killed.
Golden Queen	" 11- " 4	7	10	9	26	8	8	16	....	....	....	....	....	*	....	....	....	....	....	....	Best yellow berry.
Gregg	" 16- " 4	9	7	5	21	10	10	20	....	....	....	....	....	†	....	....	....	....	....	....	
Gault	" 22- " 8	7	8	6	21	7	8	15	....	....	....	....	....	†	....	....	....	....	....	....	
Hilborn	" 13-July 28	4	10	3	17	5	5	10	....	....	....	....	....	†	....	....	....	....	....	....	Don't think this is the true Hilborn.
Hansell	" 2- " 28	8	10	9	27	7	7	14	....	....	....	....	....	*	....	....	....	....	....	....	
Johnson's Sweet	" 16-Aug. 1	5	4	3	12	1	4	5	....	....	....	....	....	0	....	....	....	....	....	....	
Kansas	" 13- " 1	9	10	10	29	10	10	20	....	....	....	....	....	**	....	....	....	....	....	....	
Lovett's	" 16- " 4	8	7	8	23	7	7	14	....	....	....	....	....	*	....	....	....	....	....	....	
Lottie	" 16- " 1	8	10	5	23	9	6	15	....	....	....	....	....	*	....	....	....	....	....	....	
Loudon	" 9- " 1	7	10	4	21	9	9	18	....	....	....	....	....	†	....	....	....	....	....	....	
Marlboro	" 8- " 4	8	10	8	26	7	9	16	....	....	....	....	....	**	....	....	....	....	....	....	
Miller	" 11- " 4	9	10	7	26	7	9	16	....	....	....	....	....	*	....	....	....	....	....	....	
Mammoth Cluster	" 13-July 28	4	10	4	18	4	5	9	....	....	....	....	....	0	....	....	....	....	....	....	
Ohio	" 16-Aug. 8	9	8	8	25	6	8	14	....	....	....	....	....	*	....	....	....	....	....	....	
Pioneer	" 13- " 4	7	10	9	26	7	8	15	....	....	....	....	....	*	....	....	....	....	....	....	
Phœnix	July 11-Aug. 6	8	10	5	23	9	9	18	....	....	....	....	....	†	....	....	....	....	....	....	
Reliance	" 8-July 25	8	10	7	25	7	7	14	....	....	....	....	....	*	....	....	....	....	....	....	
Rancocas	" 2- " 28	8	10	6	26	7	6	13	....	....	....	....	....	*	....	....	....	....	....	....	
Redfield	" 20-Aug. 4	9	10	7	26	2	2	4	....	....	....	....	....	0	....	....	....	....	....	....	
Shaffer	" 16- " 6	10	4	5	19	6	7	13	....	....	....	....	....	†	....	....	....	....	....	....	Badly winter killed.
Smith's Giant	" 18- " 1	9	8	7	24	10	10	20	....	....	....	....	....	†	....	....	....	....	....	....	" "
Superlative	" 13- " 4	5	5	4	14	9	9	18	....	....	....	....	....	†	....	....	....	....	....	....	" "
Strawberry Raspberry	" 28- " 8	5	10	6	21	0	0	0	....	....	....	....	....	0	....	....	....	....	....	....	
Turner	" 2-July 25	8	10	5	23	9	9	18	....	....	....	....	....	*	....	....	....	....	....	....	
Taylor	" 9- " 25	8	10	8	26	6	6	12	....	....	....	....	....	*	....	....	....	....	....	....	
Thompson	" 2- " 25	7	10	8	25	6	7	13	....	....	....	....	....	*	....	....	....	....	....	....	
White Champlain	" 9- " 25	6	9	4	19	7	5	12	....	....	....	....	....	*	....	....	....	....	....	....	Row not full.
Zettler	" 11-Aug. 4	9	10	9	28	7	9	16	....	....	....	....	....	**	....	....	....	....	....	....	A local berry.

ANNUAL REPORT

OF THE

SUPERINTENDENT OF SPRAYING

FOR

ONTARIO

1898

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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1899.

REPORT

OF THE

SUPERINTENDENT OF EXPERIMENTAL SPRAYING.

1898

To the Honorable John Dryden, Minister of Agriculture for Ontario:

During the year 1898 experimental spraying was conducted at thirty points, covering the Province from Amherstburg to Ottawa.

This territory was divided into three routes, Mr. R. H. Dewar taking the western, Mr. J. H. McNeilly the central, and Mr. Joseph McPherson the eastern. They started on their trips on April 20th, 20th and 25th, respectively. It was intended at first to give six sprayings, but so many applications were lost through bad weather and during the blooming of the orchards that it was necessary to make a seventh trip on the western and central routes to accomplish this, and even with the seven trips in some orchards only two or three applications were made.

One solution was used for all the applications—Bordeaux mixture, according to the following formula:

Copper sulphate	4 pounds
Fresh lime	4 pounds
Water	40 gallons

To this was added in every case 4 ounces of Paris green.

The following plan of spraying was followed as closely as possible:

First spraying: When the buds are swelling.

Second spraying: Just before the blossoms open.

Third spraying: When the blossoms have fallen.

Sprayings at intervals of about twelve days until the danger of scab is past.

That the farmers appreciate this effort of the Department to benefit them and demonstrate the best methods of caring for their orchards, is shown by the fact that the attendance this year was 3,538 besides many who visited the orchards to see the results when the agent was not there. An increasing interest is being shown in the work year by year. The attendance this year was about 700 more than the attendance last year, and double the attendance in 1896.

Applications for the work this year were received from several points which we were unable to accommodate, and already requests have been received for the work for next year from more than thirty points, including two points where the work has already been done. These latter say that the farmers did not realize how important it was, and wished for another opportunity to see the work. In ascertaining the percentage of perfect fruit we stripped a part of each tree and carefully examined each apple, any apple which had a worm or a spot, no matter how small it might be, was counted as imperfect. Even with this severe classification in many cases from ninety to one hundred per cent of clean fruit was obtained from the sprayed trees. On the sprayed trees much of the fruit which was counted as imperfect would be barreled by packers as first class fruit, owing to the thrifty condition of the trees, the fruit being much larger and cleaner than the imperfect fruit from the unsprayed trees.

We had the common insect enemies to contend with this year. There were more numerous than usual, the dry hot weather being favorable to their propagation. The tent caterpillar was reported very bad on the 23rd of April. In many sections orchards were entirely defoliated by them. At one station where no spraying was done except on the experimental plot, they stripped the trees of their foliage, although the owner of the orchards said he had gone over the trees three times and destroyed their tents. The agent reported that the sprayed trees looked like monuments of mercy in the midst of surrounding desolation. However, they were controlled without difficulty on the sprayed trees.

The Aphis was reported bad at some points as early as April 23rd, although it was not nearly so bad as last year. I am convinced that to secure the best results we must begin treating the aphis and tent caterpillar much earlier than we have been accustomed to do. At Fruitland we discovered aphis on the buds as early as April 8th, and tent caterpillar on April 15th.

The rose-beetle was reported as doing a great deal of damage at Niagara on June 11th.

The green fruit-worm, a comparatively new-comer, and but little known here, is likely to become a serious pest—some growers reporting from 20 to 30 per cent. of their apples and pears ruined by it. The agent reported on June 16th, that it had destroyed much fruit.

The codling moth, the oldest and most formidable enemy which the apple and pear grower has to contend with, was very numerous this year except in a few orchards in the north eastern part of the Province, in one of which. at Carp, twenty miles above Ottawa, owned by Mr. Hugh Gourlay, and comprising twenty acres, varying from ten to twenty years old, not an apple injured by the codling moth could be found. Mr. Gourlay says he has never seen an apple in his orchard injured by the codling moth.

The owners of every orchard in which we worked this year, with one exception, Mr. Curwin of Goderich, reported that the moth was largely controlled by spraying.

In the southern portion of the Province the moth was very numerous, and continued to propagate until the 1st of October. Early in this month the young worms, scarcely visible to the naked eye, could be detected just burrowing through the skin of apples that up to that time were clean. As the last spraying was done about the middle of July, these latter broods were not destroyed by it. Had the whole orchard been sprayed the latter broods would not have been so numerous, as there was nothing to prevent the moths, which had bred on the unsprayed trees, propagating on the trees in the experimental plots after the spraying had ceased early in July.

It was decided to make an exhibit of sprayed and unsprayed fruit at the Industrial Exhibition, Toronto. Accordingly, on Aug. 10th, I sent a copy of the following letter to each of the gentlemen in whose orchard we had sprayed.

DEAR SIR,—We intend making an exhibit of sprayed and unsprayed fruit at the Industrial Fair, Toronto.

The fruit will be collected from orchards where experimental spraying was done this year. Will you kindly furnish us with specimens of the different varieties of apples sprayed, and, as far as possible, same variety unsprayed, which will fairly represent the results of spraying.

I would like to get about one dozen of each variety, six sprayed and six unsprayed. They could be packed in a basket and expressed to me at Toronto. I would be pleased to pay any expense connected with preparing and forwarding them. Each grower's name and address will be placed over his contribution to the exhibit.

Please answer on enclosed card and let me know if you will furnish fruit for this exhibit.

I will want the fruit about the third of September, but will write you again when and how to send it.

The following gentlemen responded, and shipped fruit for the exhibit as requested: Messrs. Claude McLachlin, Arnprior; Hugh Gourley, Carp; A. Pay, St. Catharines; G. H. Mills, Leamington; R. Govenlock, Seaforth; T. Alton, Sydenham; J. Hollbrook, Springvale; J. McKay, Waterdown; Freels Bros., Niagara; J. Knight, Renfrew; J. Hodder, Dutton; J. Gray, Bolton; F. Chute, Port Burwell; A. Stouffer, Stouffville; E. Lenentine, Ridgetown; G. Walker, Aurora; P. Paquette, Henry; H. Curwen, Goderich; H. Glendinning, Manilla; H. Black, Rockwood; A. R. Fraser, Hawkesbury; Major Walker, Ancaster; Mrs. I. Bradley, Georgetown; Miss Jane Johnston, Campbellford.

The display was in the horticultural building, and consisted of 250 plates. Plates of sprayed apples were placed side by side with plates of unsprayed apples of the same variety, and each section bore the name of the gentleman or lady contributing it.

The exhibit attracted much notice, and was thoroughly inspected by thousands of those interested.

On September 27th I received instructions from the Deputy Minister of Agriculture to forward to Mr. John Douglass, of Tara, Ont., a small box of apples for exhibition at the Township Fair, Mr. Douglass having applied for such an exhibit, saying that although they had a good apple country the people were backward in regard to spraying, and that he thought such an exhibit would be an excellent object lesson, and offering to take charge of it and see it properly placed. I wrote asking Mr. Hugh Black, of Rockwood, to forward to Mr. Douglass a box of sprayed and unsprayed fruit which would fairly represent the results of spraying in his orchard. Mr. Douglass writes concerning the basket of apples sent him:

"They were a good object lesson to the people. I had large cards printed calling attention to the exhibit. I have no doubt in my mind that it will do an immense amount of good, as nearly all the apples in our district were more or less hurt by the insect pests."

Mr. Douglass' idea is a good one, and it would be a useful and inexpensive demonstration of the benefits of spraying, and one which could not fail to arouse interest in the work, if secretaries of the local fall fairs were notified that upon application they could secure a similar exhibit.

Spraying outfits were furnished by the Spramotor Co., of London, Ont., and the Aylmer Iron Works Co., of Aylmer, Ont., and gave entire satisfaction.

I have pleasure in calling attention to the results that one man secured by spraying thoroughly this year—1898.

Mr. Joseph Tweddle, of Fruitland, sprayed his orchard thoroughly, and had almost perfect fruit, while his neighbor's orchards, under equally favorable conditions, but unsprayed, gave very inferior fruit. Mr. Tweddle sent 172 barrels of the fruit to Germany, where they sold for $1,002. There were 152 barrels of Baldwins which brought $6 11 per barrel, and although they were six weeks on the voyage—as there was no vessel sailing direct from Montreal, they went via London, where they were transhipped—yet there was not a wet, slack, or wastey barrel reported, showing that perfect fruit has good carrying qualities. The consignee writes:—"We are very pleased to inform you that the Baldwins were very fine; indeed, the best we have seen this year. We can strongly advise you to make further shipments of this quality. They are just the apples we want, and would soon have a great reputation all over this country.'

Mr. Tweddle also sprayed one of his neighbor's orchards on shares this year, and, after paying all expenses for labor and material, he cleared between four and five hundred dollars.

Mr. R. H. Dewar, of Fruitland, has a black Detroit apple tree, eight inches in diameter, standing near his buildings, the fruit of which has for years been badly infested with codling moths. This year he sprayed it five times with Bordeaux mixture, adding four ounces of Paris green each time. The first spraying was done before the tree blossomed, and the other four at intervals of from twelve to fourteen days, ending about the 12th of July. Up to this date not more than five per cent. of the fruit was injured by a worm. We examined the first of August, and found about 75 per cent. of the fruit wormy. On the 25th of August we made another examination, and could not find a clean apple. Many of the apples had three or four, and in one case five, worms in the apple. No two of them had entered at the same place, neither had they burrowed into each other's tunnels. There appeared to be no choice as to the place of entering the fruit.

On the 15th of May a large coarse sack was bound to the trunk of the tree to trap the larvæ as they were going up or down the tree. This was examined on the first of June, but no larvæ were found. It was again examined on the 11th of August, and about 200 larvæ were found, most of them in cocoons, and about fifty in the chrysalis. A large number of empty cocoons, from which the moths had emerged, were also found. We put a number of these chrysalids in a glass vessel, and in a few days the moths began to appear. In from eight to twelve days we had over twenty beautiful specimens of the moth. A number of eggs, which appeared like creamy spots about the size of a pin head, were deposited on the glass. The bandage was replaced, and left until the 27th of August, when it was examined, and 261 larvæ, mostly in unfinished cocoons, and one chrysalis, were found. It was again put on, and left until the 25th of November, when 191 larvæ were found, all in cocoons. After a careful examination, no larvæ were found on the tree at this date, except in the folds of the sack. In all 703 larvæ and chrysalids of the codling moth were taken from the bandages around this tree, in addition to which quite a number escaped, as could be seen from the empty cocoons. On October 11th we put sacks on three trees. When they were examined on the 29th of November, sixteen larvæ were found on them.

W. M. ORR,
Superintendent.

FRUITLAND, Dec. 31st, 1898.

RECORD OF SPRAYINGS.

SEAFORTH, HURON CO.—MR. R. GOVENLOCK'S ORCHARD.

1st application, April 21st.—Fine, with wind. Buds just bursting. Orchard in pasture, and trees have a lot of dead wood in them, and are in need of pruning. Found oyster-shell bark-louse.

2nd application, May 2nd.—Rained heavily one hour after spraying, and continued all night. Buds just bursting on Spies and about half open on early varieties. Found aphis, tent-caterpillar, bud-moth and apple-leaf bucculatrix. Trees have been scraped since last trip.

3rd application, May 13th.—Fine. Fruit buds just about bursting on early varieties. Bud-moth and leaf-roller on unsprayed trees, but very few on sprayed trees.

4th application, May 30th.—Fine. Blossoms all fallen and a good crop setting.

5th application, June 10th.—Fine. Tent-caterpillar and green fruit-worm appearing. Sprayed fruit looking clean, including six Snow trees. Scab showing on unsprayed fruit.

6th application, June 23rd.—Fine. Apples have set well and promise a good crop. Found larva of tussock-moth.

7th application, July 7th.—Fine. Snow apples a good crop and almost perfectly clean on our trees. Other varieties are a light crop, but clean, on sprayed trees. Sprayed foliage much better than unsprayed.

I inspected Mr. Govenlock's orchard on September 19th, with the following results:

Spy.—Experimental spraying, 70 p. c. clean, heavy load; unsprayed, 20 p. c. clean, very light crop.

St Lawrence.—Experimental spraying, 80 p. c. clean, well loaded; unsprayed, well loaded, no clean fruit.

Snow.—Experimental spraying, 90 p. c. clean, heavily loaded; unsprayed, heavily loaded, but not a clean apple.

King.—Experimental spraying, 75 p. c. clean; unsprayed, 50 p. c. clean.

Gravenstein.—Experimental spraying, 100 p. c. clean. No unsprayed trees.

Greening.—Experimental spraying, 88 p. c. clean; unsprayed, 32 p. c. clean.

Flemish Beauty.—Experimental spraying, 50 p. c. clean; unsprayed, no clean fruit.

This orchard has been in sod for fifteen years, and has never been sprayed before.

Under date of November 17th, 1898, Mr. Govenlock writes: "With regard to my orchard prior to spraying, I may say that the fruit was badly spotted, misshapen and full of worms; but this year, after spraying, there is scarcely a worm in the apples, and they are far more perfect in shape. I picked five sprayed Snow trees, and they packed twenty-five barrels, and left scarcely anything but the bruised apples; while the unsprayed trees were worthless—good for nothing but cider. There was a marked difference in all the other varieties. I consider the spraying a direct gain to me of at least $50 in my small orchard. Of course, I sprayed the balance of my orchard, but not so thoroughly. I am convinced that if every farmer would spray his orchard for a few years we would get rid of most of the pests."

GODERICH, HURON CO.—MR. H. CURWEN'S ORCHARD.

1st application, April 21st.—Fine and windy. Buds about bursting. Oyster-shell bark-louse on the trees. Rain at night and on the 22nd.

2nd application, May 3rd.—Rained all day. Could not do work. Aphis, tent-caterpillar and apple leaf bucculatrix.

3rd application, May 14th.—Fine. Fruit buds showing good except Spy. Orchard quite free of insects. Some leaf-roller and bud-moth.

4th application, May 31st.—Fine. Fall apples good crop, but winter varieties light.

5th application, June 11th.—Raining, could not work. Could not find any scab.

6th application, June 24th.—Fine and very warm, followed by rain all night and next forenoon. Found aphis, green fruit-worm and tussock-moth.

7th application, July 8th—Fine. Very little fruit here—about 15 per cent. of a crop. The fruit is falling on unsprayed trees, and the foliage turning yellow and falling. On sprayed trees the foliage is clean and healthy, and what fruit there is is clean.

Mr. Curwen is much pleased, and says the spraying makes the trees healthy. The snow apple tree we spray is very large—over 40 feet high. Mr. Curwen told me that last year he could only get four clean apples off this tree, and had to take one with a scab to make up five for the show.

I inspected Mr. Curwen's orchard and found the following results:—

Bellfleur.—Experimental spraying, 50 p. c. clean, well loaded; unsprayed, no clean fruit, light crop.

Greening.—Experimental spraying, 37 p. c. clean; unsprayed, 1 p. c. clean.

American Golden Russett.—Experimental spraying, 90 p. c. clean; unsprayed, 56 p. c. clean.

Snow.—Experimental spraying, on lower part of tree where properly sprayed, 66 p. c. clean. No unsprayed Snows, but I visited two neighboring orchards and found Snows well loaded, but not a clean apple.

Mr. Curwen writes on November 18th as follows: "Regarding the condition of the sprayed trees, I do not see any difference. They all look much the same. When we picked the fruit we kept each tree by itself, and when the packers put them up they did not know the difference between them. I did not think it did any good for the spot or codling moth. We will have to use a different treatment for them.

'They made two classes, and there were as many firsts and seconds in each lot of apples; only the Bellefleurs were a little better, but the tree stood out from the rest, and I think that might make a difference."

EXETER, HURON CO.—MR. R. S. LANG'S ORCHARD.

1st application, April 22nd.—Rained all day so that it was impossible to work.

2nd application, May 4th.—Cloudy, followed by an all night rain. Orchard in good condition, kept in sod.

3rd application, May 16th.—Fine. Many of the trees in bloom; sprayed only some of the later varieties. Bud-moths and tent caterpillars bad on unsprayed trees. Found only one tent on sprayed trees.

4th application, June 1st.—Fine. Fall apples well set but winter apples are light. Oyster-shell bark-louse, aphis, bud-moth, and tent-caterpillar at work in this orchard.

5th application, June 13th.—Rained all day. Scab showing badly on snows. Agent writes on June 13th. "I am afraid that this orchard will be a failure. I have only had one good spraying here and that was the last application."

6th application, June 25th.—Rain in forenoon but cleared, and afternoon was fine. Found a few green fruit-worms and tussock-moths. Foliage on sprayed trees decidedly better than on unsprayed.

7th application, July 9th.—Fine. Considerable scab but not many worms among sprayed fruit.

I inspected Mr. Lang's orchard and found :

Greening.—Experimental spraying 50 p. c. clean; no unsprayed trees.

Ben Davis.—Experimental spraying, 10 p. c. clean ; unsprayed, 10 p. c. clean.

American Golden Russet.—Experimental spraying 73 p. c. clean ; no unsprayed trees.

Astrachan.—No record kept.

Snow.—Sprayed and unsprayed about equal.

In a neighboring orchard I found :

American Golden Russet.—Unsprayed 20 p. c. clean.

Greening.—Unsprayed 20 p. c. clean.

Mr. Lang says that he has never had any first class fruit off this orchard. All the fruit has been scabby or wormy and not fit for packing.

On 15th November, 1898, Mr. Lang wrote :—"The spraying of my orchard was a success this year in the way of destroying insects and worms. There was scarcely an apple but was free from worms—something very unusual for my orchard. But as for destroying the scab the spraying was not a success this year. There were so many wet days when your operator called to spray that it may be the cause of the scab not being checked."

Ridgetown, Kent Co.—Mr. Edward Lenentine's Orchard.

1st application, April 23rd.—Fine morning but commenced to rain one hour after spraying. Early varieties well advanced. Found oyster-shell bark-louse.

2nd application, May 5th.—Rained all the previous night and until 11 a. m. Had to quit work on account of rain when half through. Aphis and bud-moth at work.

3rd application, May 17th.—Could not spray as trees were in full bloom. Fine. Apples have set well where trees are not too thick.

4th application, June 2nd.—Fine. Sprayed trees looking well.

5th application, June 14th.—Commenced to rain one hour after work was completed. Found tussock-moth.

6th application, June 27th.—Fine. Sprayed trees looking very well.

7th application, July 11th.—Fine. Foliage on sprayed trees looking as well as could be expected.

Inspected this orchard and found :

Baldwin.—Experimental spraying 48 p. c. clean ; heavily loaded ; unsprayed 20 p. c. clean; very light load.

Bellfleur.—Experimental spraying, 80 p. c. clean ; unsprayed 15 p. c. clean.

Greening.—Experimental spraying, 15 p. c. clean ; unsprayed 5 p. c. clean.

King.—Experimental spraying, 60 p. c. clean ; unsprayed 10 p. c. clean.

Nearly all the apples culled were on account of worms. Most of them appeared to have been attacked within three weeks.

On Nov 8th, Mr. Lenentine wrote :—"I think the spraying is a good thing. The foliage was a great deal healthier and thriftier looking. A great many people have visited our orchard and they all think it is a great improvement. Some varieties were 80 p. c. of perfect apples. I found it was a great improvement to plums as well."

Leamington, Essex Co.—Mr. Geo. H. Mills' Orchard.

1st application, April 25th.—Commenced to rain shortly after application and continued all night. Buds well advanced. Found oyster-shell bark-louse.

2nd application, May 6th.—Fine and windy. Found apple-leaf bucculatrix, aphis and larvæ of bud-moth. Orchard in fair condition.

3rd application, May 18th.—Could not spray as trees are in full bloom.

4th application, June 3rd.—Fine. Foliage looking good and very little scab on apples on sprayed trees. Mr. Mills says the reason he selected these trees for experimental spraying was because they have dropped their foliage badly for several years and he wished to thoroughly test the work.

5th application, June 15th.—Fine. Apples have set well. Tussock moth doing damage here.

6th application, June 28th.—Fine. Trees have set a full crop. Green fruit-worm in this orchard. Foliage on sprayed trees looking good and fruit clean.

7th application, July 12th.—Fine. Results here satisfactory. Foliage dark green and fruit much larger and cleaner than on unsprayed trees.

I inspected Mr. Mills' orchard and found the following results:

Greening—Experimental spraying, 72 p. c. clean; well loaded; unsprayed, well loaded but no clean fruit.

Shaker Spitzenberg.—Experimental spraying, 84 p. c. clean; no unsprayed trees of this variety.

King.—Experimental spraying, 64 p. c. clean; unsprayed, poorly loaded, foliage and fruit dropping.

Spy.—Experimental spraying, 60 p. c. clean; unsprayed, 10 p. c. clean.

Baldwin.—Experimental spraying, 92 p. c. clean; unsprayed, 20 p. c. clean.

Blenheim Pippin.—Experimental spraying, 80 p. c. clean; unsprayed, 16 p.c. clean.

Ben Davis—Experimental spraying, 36 p. c. clean, foliage good; unsprayed, 2 p. c. clean, foliage nearly all fallen.

Under date of Nov. 16th, Mr. Mills wrote:—"For several years foliage has rusted and dropped off certain trees—Kings and Spies being the worst—the fruit dropping also before matured. The results of your spraying my orchard this year far exceeded my expectation. Both foliage and fruit stayed on trees that were sprayed. In fact I found it necessary to place props under several, they being so heavily loaded, and with first-class fruit. Varieties sprayed were as follows: Kings, Spy, Baldwins, Greening, Snow, Pippin, Blenheim Orange, Ben Davis, and Spitzenburg. I think it would be a great benefit for the Government to have spraying done properly another year, as the day has come when all orchards must be sprayed in order to get good fruit.

Amherstburg, Essex Co.—Mr. Edwin Patton's Orchard.

1st application, April 26th.—Fine Some varieties fully open. Spy just swelling. Orchard in good condition, well trimmed and clean. Found oyster-shell bark-louse, bud-moth and aphis.

2nd application, May 7th.—Fine. In addition to insects found on previous trip, leaf-crumpler at work.

3rd application, May 19th.—Could not spray, as trees are in full bloom.

4th application, June 4th.—Fine. Fall apples have set well.

5th application, June 16th.—Fine. Foliage and fruit on sprayed trees looking well. Green fruit-worm, scab and leaf blight attacking unsprayed trees.

6th application, June 29th—Fine. Tussock moth doing some damage. Apples have set well on most of the sprayed trees, but on the unsprayed trees they have dropped very badly.

7th application, July 13th.—Fine The results here are good. The branches of the sprayed trees are are bent nearly to the ground with a load of large, clean fruit, while the fruit has dropped badly from the unsprayed trees.

I inspected Mr. Patton's orchard on September 26th, and found:

King.—Experimental spraying, 82 p.c. clean, well loaded and good foliage; unsprayed, 8 p.c. clean; dropped most of the fruit and foliage.

Talman's Sweet.—Experimental spraying, 84 p.c. clean; unsprayed, 60 p c. clean on the trees, but most of the defective fruit has fallen.

Snow.—Experimental spraying, 80 p.c. clean, heavy crop; unsprayed, no fruit, although the trees bloomed as well as the sprayed trees.

Fallawater.—Experimental spraying, 72 p.c. clean; unsprayed, 8 p.c. clean; most of the apples have fallen.

Ben Davis.—Experimental spraying, 72 p.c. clean, heavy crop and good foliage; unsprayed, 20 p.c. clean; foliage and fruit mostly fallen.

Mr. Patton says that Astrachan and Early Harvest would show about the same percentage as trees noted above.

DUTTON, ELGIN CO.—MR. JOB HODDER'S ORCHARD.

1st application, April 27th.—Fine. Early varieties half open. Found oyster-shell bark-louse, bud moth and aphis. Orchard in good condition as to pruning, but badly in need of scraping. Stands in sod.

2nd application, May 9th.—Fine. Fruit buds nearly bursting on early varieties.

3rd application, May 20th.—Could not spray, as trees were in full bloom.

4th application, June 6th.—Fine. Most varieties have set a good crop.

5th application, June 17th.—Fine. Green fruit worm and tussock moth at work on unsprayed trees. All sprayed fruit looking good and foliage perfect. Mr. Hodder has sprayed the balance of his orchard and it is looking well.

6th application, June 30th.—Fine

7th application, July 14th.—Fine.

I inspected Mr. Hodder's orchard and found the following results:

Snow.—Experimental spraying, 86 p.c. clean, heavy crop; unsprayed, 8 p.c. clean.

Baldwin.—Experimental spraying, 82 p.c. clean; unsprayed, 40 p.c. clean.

Greening.—Experimental spraying, 50 p.c. clean, heavily loaded; unsprayed, 28 p.c. clean; most of the fruit has dropped.

King.—Experimental spraying, 48 p.c. clean and heavily loaded with fine fruit; unsprayed, 28 p.c. clean, not half as heavy a crop, and of inferior quality.

Spitzenberg,—Experimental spraying, 60 p.c. clean, good crop; unsprayed, 12 p.c. clean.

Golden Russet.—Experimental spraying, 68 p.c. clean; unsprayed, 8 p.c. clean.

Wagener.—Sprayed four times, 68 p.c. clean; unsprayed, 8 p.c. clean.

On Nov. 18th, Mr. Hodder wrote: "The foliage this year has been about perfect, while in previous years a great deal of the foliage has turned yellow and fallen to the ground. Some of the fruit that usually was spoiled by scab, such as snow-apples and some other varieties, was quite clean. As I have been spraying for codling moth for several years the contrast this year is not so great as it otherwise would have been. However, I have much confidence in the experiment if it is done with due respect to directions in bulletin."

PORT BURWELL, ELGIN CO.—MR. FREEMAN CHUTE'S ORCHARD.

1st application, April 28th.—Fine and windy. Leaf buds almost fully open. Orchard stands in sod and is badly in need of pruning and scraping. Found oyster-shell bark-louse, bud-moth and aphis.

2nd application, May 10th,—Rained all day so that work could not be done

3rd application, May 21st,—Could not spray, as trees were in full bloom.

4th application, June 7th,—Fine, followed by rain at night. Tent caterpillar and canker worm at work. Mr. Chute would not allow me to spray in his young orchard, but insisted on my working on old trees.

5th application, June 18th,—Fine, followed by rain at night. Scab is showing badly on unsprayed trees and slightly on sprayed trees.

6th application, July 2nd,—I could not spray to-day, as the orchard is in clover in full bloom. Mr. Chute has a lot of bees which are working on the clover and he would not allow me to spray for fear of poisoning them.

I inspected Mr. Chute's orchard, and found the following results:

Baldwin.—Experimental spraying, 76 p. c. clean; unsprayed, 8 p. c. clean, and fruit dropping.

Spy—Experimental spraying, 52 p. c. clean ; unsprayed, 8 p. c. clean.

Snow—Experimental spraying, 68 p. c. clean ; unsprayed, no clean fruit.

Roxbury Russet.—Experimental spraying, 100 p. c. clean ; unsprayed, 16 p.c. clean.

Salome.—Experimental spraying, 72 p. c. clean ; heavily loaded ; foliage good ; only one tree of this variety.

Flemish Beauty Pear.—Experimental spraying, 100 p. c. clean ; unsprayed, no clean fruit.

On Nov. 16th Mr. Chute wrote : "I consider the spraying of fruit trees a great benefit, although three sprayings were all they got. The Snow apple trees your agent sprayed shed its foliage last year before the autumn set in, and the fruit was diminutive and scabby. This year the leaves stayed on until the apples ripened, and the fruit was nearly all smooth and well-formed. I can say the same of the other varieties, especially the Northern Spy and Baldwin, the foliage being healthy and the fruit free from scabs. The Flemish Beauty pear gave the best results. A year ago the tree looked sickly and the fruit cracked very badly. This year the tree grew well, the foliage was healthy; the leaves remained on the tree until the fruit was gathered, and, instead of imperfect and cracked fruit, they were large and clean from rust and cracks. I would recommend anyone who has an orchard and wants to grow good fruit to spray the trees say four or five times during the season."

PORT ROWAN, NORFOLK COUNTY—MR. H. M. BARRETT'S ORCHARD.

1st application, May 29th.—Fine. Early varieties nearly open. Late varieties just bursting. Orchard in sod. Found oyster-shell bark-louse, bud-moth, aphis and apple-leaf bucculatrix.

2nd application, May 11th.—Fine. High wind.

3rd application, May 23rd.—Could not spray as the trees were in full bloom. Orchard well trimmed.

4th application, June 8th,—Fine, followed by rain during the night. A good crop of apples here.

5th application June 20th,—Rained all day so that the work could not be done. Scab is showing badly on Snow apple trees.

6th application, July 4th,—Fine. Apples have set very well.

7th application, July 15th,—Fine.

I inspected this orchard on Sept. 28th, and found :

Snow.—Experimental spraying 59 p. c. clean ; unsprayed, not a clean apple.

Spy.—Experimental spraying, 54 p. c. clean ; unsprayed, not a clean apple.

King.—Experimental spraying, 70 p. c. clean ; no unsprayed Kings.

Greening.—Experimental spraying, 28 p. c. clean ; not a clean apple.

On Nov. 28th, Mr. Barrett wrote :—"I will say in regard to spraying of orchards that trees which were sprayed in my orchard showed 70 p. c. good apples, while those that were not sprayed showed only 10 p. c. I am satisfied that spraying is a good thing."

SPRINGVALE, HALDIMAND COUNTY—MR. JOHN HOLBROOK'S ORCHARD.

1st application, April 30th,—Fine. Buds on Early varieties almost open. Orchard in good condition, and standing in sod. Tent Caterpillar numerous ; also found oyster-shell bark-louse, aphis, bud-moth, and apple-leaf bucculatrix.

2nd application, May 12th,—Fine but windy. Leaf buds fully opened on all varieties except Spy. Insects at work on unsprayed trees.

3rd application, May 25th,—Fine. Foliage looking good, and blossoms nearly all fallen.

4th application, June 9th,—Fine. Fall apples a good crop. Scab showing badly on unsprayed Snows and very little on sprayed Snows.

5th application, June 21st,—Fine. Sprayed trees very free from insects. Found tussock moth and quite a number of apples eaten by the green fruit-worm on unsprayed trees. Mr. Holbrook is spraying the balance of his orchard.

6th application, July 5th,—Fine.

7th application, July 16th,—Fine. Most varieties are very good ; Some scab on Snows.

I visited Mr. Holbrook's orchard and found the following results :

Baldwin,—Experimental spraying, 40 p. c. clean ; heavy crop ; 50 p.c. of the spotted apples were of good size.

Ribston Pippin,—Experimental spraying, 75 p.c. clean ; heavy crop ; unsprayed, 20 p. c. clean ; light crop ; dropped badly.

Talman's Sweet,—Experimental spraying, 20 p. c. clean ; unsprayed, 10 p. c. clean.

Greening,—Experimental spraying, 20 p. c. clean ; unsprayed, 4 p. c. clean ; sprayed fruit good size ; unsprayed small and dropping.

Spy,—Experimental spraying, 50 p. c. clean ; unsprayed, not a clean apple.

Gravenstein,—Experimental spraying, 90 p. c. clean ; unsprayed, 5 p. c. clean.

Snow,—Experimental spraying, 60 p. c. clean and well loaded ; unsprayed, well loaded but worthless.

Maiden's Blush,—Experimental spraying, 8 p. c. clean ; unsprayed, 20 p. c. clean.

On Nov. 24th Mr. Holbrook wrote : "The foliage is of a much healthier color than other years, and the fruit this year was of a much better quality than that of surrounding orchards. By continuing the spraying year by year the orchard will gradually improve, and the fruit will be of a much higher standard."

St. Catharines, Lincoln Co.—Mr. A. Pay's Orchard.

1st application, April 20th.—Rained all day ; could not do the work. Aphis very bad.

2nd application, May 2nd.—Fine. Leaves one-fourth grown.

3rd application, May 13th.—Fine. Blossom open on early varieties. Cannot find any tent caterpillar here.

4th application, May 30th.—Fine. Bloom all fallen. Aphis, green fruit-worm, bud moth, and a few canker worms at work.

5th application, June 10th.—Fine and warm. Found a few tent caterpillar, in addition to insects noted on previous trip, but only the green fruit-worm is at work in the experimental plot. The scab is appearing very badly, both on fruit and foliage. There is a most decided difference between the ones we spray and those sprayed once by Mr. Pay. The foliage on these trees which are heavily loaded, look as if they had been burned by fire.

6th application. June 23rd.—Fine. Scab appearing very badly in this locality.

7th application, July 7th.—Fine and warm. Fruit which is unsprayed is wormy and badly scabbed. Mr. Pay and I examined the unsprayed trees and found 75 p. c. wormy, while on the sprayed trees we found from 8 p. c. to 10 p. c. wormy. Although we have failed to keep the fruit clean of scab, yet size, quantity and quality of the fruit and the superior foliage, are evidence of the benefit of spraying.

I inspected Mr. Pay's orchard on Sept. 15th, and found the following results :

Greening.—Experimental spraying, 58 p. c. clean, well loaded ; unsprayed, fairly loaded but not a clean apple.

Baldwin.—Experimental spraying, 70 p. c. clean ; heavily loaded ; unsprayed, light load ; a great many fallen apples and not a clean specimen.

Pomme Grise—Experimental spraying, 60 p. c. clean, fair crop ; unsprayed, very light crop and not a clean apple.

Colvert—Experimental spraying, 80 p. c. clean ; well loaded ; unsprayed, 10 p. c. clean, very light crop.

Spy.—Experimental spraying, 36 p. c. clean ; heavy crop ; apples a good size but slightly spotted ; unsprayed, not a clean apple ; fruit all fallen ; sprayed once ; 5 p. c. clean ; light crop and dropping badly.

Fall Pippin.—Experimental spraying, 75 p. c. clean ; unsprayed, no clean fruit.

Snow.—Experimental spraying, 52 p. c. clean ; heavily loaded ; unsprayed, heavily loaded ; apples small and not a clean specimen.

With a view to demonstrating that better results can be obtained where the work is properly and systematically carried on year after year, we have for the past three years worked in Mr. Albert Pay's orchard, St. Catharines, spraying the same trees each year This orchard had never been sprayed before the experimental work was commenced in it. In 1896 the results were good. In 1897 Mr. Pay said that if all his orchard was as heavily loaded with as good fruit as were the trees which we had sprayed for two years, it would be worth $2,000 to him with apples at $2 per barrel.

As to the results in 1898, writing under date of Nov. 25, Mr. Pay says:

"Regarding spraying, I would say the row of trees sprayed by you showed a very decided improvement over the row next it, which has never been sprayed, both in foliage and fruit. This is the third season you have sprayed the same row in my orchard, and the Greenings and Northern Spys in that row have had a good crop every year, and the Baldwins two good crops in the three seasons. The Baldwins had a very heavy crop this year—in fact too many to get a good size; I picked eleven barrels off the two Baldwins in the sprayed row, and not two barrels off the two Baldwins in next row, which were unsprayed. There was hardly a marketable apple on the unsprayed trees, while fully 90 per cent of the sprayed fruit would class No. 1. The Greenings and Northern Spys would be about the same. There were a number of buyers through my orchard this fall before the apples were picked, and some saw the fruit before packing, and they all spoke very highly of the stock and told me it was the cleanest and brightest fruit they had seen this year. There can be no question in my opinion as to the benefit of spraying after the showing it made during the three years. I think, too, it could be done successfully with less than six applications. However, even with that many times, I fully believe it will pay to spray every year.

Niagara, Lincoln Co.—Messrs. Freels Bros'. Orchard.

1st Application, April 23rd.—Fine and very windy. Buds not opening yet. Splendid show of fruit buds. Half of the trees being treated are ninety years old. Apples very bad.

2nd Application, May 3rd—Rained nearly all day. Commenced to work but had to quit until about 3.30 when we finished. Found a few bud moth.

3rd Application, May 14th.—Fine. Trees in full bloom. Could not do the work.

4th Application, May 31st.—Fine. Bloom all fallen; just right for spraying. Found Canker worm, green fruit-worm and a few tent caterpillar.

5th Application, June 11th.—Heavy rain this morning and again in afternoon after work was done. I find the rose-beetle very destructive, here especially on the King trees. I found six and eight on small apples, and hardly an apple without one or more. These trees have been sprayed once. The rose-beetle has been in this orchard for three years.

6th Application, June 24th.—Fine. The scab is appearing badly here.

7th Application, July 8th.—Rained after two trees had been sprayed.

I inspected Messrs. Freels Bros'. orchard and found results as follows:

Baldwins.—Sprayed, very heavy crop, 48 p. c. clean; 90 p. c. fit for packing; sixteen barrels of fruit on the tree; unsprayed, 4 p. c. clean; very light crop, not one barrel per tree.

Snow.—Sprayed, 16 p. c. clean; heavy crop; about six barrels of fruit fit to pack; unsprayed, no clean fruit, crop light, about one half barrel to the tree.

Astrachan.—Sprayed, 90 p. c. clean; unsprayed 30 p. c. clean; dropped badly, and not half the fruit there is on sprayed trees.

Duchess.—Sprayed, 90 p. c. clean, heavy crop; unsprayed, 30 p. c. clean; dropped most of the crop.

Fall Pippin.—Sprayed, 80 p. c. clean, good crop; unsprayed, light crop, none clean.

Harvest.—Sprayed, 80 p. c. clean; unsprayed, no fruit fit for market.

Spy.—Sprayed, 40 p. c. clean, about 6 barrels on the tree, all good size, about 60 p. c. slightly spotted; unsprayed, no clean fruit, only about one barrel per tree.

Mr. Freels said that the sprayed trees were selected in different parts of the orchard, and that he had no right to expect a larger crop from the sprayed than the unsprayed trees, and that if all his orchard had been sprayed this year with the same results as were obtained on the experimental trees, it would have been worth over $1,000 to him.

Under date of November 22nd, Messrs. Freels Bros'. wrote :

"The spraying of the trees did great benefit to them, and the yield of fruit was much increased thereby. However, we think that the spraying this year was not a fair test, owing to the wet and rainy weather, and we are satisfied that with favorable weather the spraying of the trees would be of incalculable benefit. Our crops this year, under the most unfavorable circumstances, exhibited an increased yield, and, in comparison with orchards not sprayed, ours shewed the benefits of spraying."

Ancaster, Wentworth Co.—Major Walker's Orchard.

1st application, April 22nd.—Rained all the afternoon, so that the work could not be done.

2nd application, May 4th.—Fine and cool. A fine orchard, well cultivated, scraped and trimmed. Found aphis, apple-leaf bucculatrix, bud moth and a few tent caterpillar and apple tree case-bearer.

3rd application, May 16th.—Fine and windy. Red Astrachan and Early Harvest in bloom; sprayed the other trees.

4th application, June 1st.—Fine. Bloom fallen.

5th application, June 13th.—Rainy. Could not do the work. N.B.—The application was made on June 16th by Major Walker.

6th application June 25th.—Rained in the forenoon; afternoon fine. Scab appearing on some varieties.

7th application July 9th.—Fine. Unsprayed fruit is wormy. Although the scab is bad, the fruit on sprayed trees is nicer and larger than on the unsprayed trees of the same variety.

I inspected Major Walker's orchard and found the following results :

Ribston Pippin.—Experimental spraying, 90 p. c. clean, well loaded; has been no clean fruit from this variety for several years before; unsprayed, well loaded but not a good specimen.

Red Astrachan.—Experimental spraying, 80 p. c. clean, fairly loaded; unsprayed, 50 per cent. clean, fairly loaded.

Spy.—Experimental spraying, 90 p. c. clean, very few apples; unsprayed, very few apples, none clean.

Baldwin.—Experimental spraying, 80 p. c. clean, fair crop; unsprayed, no fruit.

Snow.—Experimental spraying, 40 p. c. clean, good crop and fruit about twice as large as on unsprayed trees; unsprayed, no clean fruit, trees well loaded but fruit almost worthless.

Maiden's Blush.—Experimental spraying, 80 p. c. clean, fairly loaded; unsprayed, no clean fruit, crop light.

Gravenstein.—Experimental spraying, 90 p. c. clean, well loaded; unsprayed 50 p.c. clean, well loaded.

Golden Russet.—Experimental spraying, light crop of poor fruit; unsprayed, no fruit.

Bellflour.—Experimental spraying, 28 p. c. clean, well loaded; unsprayed, no fruit.

Newtown Pippin.—Experimental spraying, 52 p. c. clean; unsprayed, very little fruit, none clean.

Wagener.—Experimental spraying, 90 p. c. clean; unsprayed, 30 p. c. clean.

Greening.—Experimental spraying, 36 p. c. clean, full crop; unsprayed, light crop, none clean. This orchard has never been sprayed before.

Waterdown, Wentworth County.—Mr. James McKay's Orchard.

1st application, April 23rd.—Fine and cool. Orchard in splendid condition as regards trimming and cultivation. Aphis and Tent caterpillar bad.

2nd application, May 5th.—Fine. In addition to insects noted on previous trip, found bud moth and apple-leaf bucculatrix. This orchard has been sown with oats.

3rd application, May 17th.—Fine, but too windy to work well. Found oyster-shell bark louse, apple tree case-bearer, and a little black spot.

4th application, June 2nd.—Fine. Bloom all fallen. Found a few green fruit-worms.

5th application, June 14th.—Fine. Green fruit, worm has done considerable damage. Some scab appearing on fruit and foliage.

6th application, June 27th.—Rain in forenoon; afternoon fine. Foliage fine; fruit large and good for this year.

7th application, July 11th.—Fine. Mr. McKay is well pleased with the results of the work, as the fruit and foliage is so much finer on the sprayed trees.

This orchard has never been sprayed before. I inspected Mr. McKay's orchard and found:

Roxbury Russet.—Experimental spraying, 95 p. c. clean, full crop; unsprayed, 25 p. c. clean, crop light.

Greening.—Experimental spraying, 95 p. c. clean, well loaded; unsprayed, 5 p. c. clean, very light crop.

Baldwin.—Experimental spraying, 76 p. c. clean, fairly loaded; unsprayed, 4 p. c. clean, dropping badly; sprayed once, 40 p. c. clean.

Spy.—Experimental spraying, 90 p. c. clean, well loaded; unsprayed, 6 p. c. clean; sprayed once, 10 p. c. clean.

Red Astrachan.—Experimental spraying, 70 p. c. clean, gave forty baskets of fruit to the tree; unsprayed, 25 p. c. clean, gave ten baskets of fruit to the tree.

American Golden Russett.—Experimental spraying, 90 p. c. clean, fairly loaded; unsprayed, 6 p. c. clean, not half as much fruit as on sprayed trees; sprayed once, 20 p. c. clean.

On November 14th, Mr. McKay wrote:—"The foliage of the orchard prior to spraying could not be said to be in a healthy condition. The leaves of most of the trees were somewhat blighted, being of a yellowish sickly color, and were small in blade. It was more noticeable with Greenings than with other varieties. The fruit was also rather a poor sample. The spot was bad, thus causing development on one side only. A large number of the apples were wormy. The results of this year's spraying were very noticeable, both in foliage and fruit. The appearance of the foliage was healthy, abundant, and of a dark green color, and the blades of leaves broad. As regards the fruit, the spraying affected both quantity and quality. The blossoms appeared to have set well, thus the sprayed trees were much better loaded than those that were not sprayed. The quality of the apples was excellent. Very few spots could be seen on any of the five varieties—namely, R. Russet, Golden Russet, Greening, Baldwin, Spy—and therefore almost all apples were perfectly developed. The worms were almost entirely exterminated, so that nearly all apples were fit for market. My opinion of the benefits of spraying may easily be judged by the above remarks. In my orchard an object lesson has been given which would convince the most sceptical that spraying is a good thing. I firmly believe it will pay any man to spray his orchard, and spray it well."

Georgetown, Halton Co.—Mrs. Isabella Bradley's Orchard.

1st application, April 25th.—Fine. Orchard in bad shape; stands in sod, and needs trimming and scraping. Tent caterpillar, oyster-shell bark-louse, and aphis very bad.

2nd application, May 6th.—Fine, but too windy to work well. Tent caterpillar very bad on unsprayed trees. In addition to insects mentioned on April 25th, found bud moth at work.

3rd application, May 18th.—Fine, followed by shower at 5.30. Could not spray Snow and Early Harvest as they were in full bloom. Tent caterpillar very bad on unsprayed trees; very few on sprayed trees.

4th application, June 3rd.—Fine and warm. Blossoms all fallen. Balance of the orchard has been sprayed twice. Tent caterpillar still bad on unsprayed trees, also canker worm, bud moth, and green fruit-worm.

5th application, June 15th.—Fine. Scab appearing on some varieties. The green fruit-worm has done much damage in this locality. This is a very dirty orchard.

6th application, June 25th.—Fine. Find wormy apples on unsprayed trees. The fruit and foliage on on these trees are very fine, much larger and freer from scab than unsprayed trees. Spy's were a good crop here last year, but very scabby. Orchard not in a good state of cultivation.

7th application, July 12th.—Fine. Dr. Bradley, a stranger to the place and work, noticed and remarked on the great difference between sprayed and unsprayed trees. The fruit on the former being larger and the foliage finer. The apples from this orchard had been harvested before I arrived, so that it was impossible to obtain percentages of good and bad fruit.

On November 15th Mrs. Bradley wrote :—"With regard to the questions asked, I shall try to give you a correct and honest answer. As we always gave our orchard particular care in the matter of getting rid of the caterpillars, etc.—but of course with old-fashioned methods, such as using a swab saturated with a solution of Paris green and soft soap—we are not in the best position to make comparisons between the year of spraying and the preceding years as we would be had we entirely neglected our trees heretofore. However, we think the foliage was heavier this year, and our apples were certainly a very good sample."

ROCKWOOD, WELLINGTON CO.—MR. HUGH BLACK'S ORCHARD.

1st application, April 26th.—Fine. Found tent caterpillar, oyster shell bark-louse, and aphis. Black Spot is very bad. Good show of fruit buds. Orchard cultivated and in good condition.

2nd application, May 7th.—Fine and windy. Bud moths and apple-leaf bucculatrix here.

3rd application, May 19th.—Fine. Blossoms open on early varieties; opening on others. Trees in good condition.

4th application, June 4th.—Fine. Bloom all fallen. Tent caterpillar, bud moth, green fruit-worm and canker worm all at work here.

5th application, June 16th.—Fine and cool. Scab appearing on unsprayed trees and very slightly on sprayed trees.

6th application, June 29th.—Fine and warm. The crop here will be light for most varieties. Some scab, especially on Greenings and Snows.

7th application July 13th—Fine and very warm. The sprayed fruit is larger and finer than the unsprayed. The results here are satisfactory.

I inspected Mr. Black's orchard on October 1st, and found the following results:

Snow.—Experimental spraying, 64 p. c. clean; unsprayed, 18 p. c. clean.

Ben Davis.—Experimental spraying, 100 p. c. clean; unsprayed, 28 p. c. clean.

Wagener.—Experimental spraying, 96 p. c. clean; unsprayed, 9 p. c. clean.

Spy.—Experimental spraying, 100 p. c. clean; unsprayed, 36 p. c. clean.

Greening.—Experimental spraying, 88 p. c. clean; unsprayed, 24 p. c. clean.

Ribston Pippins.—Experimental spraying, 90 p. c. clean; unsprayed, 80 p. c. clean.

Canada Red.—Experimental spraying, 72 p. c. clean; unsprayed, no clean fruit.

Russet.—Experimental spraying, 80 p. c. clean; unsprayed, 20 p. c. clean.

This orchard has never been sprayed before.

Concerning the work in his orchard, Mr. Black wrote as follows, under date of November 16th, 1898:—"In reference to the effect of spraying this season, I feel in justice bound to give you my impressions which are as follows: The effect on the foliage was plainly noticable all the season. The leaves were fresh and had that glossy appearance which indicates growth. The bark was smooth and looked like the bark on young trees. The moss and roughness on the bark almost entirely disappeared, and the trees have made more new wood than for some years past. The fruit on the sprayed trees was as nearly perfect as is reasonable to look for. In my experience I never saw, even years ago, before so many enemies came to stay, so entirely good a crop of apples. I am safe in saying that in our Spys which were sprayed there was not one barrel of culls to one hundred barrels of good fruit. I am convinced that our chance of growing apples profitably will largely be in proportion to the thoroughness with which we spray. Good cultivation, plenty of barnyard manure, and careful spraying will ensure us equally as good and abundant fruit crops as of yore. I might just add that we had in one place in the orchard two Greening trees, well loaded, and not a *single cull apple* was found, neither worm nor scab, nor ill-shapen.

We cannot now grow potatoes without using Paris green—we must also realize that we cannot grow good fruit without spraying. The first spraying will almost entirely destroy the tent caterpillar. I hope that our Ontario fruit-growers will accept the situation and spray their apples and other fruits thoroughly. Excuse the length of this letter. I am so convinced and satisfied, I don't know where to stop praising it."

BOLTON, PEEL CO.—MR. JAMES GRAY'S ORCHARD.

1st Application, April 27th.—Fine and warm. Orchard in bad shape; poorly trimmed and in an old sod; black-spot bad. Lots of oyster-shell bark-louse, aphis and tent caterpillars.

2nd Application, May 9th.—Showery. Had to wait an hour before spraying could be done. Heavy rains at night. Buds just beginning to open on early varieties.

3rd Application, May 20th.—Fine, with high winds. Blossoms open on early varieties; on late varieties just opening. Tent caterpillar and aphis very bad. Some bud-moth.

4th Application, June 6th.—Rained a little during the work. Found the green fruit-worm. The remainder of the orchard has not been sprayed and tent caterpillar are very plentiful. They are leaving the unsprayed trees, which they have stripped of foliage, and are crawling up the sprayed trees.

5th Application, June 17th.—Fine and warm. The crop here will be light.

6th Application, June 30th.—Fine. Codling moth at work, mostly on unsprayed trees. Here are four Snow trees, two sprayed and two unsprayed, standing side by side, equally good last spring and at blooming. Now, on the sprayed trees the foliage is beautiful, and the trees are well loaded with good-sized fruit, about 95 per cent. of which is free from scab; while on the unsprayed trees, although the tent caterpillars have been gathered three times, the foliage is almost ruined, the scab is prevalent and the crop almost a failure. Have splendid results on a Harvest apple tree which Mr. Gray says has never before given a good apple.

7th Application, July 14th.—Fine. Sprayed trees in good shape. A Flemish Beauty pear, which has been sprayed, shows splendid results.

I inspected Mr. Gray's orchard and found:

Snow.—Experimental spraying, 80 p. c. clean, heavy crop; unsprayed, 23 p. c. clean, about one-eighth of a crop.

Fall Pippin.—Experimental spraying, 76 p. c. clean; unsprayed, 4 p. c. clean, one-half crop fallen.

Golden Russet.—Experimental spraying, 64 p. c. clean. This is the first clean fruit from these trees in four years.

Talman's Sweet.—Experimental spraying, 72 p. c. clean; unsprayed, 34 p. c. clean.

Calvert.—Experimental spraying, 84 p. c. clean; unsprayed, 20 p. c. clean. Most of the fruit has fallen.

Spy.—Experimental spraying, 54 p. c. clean; unsprayed, 20 p. c. clean.

Flemish Beauty Pear.—Experimental spraying, 90 p. c. clean; unsprayed, 10 p. c. clean. This orchard has never been sprayed before.

In a letter written November 15th, 1898, Mr. Gray says: "We noticed a marked improvement this year on Flemish Beauty pears and Snow apples especially. The foliage on the sprayed trees was more luxuriant and remained on later in the fall. On the unsprayed tree there was almost no fruit free from scab, very few fit for market, while on the sprayed tree there might be about ninety per cent. of good fruit. Indeed all the varieties of apples sprayed showed a marked improvement when picking time came. It is our opinion that, if the spraying is continued, year after year, the fruit will be much improved and that if this is not done very soon there will be little fruit worth gathering."

STOUFFVILLE, YORK CO.—MR. ABRAHAM STOUFFER'S ORCHARD.

1st application, April 28th.—Fine. Good show of fruit buds. Found oyster-shell bark-louse, aphis and tent caterpillar. This orchard stands in an old sod, needs trimming and scraping; has never been sprayed before.

2nd application, May 10th.—Rainy. Could not do the work. Aphis and tent caterpillar bad.

3rd application, May 21st.—Fine. Blossoms open on early varieties and snows. Found bud moth and apple-leaf bucculatrix.

4th application, June 7th.—Fine and warm. Blossoms all fallen. The balance of the orchard has been sprayed twice. In addition to insects previously mentioned, found canker worm and green fruit-worm.

5th application, June 18th.—Fine. Find a little scab on snow, greening and fall pippin.

6th application, July 2nd.—Fine. Codling moth at work.

7th application, July 15th.—Fine. Very little scab here.

I inspected Mr. Stouffer's orchard and found results as follows :

Baldwin.—Experimental spraying, 53 p. c. clean, well loaded ; unsprayed, no clean fruit, poorly loaded and dropping badly.

King.—Experimental spraying, 48 p. c. clean ; unsprayed, no clean fruit.

Talman's Sweet.—Experimental spraying, 60 p. c. clean ; unsprayed, 16 p. c. clean.

Seek-no-further.—Experimental spraying, 84 p.c. clean, well loaded ; unsprayed, 8 p.c. clean, light crop.

Canada Red.—Experimental spraying, 84 p. c. clean ; unsprayed, 20 p. c. clean.

Spy.—Experimental spraying, 84 p. c. clean, well loaded ; unsprayed, 4 p. c. clean, well loaded.

Snow.—Experimental spraying, 76 p. c. clean, heavily loaded ; unsprayed, no clean fruit, heavily loaded.

On November 14th Mr. Stouffer wrote : "I would just say the foliage on those trees sprayed was much greater and thriftier than on those not sprayed. The fruit on those sprayed was much cleaner of scab and worms than on those not sprayed. The benefit of this year's spraying in my orchard was very great.

Manilla, Victoria Co.—Mr H. Glendinning's Orchard.

1st application, April 29th.—Fine. Aphis, tent caterpillar and oyster-shell bark louse bad. Orchard in poor condition, needs trimming and scraping.

2nd application, May 11th.—Heavy shower after the work had been completed. Bud moth at work. Blossoms opening on early varieties.

3rd application, May 23rd—Rainy. Trees in full bloom, except spys. Mr. Glendinning promised to do the work as soon as the blossoms fall.

4th application, June 8th.—Rainy. Could not do the work. Mr. Glendinning will make the application as soon as it clears. Oyster-shell bark-louse moving. In addition to insects previously mentioned, found canker worm and green fruit-worm.

5th application, June 20th.—Rained all day. Mr. Glendinning promised to do the work when it cleared. Scab appearing on a good many varities.

6th application, July 4th—Rained as we were finishing the application. Light crop on most varieties.

7th application, July 16th.—Unable to reach Manilla. Wrote arranging for Mr. Glendinning to do the work.

I inspected Mr. Glendinning's orchard on October 6th and found the following results :

Alexander—Experimental spraying, 64 p. c. clean ; no unsprayed trees of this variety.

Snow.—Experimental spraying, 70 p. c. clean ; unsprayed, 8 p. c. clean.

Early Harvest.—Experimental spraying, 70 p. c. clean ; unsprayed, 25 p. c. clean.

Under date of November 24th Mr. Glendinning wrote : "I am very much pleased with the results obtained, there being a very marked difference both in foliage and fruit between the sprayed and unsprayed trees. We were troubled in this section of the Province last season very much with the tent caterpillar. Those persons who did not spray or use a great deal of labor in cleaning their trees had all the foliage eaten off, with the result that there was no fruit. Those who saved their fruit from the ravages of the caterpillar by hand cleaning had it very badly affected by black spot and the codling moth, while those that sprayed had their fruit comparatively free from all those pests. The foliage on the sprayed trees was bright and green, while on the unsprayed trees it was a rusty brown color. The fruit on the sprayed trees was large and perfect and free from spot, while that on the unsprayed trees was covered with spot and cracked open. The only use being made of them was for hog feed. Any person could stand back on my farm fifty rods from the orchard and notice the difference in the foliage."

AURORA, YORK CO.—MR. GEO. WALKER'S ORCHARD.

1st application, April 30th.—Fine. Orchard in old sod; poorly trimmed, never scraped or sprayed. Tent caterpillar bad. Found also aphis and oyster-shell bark louse.

2nd application, May 11th.—Fine. Blossoms opening on early varieties. In addition to insects previously mentioned, found bud moth and apple leaf bucculatrix; tent caterpillar very bad in this district.

3rd application, May 25th.—Fine. Could only spray two trees, the rest being in full bloom. Mr. Walker promised to spray the others when blossoms fall.

4th application, June 9th.—Fine. Bloom all fallen; green fruit-worm and canker worm at work; oyster-shell bark louse moving.

5th application, June 21st.—Fine. Apples have set only a light crop, scab appearing on some varieties.

6th application, July 5th.—Fine. Unsprayed fruit wormy.

7th application, July 18th.—Fine. Fruit scarce in this orchard; not more than 25 per cent. of a crop; not much scab on sprayed trees.

I Inspected Mr. Walker's orchard and found the following results:

Snow.—Experimental spraying, 71 p. c. clean; unsprayed, no clean fruit, all scabbed.

Spy.—Experimental spraying, 64 p. c. clean; unsprayed, 16 p. c. clean.

The Greening and Baldwin trees were picked before I arrived, but Mr. Walker says that they would show about the same percentage as Spys.

On November 25th, Mr. Walker wrote: "Throughout the season the foliage of the sprayed trees was of a darker green color, was very much less injured by leaf eating insects and fungi, and was longer retained than that of the unsprayed trees. The fruit previous to this year has been very inferior and poorer in quality, and also very much less in quantity. The results of this year's spraying have been very satisfactory, the fruit has been very much improved in quality, and also there has been a great increase in the yield. The benefits of spraying have been very encouraging, and I intend to spray all of my fruit in the future."

MARYSVILLE, HASTINGS CO.—MR. JOSEPH MCGURN'S ORCHARD.

1st applicaion, April 25th.—Fine. Buds on early varieties just opening. Found tent caterpillar, oyster-shell bark louse, aphis and bud moth. Looked like rain toward night.

2nd application, May 6th.—Fine. Leaves from one-half to one inch in diameter.

3rd application, May 18th.—Threatening rain. Could not spray early varieties, as they were in bloom.

4th application, June 3rd.—Fine. In addition to insects previously mentioned, found canker worm and red spider. Tent caterpillar very bad. They come in large numbers on the sprayed trees from the unsprayed trees which stand beside them.

5th application, June 15th.—Fine. Apples not setting well. This is the poorest orchard in this division, as it is gradually dying from black spot. Foliage on sprayed trees is much better than on the unsprayed.

6th application, June 27th.—Cloudy, followed by rain at night. Very poor show for fruit here.

I inspected Mr. McGurn's orchard, and found the following results:—

Spy.—Experimental spraying, 44 p. c. clean; unsprayed, 3 p. c. clean.

Golden Russet.—Experimental spraying, 48 p. c. clean; unsprayed, 4 p. c. clean.

Canada Red.—Experimental spraying, 75 p. c. clean; unsprayed, 10 p. c. clean.

Talman's Sweet.—Experimental spraying, 56 p. c. clean; unsprayed, 26 p. c. clean.

Snow.—Experimental spraying, 44 p. c. clean; unsprayed, 4 p. c. clean.

HARROWSMITH, FRONTENAC CO.—MR. THOMAS ALTON'S ORCHARD.

1st application, April 26th.—Fine. Buds opening on early varieties. Oyster-shell bark louse, aphis, bud moth and borer at work in this orchard.

2nd application, May 7th.—Fine. Leaves from one-half to one inch in diameter.

3rd application, May 19th.—Could not spray, as trees were in full bloom.

4th application, June 4th.—Fine, but very windy. Leaves on unsprayed trees badly eaten by insects.

5th application, June 16th.—Fine. Apples a light crop. Sprayed trees look fresh and nice compared with unsprayed, which are nearly stripped of their foliage.

6th application, June 28th.—Fine.

I visited Mr. Alton's orchard on October 10th, and found the fruit all picked. He says the crop was light, but that he considers the sprayed fruit was 50 p. c. better than the unsprayed, and that while the foliage on the sprayed trees was in excellent condition, that on the unsprayed trees was badly eaten by insects, in some cases the trees being defoliated.

RENFREW, RENFREW CO.—MR. JOSEPH KNIGHT'S ORCHARD.

1st application, April 27th.—Fine. Buds opening rapidly. Found tent caterpillar, aphis and borer.

2nd application, May 9th.—Fair but windy. Trees mostly in leaf. Bud-moth, tent caterpillar and aphis very bad.

3rd application, May 20th.—Fair. In addition to insects previously mentioned, found oyster-shell bark-louse and leaf-crumpler. Could only spray late varieties, as early ones were in full bloom.

4th application, June 6th.—Fine, but cloudy. Oyster-shell bark-louse moving.

5th application, June 17th.—Fine. A great difference can be seen between the sprayed and unsprayed trees.

6th application, July 29th.—Fine. Trees in good condition, with moderate crop of fruit. There are good results here. This orchard is badly in need of pruning. The greater part of the trees are seedlings.

I inspected Mr. Knight's orchard and found the following results:—

Wealthy.—Experimental spraying, 100 p. c. clean; foliage in good condition; unsprayed, 75 p. c. clean.

Russian.—Experimental spraying, 100 p. c. clean.

Astrachan.—Experimental spraying, 75 p. c. clean; unsprayed, same.

Duchess of Oldenburg—Experimental spraying, 100 p. c. clean; unsprayed, 75 p. c. clean.

McIntosh Red.—Experimental spraying, 100 p. c. clean; unsprayed, 50 p. c. clean.

Talman's Sweet.—Experimental spraying, 100 p. c. clean; uusprayed, crop destroyed by worms.

Unnamed Seedling, resembling Snow apple.—Heavily loaded; one side of tree sprayed, other side unsprayed. Sprayed side, 100 p. c. clean; unsprayed side, 4 p. c. clean.

Tetofsky.—Experimental spraying, 100 p. c. clean; unsprayed, 50 p. c. clean.

Crimson Pippin.—Experimental spraying, 100 p. c. clean; no unsprayed fruit of this variety.

Walbridge.—Experimental spraying, 100 p. c. clean; heavily loaded; unsprayed, 50 p. c. clean; very little fruit.

Snow.—Experimental spraying, 100 p. c. clean; unsprayed, 50 p. c. clean.

No codling moth in this orchard, but a worm that I do not know has damaged some of the fruit. Unfortunately I could not find a specimen.

On November 26th, Mr. Knight wrote as follows: "Concerning the spraying in my orchard this spring, I will sum it up thus:

"1. That on the trees that were sprayed the foliage was much more luxuriant and free from worms and tent caterpillars, as they left them nearly alone.

"2. That my orchard is badly infested with oyster-shell bark-louse, and I am satisfied that I can clean it of this pest.

"3. That several of my apple trees, such as Wealthy, Yellow Transparent and Alexander, had blighted badly for several years. They did not blight any this year. Only one tree of Yellow Transparent, that was not sprayed at all, blighted badly.

"4. The Fameuse or Snow tree which you sprayed yielded four barrels of good apples. There were not a dozen culls on the tree. On the unsprayed tree not very far away, the apples were about half crooked. On two Walbridges standing out thirty feet apart, the fruit showed a marked difference. The seedling I got Mr. McPherson to spray one-half of you saw yourself when you visited the orchard."

Arnprior, Renfrew Co.—Mr. Claud McLachlin's Orchard.

1st Application, May 28th.—Fine. Leaves one-half inch in diameter on early varieties. Find tent caterpillars aphis and borers in this orchard.

2nd Application, May 10th.—Cloudy. In addition to insects previously mentioned, find bud-moth at work.

3rd Application, May 21st.—Fine. Could not spray, as trees were in full bloom. The tent caterpillars are constantly coming on the sprayed trees from the unsprayed trees.

4th Application, June 7th.—Fine. Canker worm, tent caterpillar and leaf-crumpler at work. A marked difference between sprayed and unsprayed trees both as to fruit and foliage.

5th application, June 18th.—Rained in the morning and again in the evening after the application. Trees looking well though the crop is light.

6th application, June 30th.—Fine. Sprayed trees and foliage in fine condition and fruit a good size.

The fruit in this orchard was all picked when I arrived, and the sprayed and unsprayed fruit had not been kept separate, so that it is impossible to get accurate results. However, the gardener says that results were quite satisfactory as to fruit, and that while the foliage on the sprayed trees was perfect, that on the unsprayed was poor.

Under date of December 29th, Mr. McLachlin writes as follows :—

"With reference to the spraying of my apple trees, I would say that in the fall of 1897, I was completely discouraged with the result of my apple crop, so I made up my mind to cut out all my trees (I have about 300). In fact, I had cut some of them down, when I was advised by a friend to give them one more trial and to try spraying. The following spring I was making enquiries about a spraying machine, when I received notice from Mr. Orr, calling a meeting of those interested in fruit raising in this section, and stating that it was the intention of the Government to conduct spraying experiments in different parts in the Ottawa Valley. I attended the meeting and was so much pleased with Mr. Orr's explanations that I immediately offered my orchard for the experiment. Part of the trees were sprayed, and part left unsprayed. With the result of the spraying I am more than delighted. The apples of the sprayed trees were sound and large, the foliage a good rich color, and the trees made more growth than ever before in one season. In the fall of 1897 I had no apples fit for use. All were small and scabby. In the fall of 1898, on all trees sprayed, I had perfect, large and sound fruit, and although the past season was an off year I had some of my trees propped, they were so loaded. On the unsprayed trees the fruit was poorer even than in '97, and perfectly useless. I have bought the machine with which the experiment was conducted, and I intend using it next season, when I expect even better results, as my trees were in very bad shape from the many insects that affected them. This fall they look clean and healthy. I am fully convinced that with good systematic spraying and ordinary care of the trees, we can raise good apples in this section of Canada, and better than in most sections. The spraying experiment by the Government was of very great value to this section and was much appreciated by the people."

Carleton Place, Lanark.—Messrs. George Cornell and William Pattie's Orchards.

1st application, April 29th—Fine. Leaves one-half inch in diameter on early varieties; buds opening on later varieties. Tent caterpillar very bad, some aphis, bud moth and borer.

2nd application, May 11th.—Fine. Effects of first spraying are visible in the lessened number of insects on the sprayed trees.

3rd application, May 23rd.—Could not spray as trees were in full bloom.

4th application, June 8th.—Rained all day so that the application could not be made. Tent caterpillar very bad in this district. Everybody who has seen the sprayed trees wonders at the benefit of spraying. While the foliage on sprayed trees is perfect, that on fruit and forest trees all about is completely devoured.

5th application, June 20th.—Rained one hour after work was completed. Oyster-shell bark-louse and canker worm here.

6th application, July 2nd.—Fine. Sprayed trees in excellent condition and well loaded with clean fruit.

I visited these orchards and found the following results:

Duchess of Oldenburg.—Experimental spraying, 100 p. c. clean. No unsprayed trees of this variety.

Tetofsky.—Experimental spraying, 90 p. c. clean. No unsprayed trees of this variety.

Snow.—Experimental spraying, 95 p. c. clean. Only one tree of this variety in the orchard; it had borne no clean fruit before for several years.

Haas.—Experimental spraying, 100 p. c. clean; unsprayed, 15 p. c. clean.

Messrs. Cornell & Pattie write under date of January 18, 1899: "In the matter of experimental spraying in our orchard last summer, we beg to say that in our case the experiment was a success. The foliage of the trees sprayed showed green and healthy looking beside those not sprayed. The fruit of one showed a large percentage of good specimens—of the other a large percentage of poor fruit. As an evidence of our reliance on spraying, we bought the outfit used here, and every bush and tree on our premises will get the benefit next year. Further, a number of those who saw the spraying done here and its effect (although late to do much good last year) bought outfits so as to be ready next spring. In conclusion we wish to thank Mr. McPherson, who did the spraying here, for the manner in which he did the work, and his explanation in that regard to ourselves and all who came to see and learn.

Carp, Carleton Co.—Mr. Hugh Gourlay's Orchard.

1st application, April 30th.—Fine, high wind, trees mostly in leaf; some late varieties just opening. Found tent caterpillar, oyster shell bark louse, bud moth, aphis and apple tree case bearer.

2nd application, May 12th.—Application followed by rain in the evening; blossoms beginning to show.

3rd application, May 25th.—Cloudy; bloom partly fallen; tent caterpillar bad on unsprayed trees. Sprayed trees nearly clean.

4th application, June 9th.—Fine. Foliage on sprayed trees fine, while that on unsprayed trees presents a sickly appearance.

5th application, June 21st.—Fine. Sprayed trees and fruit in excellent condition; canker worm working on unsprayed trees. Mr. Gourlay's orchard has all been sprayed but a few trees. I am told that he is the only one within a radius of ten miles who has any apples this year. His are certainly fine.

6th application, July 4th.—Fine. Trees and fruit in good condition.

I inspected Mr. Gourlay's orchard on Oct. 14th. The following results were obtained:

McIntosh Red.—Experimental spraying, 100 p. c. clean. No unsprayed fruit of this variety. This apple spotted very badly other years.

Snow.—Experimental spraying, 100 p. c. clean; unsprayed, 10 p. c. clean.

Baldwin.—Experimental spraying, 100 p. c. clean. No unsprayed fruit.

Mr. Gourlay says that the scab has been growing worst ever year, and that the results of spraying are far beyond his expectation. He has sold his sprayed fruit to W. H. Wooding, of Ottawa, at $3.00 per barrel, while all he could get for the unsprayed fruit was $1.00 per barrel. He has 20 acres of orchard and has never found an apple affected with codling moth.

Under date of Nov. 17th Mr. Gourlay wrote: "Last year and other years the foliage of my orchard was often spotted and not healthy looking, and the tops of the limbs were often blighted. This year the sprayed trees presented a very healthy appearance, the foliage being very green and most luxuriant, and the trees making just about twice the growth they did other years. The fruit other years was more or less spotted, much of it being badly shaped from the bites of insects, more than half the snow apples being unfit for sale. This year the sprayed fruit was much larger and better shaped than ever before, and nearly free from spots, nine-tenths of it being sold as first-class fruit at $3.00 per barrel. I attribute this all to the effects of spraying. The benefits derived from spraying are almost incredible. Some of my neighbors had their orchards stripped bare by the tent caterpillar, and were much pleased to see the good effects of spraying on my trees. I had not the faintest idea that spraying could produce such a marked improvement on an orchard in one season.

Alexandria, Glengarry Co.—Mr. Angus McDonald's Orchard.

1st application, May 2nd.— Fine. Leaves on early varieties one-half inch in diameter. Found oyster shell bark louse, aphis, bud moth and tent caterpiller.

2nd application, May 13th.— Fine.

3rd application, May 26th.—Fine. Could not spray as trees were in full bloom. In addition to insects previously mentioned found canker worm and leaf crumpler. Foliage on sprayed trees is nearly clean, while that on unsprayed trees is badly eaten by insects.

4th application, June 10th.—Fine. Tent caterpillers have stripped the woods and nearly tree around. Sprayed trees look like monuments of mercy.

5th application, June 22nd.—Fine. Sprayed trees looking well, although there is very little fruit. Orchards are neglected in this part of the country.

6th application, July 6th—Fine. Foliage on unsprayed trees looks bad. Little or no fruit in this orchard. This is a rented farm and not taken care of.

I inspected Mr. McDonald's orchard. There was no fruit to mention as the trees did not bloom well. The foliage on the sprayed trees was in perfect condition, while on the unsprayed trees it was very poor, some trees having been entirely defoliated by insects.

Under date of Nov. 15th, Mr. McDonald wrote: "In connection with the spraying on my orchard, as the results were not favourable in my case, I cannot say anything in favour of spraying. At the same time I do not wish to say anything against it. The system may be excellent, and I am of opinion it is, although in this case it did not appear to work any marked change. This may be due to my orchard having yielded exceptionally heavy crops the two previous years."

Henry, Prescott.—Mr. Peter Paquette's Orchard.

1st application, May 3rd.—Fine and windy. Leaves on early varieties three-fourths of an inch in diameter. Find oyster-shell bark-louse, aphis, bud moth, and tent caterpillar here.

2nd application, May 14th.—Fine. Blossoms just opening. Some trees already in bloom.

3rd application, May 7th.—Fine. Bloom falling. In addition to insects previously mentioned, find red spider and canker worm.

4th application, June 11th—Fine. Everyone present pleased with the difference of appearance between the sprayed and unsprayed trees.

5th application, June 23rd.—Cloudy. Sprayed trees look well and are fairly loaded. Unsprayed trees badly eaten by insects.

6th application, July 6th.—Fine. Sprayed trees looking well. I inspected Mr. Paquette's orchard and found the following results:

St Lawrence.—Experimental spraying, 90 p. c. clean; unsprayed, 10 p. c. clean; fruit under size.

Wealthy.—Experimental spraying, 100 p. c. clear. No unsprayed fruit of this variety.

Snow.—Experimental spraying, 100 p. c. clear; good crop and fine foliage; unsprayed 25 p. c. clear; full crop but fruit small and foliage badly damaged by worms.

In a letter dated Nov. 18th, Mr. Paquette writes: "The foliage of my sprayed trees is in the best condition and the fruit of the very best quality. I may thank the spraying for the same."

Hawkesbury, Prescott Co.—Mr. A. R. Fraser's Orchard.

1st application, May 4th—Very damp as it had rained in the forenoon. Leaves three-quarters of an inch in diameter. Find tent caterpillar, aphis, bud moth and oyster-shell bark louse here.

2nd application, May 16th.—Fine.

3rd application, May 28th.—Looks like rain. Bloom falling. In addition to insects already mentioned I find borer, leaf-crumpler and scurfy bark-louse.

4th application, June 13th—Fine. Good show for fruit here. Found some canker worm.

5th application, June 24th.—Indications of rain. Sprayed trees in good shape and well loaded with fruit.

6th application, July 7th.—Fine. Fruit on sprayed trees clean and a very good crop.

I inspected Mr. Fraser's orchard and found the following results :

Snow.—Experimental spraying, 90 p.o. clean ; unsprayed, 10 p.c. clean.

McIntosh Red,—Experimental spraying, 90 p.c. clean ; unsprayed, 10 p.c. clean.

Winter St. Lawrence.—Experimental spraying, 95 p.c. clean ; unsprayed, 60 p.c. clean.

Talman's Sweet.—Experimental spraying, 100 p.c.. clean ; unsprayed, 80 p.c. clean.

Duchess.—Experimental spraying, 100 p.c. clean ; unsprayed, 50 p.c. clean.

Alexander.—Experimental spraying, 95 p.c. clean ; unsprayed, 50 p.c. clean.

Wealthy.—Experimental spraying, 100 p c. clean ; unsprayed, 80 p.c. clean.

All unsprayed fruit was smaller than sprayed fruit, and the foliage was poorer.

Mr. Fraser wrote on January 11th, 1899 : "I suppose you will consider it strange that I did not answer your letter sooner, but circumstances prevented me doing so. The trees that were sprayed look much cleaner than the ones that were not sprayed. The foliage much better on the sprayed than on the unsprayed trees. The apples were larger, better colored, and better quality, on the sprayed than on the unsprayed trees. The sprayed apples had hardly any spots and no worms in them ; while the unsprayed apples had both spots and worms. I had some fine snow apple trees at the foot of my orchard, just along the fence. I just sprayed the one side of the trees (the west side) and I supposed that was enough until I picked them. The apples on the sprayed side were beautiful in colour, size, and flavour, while those on the unsprayed side were small, green, and covered with scale."

Campbellford, Northumberland Co.—Miss Jane Johnston's Orchard.

1st application, May 5th.—Rainy and very cold. Trees nearly all out in leaf. Find bark loose. Tent caterpillar, aphis and bud moth.

2nd application, May 17th.—High wind and cool. Could only spray the spris as other varieties were in full bloom. This orchard needs pruning badly.

3rd application, May 30th.—Fine. Bloom falling.

4th application, June 14th.—Very warm. Canker worm at work. Leaves on sprayed trees very large and healthy looking ; muddy ; it has rained more or less for seven days.

5th application, June 25th.—Rained till 9 a.m. Sprayed at 10 and it rained again a little at 2 p.m Sprayed trees in good condition, but the crop is light.

6th application, July 8th.—Fine.

I inspected this orchard on Oct. 7th and found the following results :

Spy.—Experimental spraying, 52 p.c. clean ; unsprayed, 4 p.c. clean.

Snow.—Experimental spraying, 50 p.c. clean ; unsprayed, 8 p.c. clean.

Colvert.—Experimental spraying, 50 p.c. clean ; unsprayed, 8 p.c. clean.

On Nov. 15th, Miss Johnston writes as follows : "C ncerning the experimental spraying which was carried on in my orchard this summer, I would say that I think it is a great benefit. The trees which were sprayed were mostly Snows and Spys. The difference was most marked on spys. The packers said there very few culls. In orchards where spraying was not done the apples were of a very poor quality, and those trees in my orchard which were not sprayed had a different appearance from the sprayed ones. The foliage was so fresh and green on the trees which were sprayed while the others had a shrivelled, burnt appearance. I intend to spray next spring."

TWENTY-NINTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO.

1898.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

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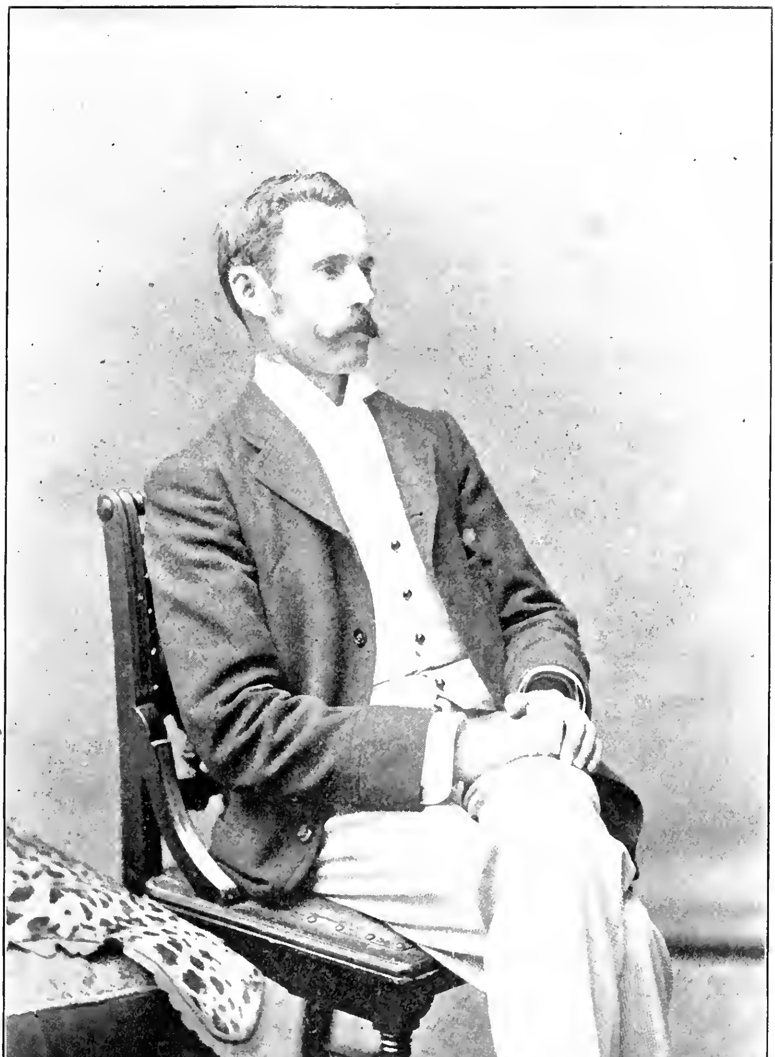

WILLIAM HAGUE HARRINGTON, F.R.S.C.

President of the Entomological Society of Ontario, 1893-5

JOHN DEARNESS, I.P.S.
President of the Entomological Society of Ontario, 1895-7.

TWENTY-NINTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO,

1898.

To the Honorable John Dryden, Minister of Agriculture.

SIR,—I have the honor to present herewith the twenty-ninth annual report of the Entomological Society of Ontario. It contains an account of the proceedings at our annual meeting, which was held in the City of Montreal, on the 8th and 9th of November last. The change from London, the usual place of meeting and the head-quarters of the society, was made in order that the members generally might join in the celebration of the twenty-fifth anniversary of the formation of the Montreal Branch. The report includes the financial statement of the Treasurer and the reports of the various sections, branches and officers of the society, as well as the papers and addresses delivered during the course of the meeting.

The *Canadian Entomologist*, the monthly magazine published by the society, has now completed its thirtieth volume and begun the issue of the thirty first. The volume contains a large number of valuable original papers contributed by the most eminent writers in this department of science in Canada and elsewhere. Great attention, it may be observed, has been paid to scale insects and a great many new species from different parts of North America have been described.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,

Editor.

Trinity College School,

Port Hope.

OFFICERS FOR 1898-9.

President .... HENRY H. LYMAN, M.A .... Montreal.
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" 4	A. H. KILMAN	Ridgeway.
" 5	R. W. RENNIE	London.

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- REV. C. J. S. BETHUNE, M.A., D.C.L., F.R.S.C., Head Master Trinity College School .... Port Hope.
- JAMES FLETCHER, LL.D., F.R.S.C., F.L.S., Entomologist and Botanist, Experimental Farms .... Ottawa.
- JOHN DEARNESS, I.P.S .... London.

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- DR. WOOLVERTON, MESSRS. BALKWILL, BOWMAN, ELLIOTT, LAW, PERCIVAL, RENNIE, SAUNDERS, and SPENCER .... London.
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Library and Rooms Committee — MESSRS. BALKWILL, BETHUNE, DEARNESS, MOFFAT, and SAUNDERS.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, 1898.

The thirty-fifth* annual meeting of the Entomological Society of Ontario was held at Montreal, in the Museum of the Natural History Society, on Tuesday and Wednesday, November 8th and 9th, in order that the members might join in the celebration of the twenty-fifth anniversary of the formation of the Montreal Branch. At the request of the President, Mr. Henry H. Lyman, the chair was occupied by the Rev. Dr. Bethune, of Port Hope.

The meeting was called to order at 2-30 p.m. on Tuesday, when the following members were present: Dr. Wm. Saunders, Director, and Dr. James Fletcher, Entomologist and Botanist, Experimental Farms, Ottawa; Messrs. John Dearness and W. E. Saunders (Secretary) London; Mr. Arthur Gibson, Toronto; Rev. C. J. S. Bethune, Port Hope; Mr. J. D. Evans, Trenton; Rev. Dr. Fyles, South Quebec; Messrs. H. H. Lyman, A. F. Winn, J. T. Hausen, Lachlan Gibb, M. Waring Davis, G. C. Dunlop, D. Brainerd, A. E. Norris, H. Brainerd, J. B. Williams, Chas. Stephenson, Rev. Dr. Campbell, and others, Montreal.

The President read letters expressing regret at their inability to attend the meeting, from the following prominent American entomologists: Dr. L. O. Howard, Director of the Division of Entomology, U.S. Department of Agriculture, Washington, D.C.; Rev. Dr. W. J. Holland, Chancellor of the Western University of Pennsylvania, Allegheny, Pa.; Professor F. M. Webster, Wooster, Ohio; Professor M. V. Slingerland, Cornell University, Ithaca, N.Y.

The report of the Librarian and Curator, Mr. J. Alston Moffat, was read by the Chairman, showing 47 additions to the Library, which make the total number of volumes 1,553, and satisfactory work in the increase of the collections.

The Chairman next read the report of the Treasurer, and explained that the large balance in hand on the 1st of September last, when the books were closed, would be greatly reduced by the payments that became due between that date and the end of the year. A discussion upon cork and pins then ensued. Dr. Fyles exhibited a sample of a substitute for cork that had been placed upon the market. Dr. Fletcher enquired why the quality of the cork recently supplied by the Society was so poor. The Secretary replied that he thought a better quality could be procured by paying a higher price for it. Dr. Fletcher considered that we should have the best obainable, as the present supply was unsatisfactory. Mr. Lyman exhibited some specimens of English-made steel pins, both gilt and black enamelled, and the Secretary was authorized to procure a moderate supply in order that the members might use them if they wished.

The Report of the Botanical Section was then read by the Chairman. Dr. Fletcher made enquiries as to *Cuscuta epithymum*, a dodder which has been found upon clover in the County of Middlesex. Mr. Dearness assured him that it had been correctly identified. He then said that it was a true annual, growing from seed each year.

The Report of the Microscopical and Geological Sections were next read by the Chairman, who remarked that London had become a headquarters of scientific research for the western peninsula of Ontario, in consequence of the good work done by the Society and its sections. It was certainly an unique matter that so many branches devoted to different departments of science should be affiliated together in connection with the Entomological Society of Ontario.

The Reports of the local Branches of the Society were next read; that of the Montreal Branch by its Secretary, Mr. Lachlan Gibb; the report of the Toronto Branch

* By an error it is stated in the last annual Report that "the thirty-fifth annual meeting" was held in 1897. As the Society was founded in 1863, this is manifestly a mistake.

also by its Secretary, Mr. Arthur Gibson; and the report of the Quebec Branch by its President, the Rev. Dr. Fyles. These reports all gave evidence of much good work accomplished, and steady progress in interest and numbers.

The Report of the Delegate to the Royal Society of Canada was read by Mr. John D. Evans, of Trenton, who represented the Entomological Society at the last annual meeting in May. It contained a brief record of the work that had been done during the previous year.

The Report of the Council of the Society was read by the Secretary, Mr. W. E. Saunders, of London, as follows:

Report of the Council.

The Council of the Entomological Society of Ontario submits herewith its Annual Report for the year 1897–8.

The Council is pleased to be able to report that the three Branches of the Society in Montreal, Toronto, and Quebec, are in an active and vigorous condition, much good work having been done in all of them during the past season. The membership of the Branches, the meetings held, and the particulars of their work will be found in their respective reports.

The twenty-eighth annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario, at the end of December last, and was printed and distributed at the close of the session of the Legislature. It contained one hundred and four pages, and was illustrated with fifty-six wood-cuts and two full-page plates, in addition to an account of the proceedings at the last annual meeting. The report contains the annual address of the President, Mr. John Dearness, and the following valuable and interesting papers: "The Locusts of the Bible," by Rev. T. W. Fyles; "A Study of the Gryllidæ (Crickets)," by Mr. Wm. Lochhead; "The Value of Systematic Entomological Observations" and "Protective Resemblances," by Mr. J. A. Moffat; "On Butterfly Books, by Mr. H. H. Lyman; "Some Household Pests," by Rev. C. J. S. Bethune; "On the Entomological Results of the Exploration of the British West India Islands by the British Association for the Advancement of Science," by Dr. L. O. Howard; "The Work Against the Gypsy Moth, 1897," by Mr. A. H. Kirkland; "Notes on the Insects of the Year," by Messrs. Harrington, Bethune, Moffat, Fyles, Gibson and Grant; "The San Jose Scale," by Dr. James Fletcher; and a short account of the proceedings at the annual meeting of the Association of Economic Entomologists. The report on the whole contains a larger number than usual of distinctly practical and popular papers that cannot fail to be of great value to the community. These papers were specially prepared by members of the Society in order to afford useful information on a great variety of insects, free as far as possible from scientific and technical language, to farmers, gardeners, fruit-growers, and others affected by the ravages of destructive insects.

The *Canadian Entomologist*, the monthly magazine published by the Society, completed its twenty-ninth volume in December last. Eleven numbers of the thirteenth volume have been issued; they contain 296 pages, and are illustrated with six full-page plates, one of which is colored, and a number of original wood-cuts. Among the many valuable papers may be mentioned a series of articles on "The Classification of the Horntails and Saw-flies of the World," by Mr. William H. Ashmead, and "The Descriptions of a Number of New Species of Scale Insects," by Mr. T. D. A. Cockerell, and others.

Friends of the Society will note with pleasure, that one of our officers, Mr. Wm. Lochhead, has been appointed to the important position of Professor of Biology, in the Ontario Agricultural College, at Guelph. The College is to be congratulated on having made so wise a choice in filling the vacant position.

Since our last meeting, great efforts have been made by the Legislature of Ontario and the Federal Government, to eradicate such colonies of the San Jose Scale as have been found in Canada, and to prevent further introductions of this injurious pest. In our last report will be found the Federal and Provincial Acts bearing upon this subject. These Acts have been vigorously enforced during the past season, and orchards, in districts where the Scale has been found, have been subjected to a rigid inspection. Exceptional efforts have been made by the Provincial Government, to wipe out all traces of this pest, the increase of which, as everyone who understands the matter knows, would be a national calamity.

The members of the Council are gratified to know that the excellent work of one of its oldest and most esteemed members has been recognized by the University of Bishop's College, Lennoxville, Que., the Rev. Thomas W. Fyles having received, at its hands, the degree of D.C.L. The excellent work of Dr. Fyles in encouraging the public taste for Entomology, by his popular papers on insects, and by the formation, in 1897, of the Quebec Branch of the Entomological Society is well known to all our members.

The Council profoundly regrets the loss by death of Prof. Panton, of the Ontario Agricultural College, at Guelph, who at the time of his decease was Vice-President of the Society. He was highly esteemed and respected by the members, both for the efficient assistance he has rendered the cause of Practical Entomology in Canada, and the agreeable and courteous manner which ever characterized his intercourse with all who came in contact with him.

The Council has much pleasure in stating that entomological books can now be imported into Canada free of all Customs duty, and that this concession was obtained through the representations of our Society. Early in the year, the President called the attention of the Council to the fact, that under item No. 464 of the tariff, books upon the application of science to industries of all kinds could be imported free of duty, and suggested that an effort should be made to secure the placing in the same category books upon entomology, on account of the close connection between that science and the successful prosecution of agriculture. This was unanimously approved by the Council and a Committee consisting of the President and Drs. Bethune and Fletcher, was appointed to prepare a memorial to the Government. The memorial having been approved, was signed by the President and Secretary, and was duly forwarded to the Finance Minister on the eve of the introduction of the budget, but owing to the pressure of other business was held over until the prorogation of Parliament. It was referred to the Minister of Customs, who requested the President to furnish more information, and to submit samples of books. On this being done, the Hon. Mr. Patterson, at once decided that such books should be admitted free under the item above referred to.

The Society was represented at the meetings in Boston, in August last, of the Association of Economic Entomologists of North America, and the American Association for the Advancement of Science, by its President, Mr. Lyman and the Rev. Dr. Bethune.

The Council desires to express its entire satisfaction with the efficient manner in which the Librarian and Curator, Mr. J. Alston Moffat continues to discharge the duties of his offices.

All of which is respectfully submitted,

Henry H. Lyman,
President.

The adoption of the report of the Council was moved by Mr. Dearness, who also said that it would be interesting to have inserted in the report of the Montreal Branch, some details regarding their Saturday afternoon lectures for young people; upon being seconded by Mr. L. Gibb, the motion was put to the meeting and unanimously adopted.

REPORT OF THE LIBRARIAN AND CURATOR FOR THE YEAR ENDING 31ST AUGUST, 1898

The bound volumes received in exchange from Government and public institutions during the year were 9: By gift—From Miss Ormerod, through Dr. Fletcher, Kollar's "Treatise on Insects Injurious to Gardeners and Farmers," and from Rev. Dr. Bethune, "The Life and Adventures of Audubon." By purchase—"A Systematic Arrangement of British Plants," and Grote's "Illustrated Essay of 1882." The number of volumes bound was 34. The number of volumes added to the library during the year was 47. The full number now on the register is 1,553. The number of volumes issued to local members was 19.

Several valuable additions have been made to the collection of native lepidoptera during the year by Mr. J. W. Bice, from his captures at electric light.

An important extension was made in the exotic collection by the receipt of a large number of attractive Japanese butterflies and moths in excellent condition from the Rev. H. Loomis, Yokohama, Japan.

Respectfully submitted,

J. ALSTON MOFFAT,
Librarian and Curator.

REPORT OF THE BOTANICAL SECTION.

The President and Council of the Entomological Society:

GENTLEMEN,—During the season just past, the meetings of the Botanical Section have been held with good regularity, beginning with April 20, and continuing every second week until midsummer was over. The members have been actively engaged in the study of the various departments and three plants new to the district of London have been found and exhibited to the meetings, namely, *Linaria minor*, *Galium cinereum*, *Fraxinus quadriangulatus;* and others of particular rarity have been noted :—Asclepias similar to Purpurea but whose species was not satisfactorily determined, *Melissia officinalis* and *Ranunculus bulbosa*, Fleshy Fungi have been the recipients of considerable attention on the part of some of the members and a more general interest has been awakened in this branch.

Some points brought out at the meetings which are of sufficient interest to be mentioned in our report are as follows :—*Lactuca scaevola* is reported from various quarters and is said to be spreading throughout the County of Middlesex and others adjoining. It is said to be a pernicious weed and some farmers complain very much of its abundance and troublesomeness.

Cuscuta epithymum, a dodder which has been found flourishing only on clover, and of which there were several reports last year, was found again in the same localities this year.

The lateness of the present summer season is also worthy of note. At the time of writing (Oct. 22), wild specimens of *Liatris cylindracea* are in bloom, and in the garden *Anemone Japonica* is full of buds and flowers, while the Phloxes, annual and perennial, and also roses and carnations are still yielding flowers; apple, pear and peach trees in the gardens, maples, elms, and even the ash trees are still in almost full leaf, many of them, particularly the three former, being quite green. Local records show that not for 17 years has there been so late and open a season.

Respectfully submitted for the Botanical Section,

I. BOND,
Chairman.

W. E. SAUNDERS,
Secretary.

REPORT OF THE MICROSCOPICAL SECTION.

The President and Council of the Entomological Society of Ontario:

Gentlemen,—I have the honor to present the report of the Microscopical Section of the Entomological Society of Ontario.

Meetings were begun in November, officers being elected as follows, Chairman, J. A. Balkwill; Sec'y, W. E. Saunders; Committee, Messrs. Rennie, Saunders and Balkwill.

Nine meetings were held at which five sets of papers were given, a good attendance recorded and much interest manifested. A good many slides were mounted by the members and a great deal of interesting and instructive discussion on microscopical subjects was engaged in.

The papers read comprised,—

Shine moulds, by J. Dearness, London.

Bacteria, by Dr. H. A. Stevenson, London.

Radiolaria, by R. W. Rennie, London.

Diatoms, by J. Dearness, London.

Marine Algæ, by R. Lees, M.A., St. Thomas.

Submitted on behalf of the Section,

J. A. Balkwill,
Chairman.

W. E. Saunders,
Secretary.

REPORT OF THE GEOLOGICAL SECTION.

To the Entomological Society of Ontario:

The Geological Section of the Entomological Society of Ontario begs leave to present the following report:

The section continued to meet weekly throughout the year. A special study of the fauna of early geological time was made through the medium of fossils from the Silurian and Devonian formations as developed in south-western Ontario, assisted by charts of the characteristic organic life of these periods.

Special trips to interesting points in our western peninsula were made by various members of our section, and reports of their observations were subsequently made. Among other places visited were the following:—Kettle Point (Cape Ipperwash), by Dr. Woolverton, the chairman of the section; the Crystal Cave at Put-in Bay, Ohio, by Mr. Percival; the bituminous shales of Alvinston, Lambton Co., Ont., by Mr. Sangster; the new oil fields in Sarnia township, Ont.; the Guelph formation as developed at Galt, Ont., by Mr. Goodburn. The chairman of the section also visited the new oil fields at Dutton. Commendable interest was manifested in the general study of geological science.

Appended are abstracts of the reports made of field observations.

Dr. Wolverton's report on Kettle Point and its concretions:

"To the lover of natural history, and especially to the geologist, there is no place in our western peninsula that is of greater interest than this.

"Kettle Point is composed of bituminous shales which overlie the Hamilton formation and which are here the highest member of the Devonian series. The chief feature of this point is the large number of concretionary bodies strewn along the shore, washed there from the shales which extend as shoals far into Lake Huron. These concretions vary in size from a foot to five feet in diameter. Their composition is limestone, colored by bituminous matter. They are crystalline and radiate from a centre. They resemble fossilized wood. When exposed to the action of the air they usually divide through the centre forming hemispheres.

"As they are being wantonly destroyed by visitors there should be legislative protection provided for these curiosities as soon as possible.

"The shales here present a fine tesselated appearance. The vertical cleavage runs in parallel straight lines at different distances, and the general appearance is much the same as it would be had these shales been placed in position by skilled workmen. Quantities of pyrites are found in these shales. The iron oxidizing tinges with red the boulders along the shore.

"By decomposition of the shales, quantities of alum are produced. This the Indians, from time immemorable, have used as medicine and a commodity for barter. Many years ago fire raged among these shales and consumed a great part of the peninsula which previously had extended far into the lake."

Mr. Percival's report on the celestine grotto at Put-in-Bay:

"It having been reported to the section that a curious crystal cave had recently been discovered on an island at the western extremity of Lake Erie, I decided to visit it and report. The cave was discovered a year ago by workmen engaged in digging a well. At a depth of about twenty feet a fissure was discovered at one side of the well, and further excavation revealed a beautiful little cavern everywhere lined with crystalline strontium sulphate (celestine). The owner having lighted the well by electricity the effect is very fine. The crystals are rhombic, of a beautiful azure blue, and vary in size from one inch to twenty inches in transverse axis. As the cavern is everywhere lined by these crystals it may be considered a gigantic geode. The cave is semi-circular in form and about forty feet in perimeter. The arch of the roof however is low owing to the vast deposit of crystals, said to be more than twenty-two feet in thickness, on the floor of the grotto.

"Crevices at several points together with other indications lead to the opinion that this is only one of a series of similar caverns in that vicinity. The owner proposes to continue excavating during the ensuing winter, and probably next summer there will be several grottoes open to the inspection of visitors.

"Strontium is a somewhat rare mineral and occurs nowhere else in large quantity. The element was isolated about a century ago. It is whitish in color, oxidizes readily, decomposes water with explosive violence, and never occurs in organic bodies. It gives a remarkable band of light in the spectrum, by which it is readily detected. Strontium was named after Strontian, in Argyle, Scotland, where it is found as a carbonate. It is also found in Sicily in small quantity. Here however the quantity in sight is quite large. Sr. nitrate is used to give a crimson tint to a flame, and is the chief material used in making Bengal fire (red). Strontium salts are also used in sugar refining to hasten the crystallization of sugar."

Mr. Percival placed beautiful crystals in our geological cabinet in the Entomological Society's rooms, where they may be inspected at any time.

Mr. Sangster's Report on Alvinston Shales.

The outcrop measures 1,400 feet in length, and borings made at various points prove that the depth is sixty feet. The river has eroded the bed to a depth of about eight feet. The shales are similar to those exposed at Kettle Point, but contain no concretions. They are highly carbonaceous and contain much iron sulphide. The shales are capped by a stratum of clay forty feet in thickness.

Experiments made with this shale prove it to be a most valuable material for the manufacture of vitrified brick. A leading manufacturer of paving brick declared no better material for the purpose had hitherto been discovered on this continent. As a company is being formed to manufacture brick from these shales, it is hoped that soon they will rank among the developed economic products of this Province.

Mr. Sangster exhibited fine specimens of vitrified brick manufactured from these shales.

Mr. John Law, who spent some time among the Catskills, southern New York reported that veins of copper, also platinum, besides traces of gold and silver, had been discovered in these regions. He exhibited specimens of drift boulders from this location; gneiss appeared to be the predominating material. He also exhibited a photograph of a famous drift rock called Eagle Rock. He thinks that prospectors would find it a favorable field for exploration.

Mr. Goodburn visited Galt and reported as follows:

The rocks at Galt are dolomite (in some cases pure) and belong to the Guelph group. They vary in colour, from a dirty yellow to a beautiful grey (the grey being the lowest in the series), and are of a peculiar crystalline texture. They furnish excellent building stones. The Guelph group varies here in thickness from 90ft. to 160ft. The underlying mass is the Niagara group. The upper portions of strata are much broken up, and contained many specimens of the Megalomus Canadensis. This bed was about 15ft. thick. The lower beds were quite compact, and also contained many fossils. One Meg. Can. which I secured is perfect, six inches in length, and larger than any figured in Nicholson's Palæontology. I also found a very good specimen of Megalomus compressus four inches long and a little over one inch in thickness, a portion of the outer spiral and the whole of the inner cast of a Murchisonia Loganii. The quarry whence I obtained my specimens is near the Grand Trunk track, and about 200 yards from the Grand River.

The Chairman visited the oil fields at Dutton, Elgin Co., Ontario, and reported that the pioneer company operating there had seven producing wells.

Mr. Kirk reported on another new oil field situated in Sarnia Township, Lambton Co., Ontario. One company operating there had thirty producing wells scattered along a line about two miles in length. These produce from 15 barrels per day downwards. They propose to thoroughly develop this tract, and sink a well every 200 feet. The producing area is about one mile in width. Another company working in an adjoining neighbourhood have very recently obtained some good wells, one of which pumps 25 barrels a day. The producing wells are all situated along anti-clinal, which, however, does not appear at the surface, being deeply covered by clay. Oil is obtained here at a depth of about 475 feet. The borings pass through clay 100ft., hard rock 15ft., shale 150 ft., upper lime 15 ft., shale 150 ft., lower lime and sandstone about 45ft. In order to obtain oil each well must be torpedoed, the charge being from 20 to 50 quarts of nitro-glycerine. These new oil fields seem to be a northwesterly extension of the petroleum oil belt. The oil is found along a line trending northwest and southeast.

GEO. KIRK,
Secretary.

THE REPORT OF THE MONTREAL BRANCH.

The 215th regular and 25th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held in the rooms of the Natural History Society of Montreal, on May 10th, 1898.

The following members were present: Messrs. H. H. Lyman (President), A. F. Winn (Vice-President), E. T. Chambers, J. B. Williams, Dwight Brainerd, L. Reford, C. Stevenson, G. A. Moore, and L. Gibb; visitor, Mr. M. Waring Davis.

The chair was taken by the President, and the minutes of the previous meeting were read and confirmed, also the last annual report.

The President then submitted the following report of the Council for the past year:

In presenting their twenty-fifth annual report the Council have much pleasure in being able to congratulate the Branch upon having enjoyed a continuous and fairly prosperous existence for a quarter of a century. This, in view of the small number interested in the pursuit of this particular branch of science, coupled with the fact that in this country almost everyone has to work for a living, is, we think, a highly creditable showing.

During the season eight meetings have been held, at one of which we had the pleasure of the attendance of Dr. Fletcher, and at another of that of Rev. Mr. Fyles, and the following papers were read:

Annual address of the President.

Notes on the Collecting Season of 1897—Dwight Brainerd.

On the Food of the common Grass Snake—J. B. Williams.

A late Autumn Ramble on the Mountain—A. F. Winn.

On the Mounting of Lepidoptera—H. H. Lyman.

The San Jose Scale—Dr. James Fletcher.

Further notes on the Genus Chionobas—H. H. Lyman.

Our books and original papers—A. F. Winn.

Our native Pieridæ, a theory—Dwight Brainerd.

Introduction to the Classification of Insects—Rev. T. W. Fyles.

An Arctian: what is it?—Rev. T. W. Fyles.

Life History of Tæniocampa alia, Gn—Rev. T. W. Fyles.

The Dytiscidæ—A. F. Winn.

During the season a number of our members again took part in the course of short lectures to young people on Saturday afternoons at the Natural History Museum. This work is now fairly established, and should be productive of good results in the future.

Our small library, which had suffered greatly in the past through the Branch having no permanent quarters, has received some valuable additions through the kindness of one of our absent members, Mr. Jack, and the Cabinet of the Natural History Society has been materially added to by two of our members, Messrs. Winn and D. Brainerd.

Our Branch has also presented a copy of Comstock's Manual for the study of Insects to the library of that Society as a slight return for privileges accorded to our Branch.

Steps have been taken to secure as far as possible the interchange of papers between the different branches of the Society, that all may get the benefit of such papers. Should this scheme be successfully carried out, it should add materially to the interest of the meetings, and cause the several branches to take more interest in each other's work.

At the last annual meeting of the parent Society our Branch was honored by having one of its members elected to the presidency.

The Treasurer's report shows that the finances of the Branch are in a satisfactory condition.

Respectfully submitted on behalf of the Council,

HENRY H. LYMAN,
President.

The Treasurer then submitted his report, which showed an accumulated balance in hand of $38.68.

Upon the motion of Mr. J. B. Williams, seconded by Mr. L. Reford, the reports of the Council and Treasurer were received and adopted.

The President then read his annual address, giving a resume of the past year's work, and suggesting the holding of a conversazione in the autumn to mark the completion of the 25th year of the Montreal Branch.

The following officers were then elected for the ensuing year :

President—Henry H. Lyman ; *Vice-President*—A. F. Winn ; *Secretary-Treasurer*—Lachlan Gibb ; *Council*—G. C. Dunlop, J. B. Williams, Dwight Brainerd.

L. Gibb, Secretary-Treasurer.

REPORT OF THE TORONTO BRANCH.

The second Annual Meeting of the Toronto Branch was held in the Education Department (Normal School) on Friday evening, the 1st April, 1898.

The following members were present : Messrs E. V. Rippon, President : Arthur Gibson, Secy-Treas : H. D. Chipman, C. T. Hills, C. H. Tyers, A. J. Cherry, H. C. Austen, S. R. Carter, E M. Fenwick and Frank Welch.

The minutes of the previous regular meeting were read and approved.

Report of the Council : The Secretary read the following report of the Council for the year ending 31st March, 1898.

The Council of the Toronto Branch of the Entomological Society of Ontario take pleasure in presenting the second Annual Report of the proceedings of the Branch for the year ending 31st March, 1898.

Since our previous Annual Meeting one new member, Mr. E. M. Fenwick, has been added to the roll of membership, and it is earnestly hoped that throughout the year now commencing, the members will endeavor to obtain as many new additions to the roll as possible.

During the year, eighteen regular meetings have been held, and the following papers, contributed by the members, tended considerably to add to the interest manifested in, and the success attending these meetings.

"Parasitic Forms of Insects" by Mr. E. V. Rippon.

"Collecting in and about Kingsville, Ont." by Mr. C. T. Hills.

"Some of the Insect Pests of the Niagara District" by Mr. H. C. Austin.

"Muscular Powers of Insects" by Mr. H. D. Chipman.

"The Mosquito" by Mr. A. J. Cherry.

"On the Noctuidæ Occurring at Toronto" by Mr. Arthur Gibson.

On the 23rd November last the Branch had the pleasure of contributing an illustrated lecture on "Our Friends and Foes of the Insect World", through the kindness of one of our members, Mr. T. G. Priddey, to the eleventh Section of the Boys' Brigade. About 200 boys were present, most of whom took an interest in the discourse, and it is hoped that some stray seed may have fallen into good ground.

During the collecting season three field days were held, viz., on the 24th May to "Trout Creek", on the 19th June to "Trout Creek" and on the 1st July to Forks of Credit.

The Branch is indeed pleased to place on record the appreciation it feels towards the Minister of Education (Hon. G. W. Ross) and the Education Department for Ontario, for their kindness in granting the Branch the free use of a room, in which to hold meetings and store the collection and library.

The report of the Librarian-Curator shows that during the year quite a large number of valuable Government publications have been donated to the Branch, also that the collection of insects is steadily increasing.

The Treasurer's report shows the balance carried forward to be on the right side.

All of which is respectfully submitted.

E. V. Rippon, President.

The report of the Treasurer was presented, as also that of the Librarian-Curator, submitted by Mr. H. D. Chipman. On motion of Mr. Hills, seconded by Mr. Austen, the reports of the Council, Treasurer, and Librarian-Curator, were adopted as read.

The election of officers for the ensuing year resulted as follows:

President—Mr. R. J. Crew; *Vice-President*—Mr. C. T. Hills; *Secretary-Treasurer*—Mr. Arthur Gibson. (accl.); *Librarian-Curator*—Mr. H. D. Chipman; *Members of Council*—Messrs H. C. Tyers and E. M. Fenwick.

The retiring President, Mr. E. V. Rippon, then addressed the meeting. He referred chiefly to the work done during the past year, and while pleased with the result, said he would like to see the members take a more active interest in the work. As regards the collection of insects he hoped the members would contribute as many specimens as they possibly could during the coming season, and pointed out the advantage to all the members in having a representative collection in the possession of the Branch. Of course, it would not be expected that the members would neglect their own private collections, but with a little extra work on the part of each member, he felt satisfied that much progress could be made in the collection during the approaching season. He also referred to the reading of papers at the meetings, and hoped that the members would make an effort to contribute more papers in future. During the past year only six papers were contributed by the members. He encouraged those present to make more notes during the coming season, feeling sure that if such were done more papers would be contributed at the meetings. He mentioned that the outlook for the Branch's future was much brighter than ever before, as the Education Department for Ontario had very kindly granted the Branch the free use of a room in which to hold meetings, and store the collection and Library. He also touched upon the membership and hoped that those connected with the Branch would endeavor to have some new names added to the roll during the ensuing year.

The meeting then adjourned.

Arthur Gibson, Secretary.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec Branch of the Entomological Society of Ontario was held on the 26th of February, 1898. Eighteen members were present, the President, the Rev. T. W. Fyles, occupying the chair.

President's Report. The Quebec Branch of the Entomological Society of Ontario is to be congratulated on the success which has attended it during the first year of its existence. Its numbers have increased, its meetings have been regularly held and well attended, and considerable interest in natural history has been awakened in the community through its proceedings. The pleasures of its monthly meetings have been enhanced by the hospitality of its members. This has been so far extended that its gatherings have taken as much of a social as of a scientific character: though the objects of the association have never been lost sight of—"Philosophy in sport" having been made "Science in earnest."

In the course of the summer a number of rare and interesting specimens were taken, and these were afterwards exhibited and identified. Among them were some the names of which were new to the Quebec lists.

The thanks of the members are due to the authorities of Morrin College for the countenance and encouragement they have given to the association.

The Branch was represented by its President at the annual meeting of the Entomological Society of Ontario held in London, Ont, on the 12th of October. On this occasion many hearty good wishes for the prosperity of the Branch were expressed.

The parent society has reached the 35th year of its existence. Its 28th annual report is now in the press. Its monthly organ, *The Canadian Entomologist*, which has now reached its 30th volume, ranks as one of the leading Entomological publications of the day, and has an extensive circulation, not only in Canada and the United States, but in Europe and other parts of the world. Flourishing branches of the Society exist in Toronto and Montreal. The Quebec branch will, we trust, be no less prosperous than these.

The Society has experienced a great loss by the death of its Vice-President, J. Hoyes Panton, M. A., F. G S., Professor of Natural History and Geology, in the Ontario Agricultural College, Guelph. He was the author of a useful handbook entitled "Our Insect Foes and How to Destroy Them." His valuable article on "Entomology for Rural Schools," which appeared in last year's report of the Society, is, no doubt, fresh in the minds of many of you. His useful career was cut short while he was yet in his prime. The American Entomological Society has also sustained a great loss by the death of its President, Dr. George H. Horn. The *Entomological News*, of Philadelphia, thus speaks of him:

"The entomological world has lost a shining light and American Coleopterology its greatest votary. As a systematic coleopterist he probably did not have a superior in the world. His large collection of beetles was considered the finest extant in the field he cultivated. It, with his library, and five thousand dollars for the care of the former, he willed to the American Entomological Society."

Entomology in the United States has made great strides. The Division of Entomology in the Department of Agriculture, Washington, D. C., has been of vast benefit to the agriculturists and horticulturists of this continent. Its present able director, Mr. L. O. Howard, and his efficient staff, are not merely supporting, but raising more and more the high character that its services have won for it. Among the valuable bulletins that it has lately issued are:

"The Gypsy Moth in America," by L. O. Howard.

"Revision of the Tachinidæ," by D. L. Coquillet.

"Some Little-Known Insects Affecting Stored Vegetable Products," by F. H. Chittenden.

"Insects Affecting Domestic Animals," by Herbert Osborn.

The insects that are causing the greatest alarm in America at the present time are the Gypsy Moth (*Porthetria dispar*) and the San Jose Scale (*Aspidiotus perniciosus*) Comstock. Specimens of the former species escaped in 1869 from the residence of Professor Trouvelot, at Medford, near Boston; and for eight years the insects increased in numbers without exciting much attention. The species has now extended its ravages through a district of 220 square miles, and the State of Massachusetts has expended $775,000 in the effort to exterminate it.

The pernicious scale insect was first noticed in the San Jose Valley, California. It has now located itself in spots from Florida to Canada, and from Washington to New Jersey. Its wide and rapid spread is owing to the fact that it has been 'shipped' with fruit and with nursery stock in all directions, It infests deciduous fruit trees, and, unless prompt measures are taken, an orchard attacked by it will be completely destroyed in a very few years. Our Canadian Department of Agriculture has taken the alarm, and posters, drawn up by Dr. Fletcher have been widely distributed to draw the attention of fruit-growers to the danger.

But Entomology has not only to deal with insects, more or less obnoxious to man; it brings to our notice the beneficial labors of hundreds of other kinds. It holds up to our admiration the marvellous beauty with which the Creator has gifted many of his lesser creatures, and it brings home to us the teaching that "His tender mercies are over all His works." As it is in grace, so it is in nature, "He that seeketh findeth." The works of the Lord are great, *sought out* by all them that have pleasure therein.

Report of the Council In presenting this, the first annual report of the Quebec branch of the Entomological Society of Ontario, your Council finds that the branch, although not eleven months in existence, has succeded very well in the objects for which it was instituted, viz.: the inculcating and promoting a lively interest in entomology, the collection and classifying of specimens, and bringing the members together in social intercourse, through entomological excursions, lectures and gatherings at each other's houses.

Our membership is now twenty-six, viz.: eighteen adults and eight juniors. We have grounds for hope that, during the present year, it will be largely increased.

Meetings have been held monthly, with exception of the midsummer months, in Convocation Hall of Morrin College, by kind permission of the College authorities, for which courtesy our sincere thanks are due.

Papers have been read and lectures illustrated by diagrams, delivered in the same Hall, which have been numerously attended. Instruction has also been given as to the killing, mounting and preserving of specimens, which has been much availed of; and we are glad to see it, especially amongst our Junior members. Several nicely-mounted specimens, taken during the summer campaign by members of our branch, have been shewn at our meetings and evince keen interest in the study of entomology on the part of almost all.

Papers have been read and lectures given on land beetles, two winged flies, flesh flies, mycetophylidæ (mushroom flies), bombilidæ, parasites, especially those infesting cattle, horses and sheep, and the best means of their extermination (most useful information to the farmer and grazier), as well as the tiger moths—Arctiidæ—Colias interior, etc. The caterpillars have not been forgotten and our "woolly-bear" friend, "Phragmatobia rubricosa," as he sturdily scampers over the snowdrift, lets us know that life is by no means lacking in even the smaller things of creation during a Canadian winter, for he early shows himself, a harbinger of spring.

The want of a proper cabinet for the conservation of insects arose, and through the kindness of a few of the members and friends of the Association, a very handsome one has been obtained, which is placed in Morrin College, and has already received its first instalment of insects.

Before closing what must necessarily be but a brief report, owing to the short time since the organization of the branch, we must call your attention to an item very interesting to our hive of workers, viz: the treasurer's report, which shows that, after remitting to the parent society the necessary honorarium and paying expenses, we have, out of our subscription list, a balance in hand of $6.70.

Joseph Eveleigh Treffry,
Secretary.

The officers elected for 1898 were:

President—Rev. Thomas W. Fyles; *Vice-President*—Miss Macdonald; *Council*—Hon. Richard Turner, Mr. J. Eveleigh Treffry, Prof. H. Walters, Mrs. R. Turner, Miss Bickell, Miss B. Winfield; *Secretary-Treasurer*—Lt.-Col. Crawford Lindsay; *Curator*—Professor H. Walters.

Since the annual meeting in February the branch has held four regular meetings, and five field-days. On the latter occasions very happy excursions to the Gomin, the Island of Orleans (twice), and Beauport were made.

The branch now numbers twenty-eight adult members and fourteen junior.

CRAWFORD LINDSAY,
Secretary-Treasurer.

QUEBEC, Nov. 5th, 1898.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

Having the honor to represent the Entomological Society of Ontario, I beg leave to submit the following report of its work and proceedings during the past year.

The Society still maintains its former position as to its increasing membership. Its Branches are doing good work, and have given a very considerable impetus to the study of insect life. The Toronto Branch having been inaugurated, commenced its life with the New Year, and later a Branch was formed in Quebec, under the most favorable auspices. The Library has been augmented by an unusually large number of additional volumes, numbering no less than eighty-eight; the total number on the register now being 1,506. Important additions were also made to the Society's collections of insects.

"The Canadian Entomologist," the official organ of the Society, maintains its prestige among its class of literature. The twenty ninth volume of 306 pages was issued during the past year (1897), its contributors numbering forty-four, of whom thirty reside in the United States of America, one in Mexico, one in Germany, and the remaining twelve in Canada. These contributed seventy-six articles, in which were described twenty new genera, one new subgenus, ninety-one new species, and six new varieties.

The following are a few of the more important papers above referred to, viz.:

On the Mexican Bees of the genus Augochlora.—By T. D. A. Cockerell.

The Coleoptera of Canada.—By Prof. H. F. Wickham. Continued through nine numbers, and being also a continuation of a series of articles on the same subject which have appeared during the past three years, making an extremely useful compilation for students in Canadian Coleoptera.

A Generic Revision of the Hypogymnidae (Liparidae)—By Harrison G. Dyar.

Catalogue of the Phytophagous and Parasitic Hymenoptera of Vancouver Island—By W. Hague Harrington, F.R.C.S.

Some new species and varieties of Lepidoptera from the Western U S.—By Wm. Barnes, M.D.

Descriptions of some new Genera and species of Canadian Proctotrypidæ—By Wm. H. Ashmead.

Synonymical and descriptive notes on North American Orthoptera—By Samuel H. Scudder.

On rearing Dragon Flies—By James G. Needham.

Contribution to the knowledge of North American Syrphidae—By W. D. Hunter.

Preliminary Studies of North American Gomphinæ.—By Jas. G. Needham.

A Generic Revision of the Hypocritidae—By Harrison G. Dyar, Ph.D.

Notes on the Life History of Colias Interior (Scud)—By H. H. Lyman.

The Life History of Epirranthis Obfirmaria, Hbn.—By Rev. Thos. W. Fyles.

Notes on Grapta Interrogationis Fabr.—By H. H. Lyman and A. F. Winn.

Also there appears a number of book notices, correspondence, etc., etc.

The thirty-fifth annual meeting of the Society was held in its new room in the Young Men's Christian Association Building in London on Tuesday and Wednesday, October 12th and 13th, 1897.

The annual report published by the Society to the Department of Agriculture of the Province of Ontario consists of 104 pages, in which is contained a full report of the proceedings of the annual meeting above mentioned, together with the annual address of its President. (The reports and papers contained therein were here enumerated.

JOHN D. EVANS,
Delegate.

REPORT OF THE TREASURER FOR THE YEAR ENDING 31ST AUGUST 1898.

Receipts.		Expenditure.	
Balance on hand September 1st, 1897	$ 575 52	Printing	$ 597 85
Members' fees	335 13	Report and meeting expenses	214 00
Sales of Entomologist	196 46	Library	35 92
Sales of pins, cork, etc	74 06	Expense account, postage, etc.	133 49
Government grant	1,000 00	Rent	175 00
Advertisements	26 50	Salaries	300 00
Interest	23 87	Pins, cork, etc	36 03
		Balance on hand August 31st, 1898	739 25
	$2,231 54		$2,231 54

We, the auditors of the Entomological Society of Ontario, hereby certify that we have examined the books and vouchers of the treasurer and find them well kept and correct and that the above statement is in accordance with the accounts.

W. H. HAMILTON, JAS. H. BOWMAN, } Auditors.

STATEMENT OF RECEIPTS AND EXPENDITURE FROM SEPTEMBER 1ST, 1898, TO 31ST DECEMBER, 1898.

Receipts.		Expenditure.	
Balance on hand September 1st, 1898	$ 739 25	Printing	$ 206 45
Members' fees	86 90	Report and meeting expenses	155 73
Sales of Entomologist	15 47	Library	22 51
Sales of pins, cork, etc	11 58	Expense account, postage, etc.	22 53
Advertisements	7 00	Rent	100 00
Interest	13 80	Salaries	50 00
		Pins, cork, etc	9 44
		Balance on hand 31st December, 1898	307 34
	$874 00		$874 00

J. BALKWILL, Treasurer.

THE PRESIDENT'S ANNUAL ADDRESS.

BY HENRY H. LYMAN, M.A., MONTREAL.

GENTLEMEN,—It is with much pleasure that I welcome you to the thirty-fifth annual meeting of our society, and especially is this pleasure enhanced by the fact that our meeting is held in this city in celebration of the twenty-fifth anniversary of the formation of the Montreal branch.

It is a subject for much congratulation that our society, which started from such small beginnings, has grown to such a large number of members, with associate members all over the world, and that its monthly journal takes so high a place in the field of entomological periodicals. But I think that we in Montreal have some reason to be proud of the fact that we are the third oldest entomological association on this continent, and, without any monetary grant or assistance from Government, have been able to keep our meetings up with great regularity through a quarter of a century.

Two hundred and seventeen meetings have been held, and over 200 original papers have been read by our members, and about 80 of these have been published.

But, to turn to matters of more general interest, when an amateur entomologist, with extremely little leisure to devote to this science, has the honor, or perhaps I should say the misfortune, to be elected to the distinguished position of president of so important a society, the question what he is to do for an annual presidential address becomes at once a serious bugbear.

We amateurs have to take our science in so scrappy a fashion, in such small mouthfuls, that it is generally impossible for us to follow out any continuous line of investigation or experiment, and our work is of too fragmentary a nature to afford material for an important address. True, by reading and study, we might familiarize ourselves sufficiently with the work which has been done in some particular line by other entomologists to enable us to give a fairly accurate review of such subjects, but that seems hardly desirable, unless one can add something of interest from one's own observations.

Many of my predecessors in this office have devoted much of their addresses to a review of the principal injurious insects of the year, but I feel that this subject can be so much better handled by those who are by profession economic entomologists that I prefer to leave that task to them.

It has occurred to me that there are many subjects, some of them small in themselves, perhaps, but which for all that are not without their interest, and I have therefore determined to invite your attention to a sort of entomological omnium gatherum or olla podrida.

But before taking up any of these subjects, it is my painful duty to refer to the sad event which so early in the season, and in the maturity of his powers, deprived our society of our highly respected vice-president. Prof. Panton was elected at the last annual meeting, though unable to attend on account of illness, but I do not think that any one at that time anticipated a fatal termination, and I, certainly, looked forward with pleasure to meeting him at this annual meeting.

But the greatest loss to entomology in America, using the latter term in a wider sense than our neighbors generally use it, which has occurred during the year was unquestionably that sustained in the death of Dr. George H. Horn, who since the death of Dr. J. L. Leconte has been facile princeps among American coleopterists.

By the death of Dr. J. A. Lintner, American economic entomology has suffered a great loss, and I am sure his memory will be cherished by all who had the privilege of his acquaintance. He was a very able entomologist and a kindly, unassuming gentleman.

Among other losses by death especial mention should be made of Prof Kellicott, of the Ohio State University, but whom I had not the privilege of knowing.

But to turn to less mournful subjects: If I were asked to state what I consider the chief characteristic of entomologists, I think I should say their patience. Surely a man deficient in this virtue would not continue long in the pursuit of this science. Are we ever thoroughly discouraged? Does not hope spring ever fresh in our hearts? We may secure the eggs of a species whose life history we are anxious to enravel, and after carrying the larvæ nearly through, and just when success seems about to reward our patient care, a mysterious disease may sweep the whole brood away, and yet we only say, "I must try it again; better luck next time."

When I think of the myriads of species whose life histories are waiting to be unravelled, of the comparatively few who are engaged in this work, of the few life histories which we can work out in a single season, and of the very few seasons we have in which to do this work, I am inclined to think that the way we go at this task is almost sublime.

But this reflection leads me to what is perhaps a delicate question, and that is—Would it not be better if some of our friends, when working out these life histories, would give less time to debating as to more generalized and more specialized forms?

Surely it will not be contended that a more specialized form is necessarily higher than a more generalized one? There is evolution downwards as well as upwards, specialization towards degradation as well as towards advancement.

I confess that when I find able entomologists laying such great stress upon such minutiæ as one vein being slightly more appressed to another vein in one genus than in some other genus, or the presence or absence of some minute veinlet, when it is admitted that even individuals of the same species show variations in these matters, which fact has to be accounted for on the convenient doctrine of reversion, or when it is proposed to classify families as higher or lower chiefly upon the single characteristic of having or not having the fore pair of legs aborted, my share of the patience to which I have alluded tends to wear thin.

While not a champion of the New Woman, I certainly believe in the doctrine of the equality of the sexes in the case of the Lycænidæ, and protest strongly against any attempt on the part of the gentleman Lycænid to lord it over his spouse on account of his aborted fore legs. The bear has a plantigrade foot, and the domestic fowl is a biped, but it is hardly probable that these facts would lead any systematist to place these animals next to man in the order of classification. We shall never have a natural, and therefore scientific and satisfactory classification of these creatures until we know them in all their stages, when our classification will be based upon the sum of their characteristics.

There is one word which I would like to say to our professional friends, and that is, that I think they might show a little more consideration for the amateurs in the way of giving the reasons for any necessary changes of name. Amateurs have neither the time nor the opportunity to keep up in detail with the tremendous output of entomological literature, and when one takes up a number of a journal containing an instalment of a "revision" of some group, and finds that some well-known name has entirely disappeared, and after a protracted hunt finds, let me say, such an old acquaintance as *Euchætes Collaris*, Fitch, disguised under the name of Cycnia Tenera, Hübner, and this without a word of explanation of this wonderful discovery, one can hardly be blamed for exclaiming "A plague on all your revisions."

In entomology, as no doubt in other branches of natural science, some men are lumpers and others are splitters. To the latter I would say that the describing of new species should certainly not be done on the chance of their proving distinct, and to the former that once a form has been described as a new species it should not be lumped except upon overwhelmning proof. As an example of most unwarrantable lumping may be instanced the case of *Euchætes Collaris*, Fitch, which on the authority of some wise-acre was known for many years as "the common white variety of *Euchætes Egle*," because, forsooth, entomologists were too lazy or too stupid to secure the eggs and rear the species.

But I find a very curious tendency in many men to be both lumpers and splitters, lumpers in dealing with the work of others, but splitters in their own work.

A man takes up some group with the view of monographing it, gathers specimens from far and near, inspects all the types to which he can gain access, and finally announces that what have passed for half-a-dozen distinct species are merely slight local varieties of one world-pervading species.

Now this may be all right, though I think that such lumping might, perhaps, better be deferred till the forms in question had been bred through all their stages. But look what follows: among the material gathered together he finds one specimen slightly different from any of the named forms, and two other specimens which agreeing together differ slightly in some other direction, and upon these three specimens two new species are founded, although the divergence does not appear to be greater than in the case of the forms which he has just lumped; and thus we have a patent lumper and splitter combined.

What I have already said of the difficulty, especially for amateurs, of keeping up with the literature of the subject leads me to suggest that it would be a great assistance if an annual list of all the new genera and species of North American insects, with the references as to where described, were published in the January number of the "Canadian Entomologist," and I feel sure that our journal would thereby become of greatly enhanced value to all working entomologists.

The insufficient indexing of some publications is a frequent source of vexation and loss of time, and adds materially to the difficulty of those who need to refer to articles some time after their publication. If the index of every journal were begun with the issue of the first number, each article being cross indexed as soon as issued, the work would not be heavy, and when the last number was in type a thoroughly satisfactory index could be completed in a very short time. The late Dr. Lintner placed a very high value upon a thoroughly complete index, and spared no pains to make the indexes of his Reports as perfect as it was possible to make them.

From 1868 to 1873 inclusive we had an Annual Record of American Entomology, edited by Dr. Packard, with a number of leading authorities in the different orders as associate editors. It was a very useful work, and it is, I think, much to be desired that we should have some sort of an annual index of American Entomology. The difficulties in its way are, I know, very great, but if it were possible for it to be undertaken by the Division of Entomology of the Department of Agriculture at Washington, it would be a great assistance to all the working entomologists of the continent.

Another point of great importance is the care of important collections, and especially the preservation and accessibility of types. It is not reasonable for any one to expect types to be lent for study as the risk of loss or damage is too great, but they should certainly be accessible to those who visit for this purpose the museums or private collections where these types are preserved. It is certainly disappointing when one has made an expensive journey for the purpose of examining a collection, or studying certain types, to find that one's journey is wholly or partly in vain, either through the caprice of a museum curator, or through the collection being in too crowded a condition to permit of an examination being made with safety.

To any one who augments his collection by either exchange or purchase, the different styles of pinning and spreading specimens of Lepidoptera are matters of serious concern, as one generally has to reset all specimens so obtained, unless one is willing to have one's specimens at all sorts of heights, and spread in all sorts of ways. The late Mr. Morrison, who collected so extensively for his patrons, used to insert his pins so that there was frequently very little more than a quarter of an inch above the thorax, and as he used very small sized pins, which bent easily, it was very difficult to handle the specimens without knocking off the antennae.

It was a great step in advance when all the principal makers of microscopes were induced to accept the Microscopical Society's screw, as any objective could be used on any stand. Is it too much to hope for, that entomologists on this continent should adopt a standard length of pin, and a standard height at which to place the specimen on the pin, a standard spreading board for Lepidoptera and a standard style of setting? And this brings me to the most important suggestion which I desire to make, and that is, that North American entomologists might with advantage follow the example of the ornithologists and form a "Union" with a limited number of full members, and an unlimited number of associate members, the full members to be chosen from the leading entomologists of the continent, but associate membership to be open to every entomologist.

The American Ornithologists' Union has been a marked success, and I see no reason why a similar union should not work equally well among entomologists. There are many subjects with which such a union might deal, and if its decisions were generally accepted, as I have no doubt they would be, I am sure it would do a great deal to harmonize the work in this branch of science.

To mention a very few of the things which might be dealt with in addition to those which I have already mentioned I may suggest the capitalization or otherwise of specific names, the nomenclature or numbering of the veins in the wings, the designation of the various segments of larvæ, as well as all the questions in regard to nomenclature. If it be objected that ornithology is practically one subject, while entomology is a whole collection of subjects, I answer, "True, but the same principles apply to all the branches." Take the case of the capitalizing or otherwise of specific names. Some capitalize all specific names, as Mr. W. H. Edwards, with whom on this point I entirely agree, others use capitals for names derived from persons and small letters in other cases; others, and I am afraid the large majority, use the lower case letter in all cases. Would it not, however, be better in such a matter as this to waive our personal predilections and for the sake of uniformity accept an authoritative ruling by such an organization as I have suggested.

With regard to venation the question of uniform designation is of much greater importance, as it is impossible for an amateur to familiarize himself with all the systems in vogue, and hence many generic descriptions or articles on structure are quite unintelligible to many readers. The old system of named veins and veinlets or nerves and nervures seems certainly preferable to me to the confused systems of numbering now in use by different authors, and surely this is a matter which could very profitably be settled by such a body, while in the realm of general nomenclature the field is so vast that the Union would have abundant material for business at its annual meetings for many years to come.

Another point in the same connection may be mentioned, and that is in regard to the official organ of such an association. There have been at different times so many different entomological journals started and carried on for a few years only to die out again. There are many entomologists who cannot afford to subscribe to more than one journal, and it might be better if instead of so many journals with small circulations competing for subscriptions there were fewer in the field, but those more generally subscribed to.

But lest I weary you with suggestions which may be regarded as savouring of presumption in an amateur, I would now invite your attention to a rapid glance at a portion of the work which is being carried on by some of the leading entomologists of the continent. While, as I said, I prefer to leave to others who are so infinitely better qualified the task of giving a review of the insect depredations of the year, I can hardly avoid referring somewhat briefly to some of those which have attracted the widest attention.

As Canadians we are naturally especially interested in the work which our own official entomologist is engaged in. Dr. Fletcher is certainly untiring in his work, travelling about the country from the Atlantic to the Pacific to attend meetings of farmers, fruit growers and dairymen, for the purpose of interesting and instructing them in the importance of economic entomology, and in regard to the economic value of particular grasses, and the people are thus being brought to see that the aim of the experimental farms is not the providing of handsome residences in a charming locality for a certain number of scientific gentlemen, but that there is a very real money value to the agricultural interests of the country in the work and investigations which are being carried on there. But naturally from the large sums annually devoted by the Central Government at Washington and the various States to the prosecution of economic entomology by a large and highly trained force of entomologists, the work in that country must necessarily overshadow what we are doing in Canada, though I think it is also undoubtedly a fact that from our more northern latitude we are much less subject to insect depredations of a devastating character.

The attack which in recent years has caused the most widespread alarm on account of the serious nature of the damage likely to result from it is unquestionably that of the San José Scale. This most injurious insect appeared in California late in the seventies, was brought east on nursery stock to New Jersey in 1887 or 1888 and had by 1893, when its presence in the Eastern States was discovered by Dr. Howard, spread through portions of almost every one of the Eastern and Middle States causing the death of thousands of trees before its presence became known. Naturally it soon became a subject of discussion at all meetings of agriculturists and entomologists and has been the subject of legislation by sixteen of the States.

From this very necessary publicity it was naturally to be expected that other countries would take alarm and endeavor to protect their agricultural interests from so great a danger. The first country to do so was Germany, the German Emperor issuing a decree on the 5th February last prohibiting the importation of fruits and plants from America, which prohibition was subsequently restricted to living plants and fresh fruits which might be found to be affected by living scale.

Following shortly after the action of Germany came the passing by our Canadian Parliament of the San José Scale Act on the 18th March last, by which Act it was provided that nursery stock should be excluded when imported from such infected countries as might be designated by the Governor-General in Council, and the United States, Australia, Japan and the Hawaiian Islands were immediately so designated, the plants not subject to the attack of the Scale being exempted from the operation of the Act.

A month later the Government of Austria-Hungary issued a decree barring out living plants, grafts and layers, as well as the packings and coverings, but not excluding fruit except such as might upon examination be found to be infected. Following this the Government of the Netherlands sent an expert to the United States to investigate and report, and Sweden also sent an expert partly for the purpose of making a similar investigation.

The Legislature of Ontario has passed a law for the destruction of badly infested trees and providing reasonable compensation for loss so incurred, while in the United States a bill governing inter state commerce in nursery stock and providing for quarantine in the principal ports of the country was reported favourably upon by the Committee on Agriculture at the last session of Congress and will doubtless become law at an early date.

In this connection attention may be directed to the obvious limitations of the use of natural enemies of insect pests, the attempted introduction of Californian beetles into New Jersey in the hope of their multiplying and checking the San José scale having proved a failure, as has also the attempt to infect the scales with a parasitic fungus from Florida.

The present year has been an important periodical cicada year, the broods occurring this year being the brood XVII. of the Septendecim race and brood VII. of the Tredecim race. In this connection especial attention should be called to the very important pamphlet upon this subject prepared by Mr. C. L. Marlatt, First Assistant Entomologist at Washington, and issued as Bulletin No 14 of the new series of the U. S. Department of Agriculture. This paper extending to 148 pages copiously illustrated, is certainly the most important contribution which has yet been made to our knowledge of this wonderful and interesting insect.

Last winter, the Legislature of Massachusetts appropriated $200,000.00, the full amount asked for, to continue the work of exterminating the Gypsy Moth, and as a consequence very remarkable progress has been made in this work during the past season, and it now seems probable that if similarly liberal appropriations are continued for several years longer this important, but tedious, work will be crowned with success. The work of destroying the Brown-tail Moth has also been intrusted to the same force and is being carried on in connection with the Gypsy Moth work.

Other work in Economic Entomology which may be referred to is the progress made by the Division of Entomology at Washington in the accumulation of data concerning the distribution of injurious insects in the United States.

Mr. Pergande, in furtherance of his investigations of the Lecanium scales affecting the fruit trees, spent the summer in Europe and collected large material.

In the early spring, Dr. Howard visited Mexico to investigate the possibilities of preventing the introduction of the Morelos Orange Fruit Worm into California.

Mr. R. A. Cooley, an assistant to Prof. Fernald, has been at work upon the genus Chionaspis and has accumulated an enormous amount of material, and it is anticipated that his paper, when published, will give more than twice the number of species formerly known.

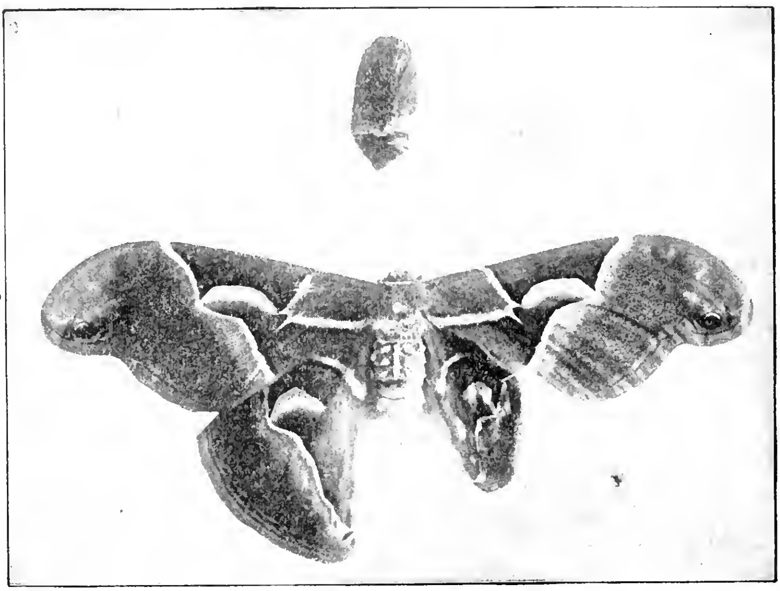


Fig. A. Operation of the first category. A compound pupa and a compound moth of P. Cynthia.

But while the economic side of the science is that which is of chief interest and importance to the community, I confess that my own interests lie rather in the direction of the purely scientific side of the subject.

From this point of view the experiments of Mr. Henry E Crampton, Jr., of the Department of Zoology of Columbia University, are of surpassing interest.

Mr. Crampton, following up the experiments of Mr. G. Born upon frog and toad embryos, determined to try similar experiments in grafting upon Lepidoptera in the pupal period and has obtained some truly marvellous results Mr. Crampton selected the pupæ of the large Saturnians, Cynthia, Cecropia, Promethea and Polyphemus as being the most suitable, though he also experimented with success upon Vanessa Antiopa, but had no success in his operations upon Danais Archippus.

The butterflies are not so well suited to these experiments as these large moths, partly because of their status being higher than that of the moths, and in the case of those which winter either in the larval or imago state, the chrysalis period is too short.

Naturally, failure resulted in a good many cases, the average of successful operations amounting to about ten per cent.

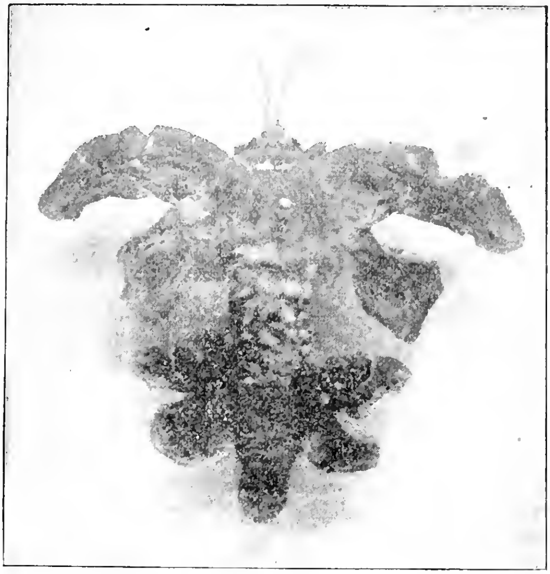


Fig. B. Operation of the second category. Union in "Tandem" of P. Cynthia, anterior, and C. Promethea, posterior.

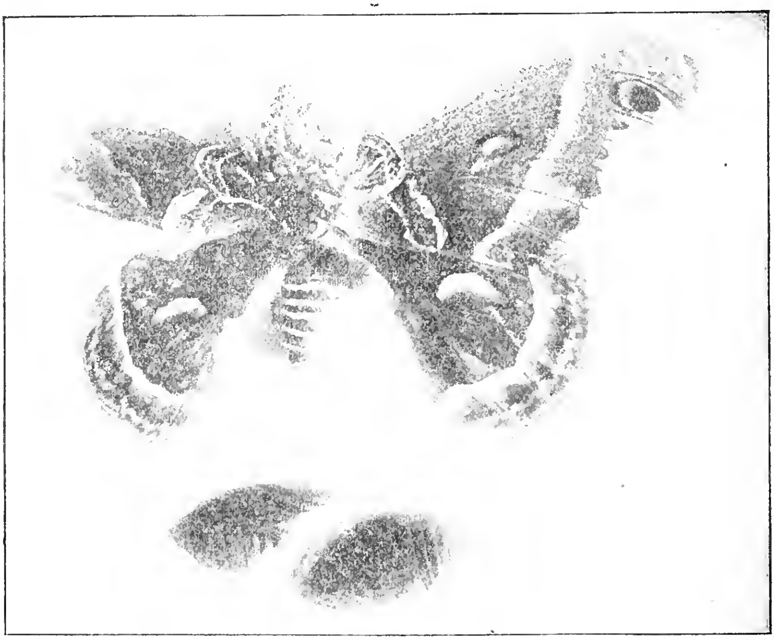
The operations were of great variety, the anterior end of one pupa being joined to the posterior end of another either of the same or of a different species, or they were joined in tandems or in pairs back to back, while in one case the tip of the abdomen of one moth was grafted to the upper side of the abdomen of another. One pupa had had its head cut off and was still alive and the abdomens of some were cut off about the middle to see if any regeneration would take place. No cases have been successful where the division has been made longitudinally through the centre of the pupæ, and the nearer this line is approached the fewer there are which are successful, and conversely the less that is taken off the more likely are the subjects to survive.

The modus operandi is to slice the pupæ with a razor and effect the junctions with melted paraffin. The paraffin ring cannot be removed, as the coalescence is only effected between the interior portions, the two portions of the pupa case never uniting. The paraffin ring naturally tends to prevent the imagos emerging and they have to be helped out when they seem, from the papery condition of the pupa case, to be ready for emergence, the case being picked off bit by bit.

In general, the wings fail to expand and as a consequence the abdomen remains distended by the hæmolymph. In some cases the wings, or a majority of them, expand very well, one, perhaps, being aborted. In the case of a tandem junction, the anterior one may expand and the posterior one not. In such a case the former had only lost the tip of its abdomen, while the lower one had lost its head. In one case where two portions of pupæ were joined laterally, one eye in one part had coalesced with the neighbouring one in the other part to form a common eye. As a rule, the operations greatly retarded the development of the specimens.

Fig. C. Operation of the third category. United pupæ and united imagines of S. Cecropia.

One of the objects of these experiments was to see what effect, if any, the unions would have on the colours of the resulting moths, but the results were rather negative, as nothing very definite was obtained.



ig. D. Operation of the third category. United pupæ and united imagines S. ecropia

Another object was to ascertain if it would be possible to breed from such monstrosities, but though some individuals had shown symptoms of desiring sexual connection, no union had ever taken place, and so no eggs had been obtained, and as these operations must greatly lower the vitality of the subjects, it seems very improbable that any attempts at breeding from these monstrosities could ever be successful*.

Another man who is doing good work, though in a much less startling field, is Dr. Otto Seifert of New York, in his experiments with heat and cold applied to the pupæ of butterflies and moths. Following up the work of Dorfmeister, Weismann, Edwards, Stange, Merrifield, Standfuss, and Eimer he has made extensive experiments upon a considerable number of species.

Pyrameis Atalanta, which seems very susceptible to these influences, Papilio Asterias, P. Turnus, Colias Philodice, Grapta Interrogationis, Melitæa Phaeton, Danais Archippus, Limenitis Disippus, Vanessa Antiopa, Junonia Coenia, Arctia Arge, A. Nais, Philosamia Cynthia, and Samia Cecropia have all been experimented upon with more or less success.

The operations were carried on by means of an incubator and an ice chest, the temperature in the former being maintained as nearly as possible at 38° C. equal to 100° F. while in the latter it varied between 4° C. and 6° C. equal to 39° F. and 43° F.

In summarizing his results Dr. Seifert informs me that the effect seemed to depend more upon the susceptibility of the individual than upon the length of the exposure to these artificial conditions, as in some cases chrysalides kept ten days on ice produced more aberrant forms than resulted from others kept for thirty days on ice.

Cold and heat did not always have opposite effects in some particulars, as for instance Limenitis Disippus exposed to heat was deepened in colour along the costa to the middle of the wing, the mesial band of secondaries narrowing or being omitted altogether. Subjected to cold the colour was turned darker also but in a different way, the darker tone being chiefly produced by many black scales along the veins, and the mesial band on secondaries being more marked.

While heat in general tends to produce a more marked or defined design, when accompanied by an excess of moisture Dr. Seifert found a tendency to almost destroy the colour but never to affect the design.

Heat and cold were also found to affect the shape of the wings, in some cases the apex of primaries becoming more pointed, while in P. Turnus and G. Interrogationis cold caused a remarkable development of the scallops and dentations of the wings.

Cold changed the rounded secondaries of Junonia Coenia to a form more elongated towards the anal angle, while heat shapes the wings of Limenitis Disippus nearly to those of Danais Archippus.

Pyrameis Atalanta was affected in the most interesting manner by cold, the red transverse band on primaries above being broken up into four spots while below the secondaries are much changed in appearance, the buff tone of the lower two-thirds of the outer margin being greatly strengthened and spread inwards, while a violet bloom tends to spread over the wing.

In Arctia Arge the prominent black spots on the abdomen vanish entirely or are much diminished by heat, and the black marks on primaries are also reduced.

By cold the black spots on the abdomen are enlarged, sometimes in the female becoming transverse bands, while on the secondaries blackish streaks originating from the base spread outwards towards the margin.

Dr. Seifert also experimented upon eggs but could only find that heat hastened development while cold retarded it. Eggs of Colias Philodice exposed to a temperature of

*The cuts illustrative of these experiments have been copied from those in "Biological Lectures," published by Messrs. Ginn & Co., of Boston, by the kind permission of Mr. Crampton, who delivered the 11th lecture at the Marine Biological Laboratory of Wood's Holl in the summer session of 1897.

100° F. hatched in 36 hours, while cold if not carried too far, 8-10 days, merely retarded the hatching, but eggs of A. Luna exposed to cold for 20 days were all killed.

The chief point which Dr. Seifert is seeking to elucidate is whether the variations obtained can be transmitted to the offspring and become hereditary. This field of investigation, while much less startling than that in which Mr. Crampton is working, certainly seems likely to prove more fruitful.

Among the most important publications on the Lepidoptera of North America which have appeared during the year must be mentioned Prof. Fernald's monograph of the Pterophoridæ, with its sixty-two pages of text and nine plates devoted altogether to structural details, which work has been accorded the highest praise by those best able to judge of its merits.

Mr. Beutenmüller has laid us under a further debt of gratitude by the issue of his "Descriptive Catalogue of the Bombycine Moths found within Fifty Miles of New York City," which appeared last month. This is on the same plan as his previous catalogues of Butterflies and Sphingidæ, and extends to ninety-six pages, with nine excellent plates. One hundred and eighty-one species are described, of which ninety-three are illustrated, but from lack of space the author had to omit all generic descriptions. At present this work is only available to those having access to the "Bulletin of the Amerian Museum of Natural History," or are so fortunate as to receive a copy of the author's edition, but I am glad to be able to announce that Mr. Beutenmüller, on completion of the series, contemplates re-issuing the whole in book form, which will then be generally available.

Mr. Beutenmüller, in addition to carrying on this important work, is also engaged upon studying various genera of the Lepidoptera with a view to revision, and has recently issued a review of the genus Euchloë or Anthocharis, to be followed later by a paper on Argynnis.

Dr. Dyar has been carrying on his important studies on structure, especially of larvæ, and is engaged in conjunction with Dr. J. B Smith upon a monograph of Acronycta, and is also at work upon a new catalogue or check list which, it is promised, will render the Lepidoptera scarcely recognizable by those who have accustomed themselves to Dr. Smith's Check List of 1891.

Dr Ottolengui of New York has taken up the Plusia group and has gathered specimens of nearly, if not quite, all the known North American forms, and has secured either specimens closely agreeing with all types which he has not been able to see or, where this was impossible, carefully executed colored figures of such types. He is thus in a position to monograph the group, and has discovered some extraordinary errors which have been current for many years. If I may be pardoned for saying so, his work has been carried on on precisely similar lines to my study of the Callimorphas some years ago, namely, by finding out first what each author meant by his description, fixing the types absolutely, and then working from that basis, instead of taking things for granted and going by guesswork, and this, I contend, is the only true method.

In Coleoptera, as I am informed, the illness and death of Dr. Horn has produced almost a standstill.

In Hymenoptera valuable contributions have been made chiefly by Mr. Ashmead, aided by Dr. Howard, Mr. Marlatt and Dr. Dyar, the latter in Tenthrenid larvæ, and the growth of knowledge in this order has been almost phenomenal, while Dr. Smith has been engaged in most interesting work on the underground forms, the Digging Bees, by means of the plaster cast method.

In Diptera the works of Messrs, Coquillett and Johnson, especially the very important "Revision of the Tachinidæ" by the former, have added much to our knowledge, and it is encouraging to note the increase in the number of students in this order.

In Orthoptera the event of chief interest has been the issue of Dr. Scudder's most important "Revision of the Melanopli," a work which must have involved an immense amount of labor and research, extending as it does to over 400 pages, and illustrated by twenty-six plates. In connection with this order attention may be called to the interesting discovery that the large Mantid, Tenodera Sinensis, Saussure, from China and Japan, has been introduced into the United States and has been breeding for at least three years in the vicinity of Philadelphia.

In regard to Hemiptera, I have already referred at some length to the San José Scale and the work in connection therewith, but mention should also be made of Prof. Cockerell's pamphlet on the other scale insects closely allied to the San José Scale and liable to be confounded with it.

The completion early last year of Mr. W. H. Edwards's magnificent work on the Butterflies of North America, which was undertaken in 1868, caused something like a pang to those who for so many years had been receiving as they appeared the successive parts of this splendid work, and the hope has been expressed on many sides that the talented author might be willing to undertake the issue of a supplementary volume of, say, twenty-five plates, for which he has ample materials, provided one hundred subscribers at $1.00 per plate could be secured.

But if the closing of Mr. Edwards's labors produced a temporary lull in the issue of beautiful illustrations of our North American butterflies, we are now about to see issued a work which is surely destined to popularize the study of the Lepidoptera on this continent if anything can.

Dr. Holland, the talented Chancellor of the Western University of Pennsylvania, who has amassed an enormous collection of Lepidoptera, including that of Mr. Edwards with all that author's types, has undertaken the publication of a large edition of a popular book on the North American butterflies, to be called "The Butterfly Book, A Popular Guide to a Knowledge of the Butterflies of North America," and has authorized me to make the following announcement in regard to it:

It will be brought out, probably about the end of November, by the Doubleday & McClure Co. of New York,* and will be illustrated by forty-eight coloured plates done by the same system of photographic reproduction and printing which has become so familiar through the publication on Birds issued monthly by the Nature Study Publishing Co. of Chicago and New York. These plates will represent 526 species of diurnal lepidoptera, in many cases giving both the upper and under sides of the insect. The figures are, in the main, taken from the type specimens contained in the Edwards collection, and many of the species are represented for the first time, having never previously been figured. In addition to the representations given of the imago, Dr. Scudder has most kindly granted permission to reproduce the plates contained in his Butterflies of New England in which the early stages of these insects are represented. There are, furthermore, to be about 200 cuts in the text, representing anatomical details of structure which are useful in the determination of genera. A cut representing the neuration of each genus is given, and in some cases additional cuts showing the subgeneric forms. Brief descriptions of the imago, egg, caterpillar and chrysalis, when the latter are known, are given in the text. Interlarded in the somewhat dry technical details are extracts from the writings of other authors, which are calculated to interest the general reader, and quotations amusing and pathetic, gathered from out of the mass of butterfly lore.

All this is to be put before the American and Canadian public in good binding for the sum of $3.00, but it will be necessary to sell 7,000 copies of the book, unless a monetary loss is to result, but surely among the 70,000,000 of the United States and the 5,000,000 of Canada there should be no difficulty in disposing of 7,000 copies of such a book at such a price.

A fair idea of the character of the plates can be obtained from the rough proofs which Dr. Holland has sent to be shown at this meeting.

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* A Canadian edition has been published by Mr. William Briggs, 29-33 Richmond St. West, Toronto.

In regard to the publication "Birds," which title has recently been enlarged to "Birds and all Nature," and which has begun giving excellent illustrations of butterflies and mammals in addition to the plates of birds, it seems a great pity that with such beautiful plates it is not considered worth while attempting to make the text of some scientific value.

Another popular book under the name of "Every-Day Butterflies," from the facile pen of Dr. Scudder, is announced and will contain familiar and fully illustrated accounts of sixty or more of the commonest butterflies, taken in the order of the season.

In conclusion I have to express my indebtedness to Dr. Howard, Dr. Smith and Prof. Fernald for the kind manner in which they responded to my inquiries, and for the valuable information afforded and suggestions offered, which have materially contributed to any interest which my address may possess, and to you, gentlemen, my acknowledgments are due for the patience with which you have listened to me.

Dr. Fyles, in rising to move a vote of thanks to the President for his valuable and interesting paper, said that he approved of the address with one exception namely, that when so good a worker, so good a collector, read so good a paper as the address just given, he should not call himself an amateur. Dr. Wm. Saunders seconded the motion He had listened with great pleasure to the address, so full of admirable suggestions showing the keenest interest and deep insight into the needs of the active entomologist. He called attention to the many interesting statements of the investigation now progressing. *Carried.*

Mr. Lyman briefly acknowledged the vote, saying that as he was not a professional entomologist he must be an amateur.

Mr. W. E. Saunders, referred to the President's suggestion of the formation of an American Entomologists' Union, and spoke of the good work done by the American Ornithologists' Union, in preventing needless changes of nomenclature and in other important matters. Mr. A. E. Norris spoke on the importance of uniformity of setting, strongly approving the President's suggestion of a Union to authoritatively settle all such matters. He would favor the giving of greater attention by the societies to the working out and making complete exhibitions of the life histories of insects, as such exhibits are at once the most interesting and instructive.

A paper entitled "Some International features of Economic Entomology" by Prof. F. M. Webster, Wooster, Ohio, was then read by Dr. Fletcher.

SOME ECONOMIC FEATUES OF INTERNATIONAL ENTOMOLOGY.

By F. M. Webster.

When that massive ridge of Archæan rock, the backbone, so to speak, of the future American continent, was first laid down, stretching away from northwest to southeast, it is hardly to be supposed that it was cut in twain from east to west by some huge chasm, which, in future ages, was to separate from each other two distinct worlds of animal life, with no inter-communication between them.

Nor is it more likely that, after the ponderous ice sheets of the Glacial Period had plowed their way from the far north, crushing and grinding the solid rock and transporting huge boulders from the area that we are now pleased to term Canada, far to the southward, and depositing them along what is now the Ohio River, there should have been thrown athwart this pathway an invisible barrier across which animal life could not by any possibility make its way.

It was nature that hollowed out the beds of the great, turbulent lakes and furrowed out the course of gigantic Niagara, but it was uncivilized man who first chose to make these barriers between himself and his enemies ; and while civilized man has followed the example thus set for him, this is no part of nature's handiwork. Though the Cross of St. George may now proudly float from the one side, and the Stars and Stripes as proudly respond to the northern breezes from the other side; though there may be martialled, armed hosts on either side, the coats of one being red and the other blue, this is but following in the footsteps of the uncivilized aborigine, and not in the pathway of nature.

The feathered migrants of the air will, each recurring spring, make their way from the far south and rear their young in your woods and fields and along your inland lakes and streams, gathering their progeny together and making their way southward again in autumn, though a Queen might issue her edicts and a President promulgate his orders to the contrary. Again, the finny tribes of the sea and lakes seek their food and deposit their spawn wherever their inclinations and a favorable situation may tempt them, wholly unconscious of the tribulations that they bring upon the enthusiastic angler from the cities of the United States, who suddenly finds himself and his craft in the hands of British law in case he attempts to follow them. The moose, the wild deer, the wolf and the bear are no less free to go and come, roving northward or southward as their inclinations prompt them, totally ignorant of the terrors lurking in invisible, arbitrary lines and the questionings of custom house officers; for these are the belongings of men and not of nature.

In the light of what has been stated, then, it may be said that at present Canada and the United States are separated by an imaginary, arbitrary, political line, which we as subjects of two powerful nations are bound to respect in matters outside of natural science, but it seems to me that the naturalist must be permitted to demand that this condition is not allowed to extend farther. We are dealing with nature, and nature, as has been shown, knows no national lines. With us, as entomologists, the fact that we are all Americans must stand paramount to any other considerations. America is separated more or less widely from other portions of the world by depths of sea, which form a far more effective barrier to insect migrations than any that human minds can conceive or human hands erect. Unaided by man or his agents, but few insects could make their way from the eastern to the western hemisphere, or vice versa, though those neo-tropical might and probably have, unaided by man, spread from thence northward into the nearctic regions. Two illustrations of these last will suffice, one the Harlequin Cabbage Bug, *Murgantia histrionica* (Fig. 1), known to inhabit Central America and the West Indies, has lately pushed its way northward, in Ohio, to within twenty miles of Lake Erie, or to about Lat. 30° 15′ N., while the Chinch Bug, *Blissus leucopterus* (Fig. 2, highly magnified), in all probability originally a neo-tropical species, has, as you know, spread northward over a portion of the Dominion of Canada, and while it has not as yet been known to depredate upon your crops to any noticeable degree, yet it may do so in the future, in which case it may be expected to first make its presence known in your timothy meadows rather than in your grain fields, and quite likely will work considerable injury before it is recognized by your agriculturists. Another phase of this problem of insect migration is illustrated by the Colorado Potato Beetle, *Doryphora decemlineata*, which at one time was restricted to the country about the base of the Rocky Mountains, and its food-plant consisted of vegetation having no economic value. But now came the eastern emigrant farmer with his indispensable potato, a plant closely allied to the natural food-plant of this insect, and thus the potato patches of the settlers became as so many stepping-stones to the beetles and enabled them to make their way eastward to the Atlantic coast and Canada, transcontinental railways probably hastening their arrival, as they are shown to have appeared along the lines of railways earlier than elsewhere. So much for this aspect of the problem, but let us now turn our attention toward some other phases of a more international character.

Fig. 1.

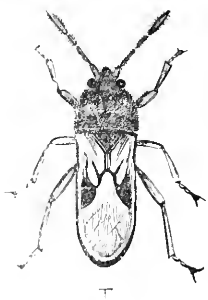

Fig. 2.

Many years ago, probably about 1856 or 1857, the Cabbage Butterfly, *Pieris rapæ* (Fig. 3), was introduced about Quebec, and possibly also again about 1891, since which time it has spread westward and southward until it now extends from the Atlantic to the Pacific and nearly to the Gulf of Mexico, even its numerous parasites not being able to entirely prevent its ravages. The Codling Moth, *Carpocapsa pomonella*, was in all probability first introduced into the United States, but Canada has as you all know sustained her full share of injury from its ravages. These two species have been brought to our shores from the mother country, and they are by no means the only ones that have been introduced from Europe or Palæarctic regions, and, I fear, those that we now have with us will not be the last to come this way. The latest and most serious introduction of all, the San Jose scale, *Aspidiotus perniciosus*, is in all probability another contribution from the Palæarctic region, as I have been able to prove almost conclusively that it came to us from Japan, and we therefore received it from the west instead of the east. Recent experiences are amply sufficient to show that it will destroy the orchards of Canada as well as those of the United States, within whose domains it first made its unwelcome appearance.

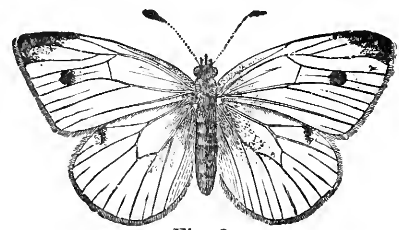

Fig. 3.

The foregoing illustrations will certainly be sufficient to convince anyone that we cannot by simple Legislative or Parliamentary enactment erect a Chinese wall, so to speak, that shall keep Canadian insects, whether native or introduced from making their way into the United States, or similar species escaping from the latter into Canada. We in the United States are more likely to import more insect pests than you, and, owing to our geographical situation, will suffer most from their depredations, but, put the matter as we will, we are much in the position of a large family threatened with an attack of some contagious disease; if one member contracts it all will be alike exposed, and to attempt prevention by individual isolation, will result in no end of trouble and aggravation without accomplishing the end desired, precisely as we have found our State laws to do. What we need, primarily, is an international quarantine measure that shall apply uniformly to all North America. A judicious, properly enforced measure that shall mean the same from the mouth of the St. Lawrence to the mouth of the Rio Grande, and from there to Vancouver or the mouth of the Yukon, and as far beyond as is found necessary. It is all very well for your Canadian law-makers to say that it is none of Canada's affair what is done in the United States, and our politicians will make the same plea, but we who are continually dealing with these problems of nature know better! We know that there is a power higher than that of our combined nations, that rules these natural elements, which power we cannot control, but, may oft'times utilize to our advantage. International entomology and international insect legislation are matters that we are being confronted with for the first time—matters of the future rather than of the past—but the next century will see them brought to the front. There will arise important questions which must be settled calmly, judiciously and justly, and entomologists must be ready to advise and counsel in these matters. The Entomological Society of Ontario ought and will have its influence in solving these international problems, as these come up one after another for solution and in accordance with nature's unyielding laws. I look for the time to come, and in the comparatively near future, when these matters will become far more important factors in international law than they are at present, as, indeed it seems impossible that the situation can be otherwise.

If we look about over the world at the present time, we find Cape Colony prohibiting the importation of all American nursery stock, whether from the United States or Canada. Several European nations have gone even farther and attempted to prohibit American green fruits from being brought within their respective domains. Queensland quarantines against New Zealand, South Australia against New South Wales, and Tasmanian fruit is condemned and destroyed in Melbourne; British Columbia destroys infested fruit from the United States as well as from other parts of British America, while

Canada prohibits the importation of nursery stock from the United States; at the same time several of these States have enacted laws which enforced to the letter would become quite prohibitory in their effects. The most of this trouble has come from the appearance of that pernicious little pest the San Jose Scale, *Aspidiotus perniciosus*, which we, in all probability, first received from the west.

Now, this method of dealing with the problem of insect control cannot be said to be all wrong, as some of it is quite necessary and proper, but there is certainly a great deal of misdirected effort being put forth and commerce is suffering therefrom to a considerable extent. It is the beginning of insect legislation, and first attempts at anything are usually more or less crude and capable of improvement. It is all right for Cape Colony to protect her growing fruit interests by keeping certain fruit pests out of South Africa, by prohibiting the importation of nursery stock, liable to infection, and keeping these Acts in force until such time as the pests have either become exterminated or some method discovered whereby the nursery stock can be effectually disinfected and rendered safe. If the Australasian Colonies had, years ago, united on a uniform code that would apply to all ports alike and admitted nursery stock and green fruits after an examination and disinfection, as has been done at the port of San Francisco, California, during the last few years, they would not now be contending against each other. If we in America had taken similar steps in the matter of insect legislation fifty years ago, we would in all probability have escaped much of the insect depredations of the present, as the major part of our seriously injurious species in this country are of foreign origin.

It is of course, too late, now, to prevent what has already been done, but it is not too late to take measures to prevent further importations from both east and west. In our efforts to suppress the insect pests that we already have with us, we are overlooking the greater problem of prevention of future similar introductions. We are laying altogether too much stress upon individual effort, as put forth by States, Colonies or Provinces against each other, and entirely losing sight of the international aspects of the problem. We cannot seem to diabuse our minds of the idea that political lines have something to do with the management of these natural organisms, and cannot apparently grasp the idea that natural barriers may be utilized by one or more nations acting in unity, and for the direct benefit of all thus acting. Sometime in the future, though neither you nor I may live to see it come to pass, these arbitrary, imaginary lines will, in problems of this sort, be lost sight of, and there will appear in their stead lines of another sort, far less imaginary and more natural, and these will encompass not one nation alone, but one or many as the case may be. We shall then designate these areas by a term now unknown, except to scientific ears, viz., Zoogeographical Regions, and while these may vary somewhat from the outlines laid down by Wallace, in his "Geographical Distribution of Animals," yet they will probably cover much the same areas as there indicated. There will probably continue to occur cases like that of the Colorado Potato Beetle, where a species may spread from one section of a Zoogeographical Region over, and become destructive in, many portions of the remainder, yet these phenomena are likely to occur but rarely. We may learn that the Almighty can make a better barrier, over or around which insects cannot make their way, than the wisest of men or the mightiest of nations. There are phenomena connected with the geographical distribution of insects for which we cannot, with our present knowledge, account. There are boundaries beyond which certain species do not make their way, though to the human eye and mind there are no obstructions in the way of their doing so. The science of applied entomology is yet in its infancy, and we have very much to learn even of our most common species of insects, but we can even now see the unnatural and impractical methods that we are trying to apply toward their control, as between one portion of the world and another. We try to erect legal barriers where none exist in nature, and ignore those which nature has provided. All of this, of course, applies to protection from future importations, and not to such as have already gained a foothold, these last being beyond the scope of my paper, as I have restricted it, and the management of these will depend largely upon the energy and care of the people inhabiting the territory over which such species are now distributed. There is, however, a very important phase of the problem of controlling these pests, already imported from foreign countries, and which will be discussed later on in my paper. While it has not been deemed best to discuss, in detail, legislative control of such destructive species as have already been colonized here in this country, and many of them widely diffused, yet their possible control in many cases at least, by the application of nature's own forces seems to me to constitute a very important feature of International Entomology.

Forms of both plants and animals, unaided by the influences of man, make their way over the face of the earth but slowly if at all, and it is probable that a species often becomes so influenced by the change that it loses its specific identity and takes on new characters, so that the specialist rechristens it and gives it another name. The result of all of this is that wherever a species makes its way, naturally, its enemies usually follow, or else while undergoing the process of adaptation, new enemies come to exert their influence. In other words, the difference between an artificial and a natural introduction is much the same as suddenly dumping an iceberg into a pond, as against allowing the same amount of water to make its way into the pond, from the same source, but through a small spring or brook. In the former case both equilibrium and temperature are disarranged, while in the latter the effect is too gradual to cause any radical changes.

The legitimate introduction of plant life from one country into another has come to be a matter of vast commercial importance, and, adding as it does to our health, comfort and pleasure, such introductions are in every way commendable. Accidental introductions may, however, not always prove so satisfactory. Now, all of this brings me to the second phase of the subject of International Entomology, viz., the intentional, if not indeed necessary, introduction of exotic insects in order to re-establish the equilibrium that has been upset by the importation of plant life, or, as is sometimes the case, to enable the plant introduced to become permanently established.

Of species of insects purposely introduced from one country into another, there are those whose products constitute articles of commerce, of which the honey bee and silk worm are well known illustrations. The importation of large quantities of the ova and imagines of two species of American aquatic hemiptera, *Corixa mercenaria*, Say, and *Notonecta americana*, Fabr., from Mexico, where they are used for human food, into England, where they are to be used as food for birds, game, fish, etc., is another illustration of a different feature of this commerce in insect life.

The relations of insect to plant life are, however, so various and intimate; and, because of their reaching out over the face of the globe for the fruits, grains and ornamental vegetation of other climes, men are finding themselves more and more driven to import insects foreign to their respective countries. In some instances it has been found impossible to permanently establish an exotic plant without insect assistance. We all remember how impossible it was to get the red clover plant established in New Zealand until humble bees were also imported to fertilize the bloom, as the plant is not one that will perpetuate itself indefinitely from the roots; and at present we in the United States are unable to grow the perfect Smyrna fig owing to a lack of the good offices of a little foreign insect, *Blastophaga pensens*, which actually represents the male element in its fertilization.

Lastly, we come to what appears to be the most important of all insect importations, viz., the introduction of foreign, carnivorous insects, whose office in their native country is to prey upon and destroy those that are destructive, which last we have unintentionally imported into this country on trees, plants and shrubs, or in the fruits and grains coming to us from these same countries. That is to say, when we find that we have introduced a destructive species of insect, we are to go to the native habitat of this and there secure its native insect enemies, and introduce these to hold the former in check, as they do at home.

Parasitism is nature's insecticide—one of the forces that is employed by nature to restore equilibrium, so to speak, among natural organisms in point of numerical strength. The observing entomologist may every year witness proof of this, for he will observe some species to increase very rapidly during a short time, and, knowing of their fecundity, will often be led to predict a serious outbreak. But at the opportune moment, Presto! a change! and the species that was but yesterday, as it were, literally swarming, is now reduced to a minimum, while the dead are everywhere thickly scattered about. Two instances of this sort have, the present year, come under my own observation. Early in May, the females of the grain aphis, *Siphonophora avenæ*, appeared on the growing wheat and were soon surrounded by their young. These insects were in a short time as plentiful as they usually are, at that season, in years of excessive abundance, and there seemed every indication of an outbreak of the pest. But now there appeared a little Braconid parasite, *Aphidius avenaphis*, and within ten days there were few living adults to be found, though the distended, brown bodies of those that had succumbed to their minute enemy were everywhere plentiful. It was as if a Mighty hand had been stretched forth accompanied by the command, Peace! be still. During August and early September there were great numbers of caterpillars of *Spilosoma virginica* (Fig. 4, *a* caterpillar, *b* chrysalis, *c* moth) and to a less degree of *Arctia acræa*, in Northern Ohio, and, if they had all developed moths, there would have been much injury caused by the caterpillars next year. But this was not to be, as by September 20th the dead and dying were hanging to weeds, grass and fences, in myriads, having been attacked and killed by a fungous enemy, probably *Empusa aulicæ*, Reich., and neither of these caterpillars will probably be at all abundant with us next year. The same phenomenon was noticed in Ohio six years ago.

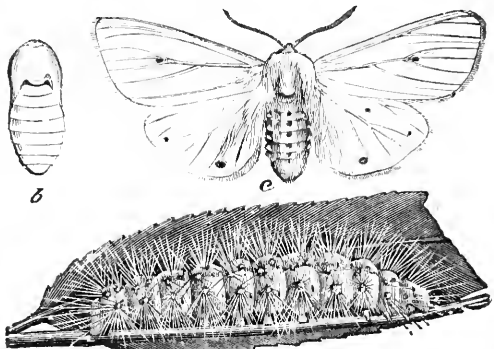

Fig. 4.

Scattered through our entomological literature, are hundreds of such illustrations of the value of parasites in holding in check the hordes of destructive insects that occur in this country, and there is hardly a working entomologist who cannot add to these from his own unpublished notes.

Of our most destructive insect pests nearly all have been brought to this country from abroad. Lack of their natural enemies here, together with the fact that, in many cases, these introduced pests are not known as such in their native homes, leads us to conclude that we, in our importations, have left these enemies behind. The case is much as though we were to import from some foreign country a huge piece of machinery, but on its arrival we find that the balance wheel has been omitted, and in such a case what are we to do? Cable back for the missing wheel, or attempt to run our machine without a balance wheel? There are, doubtless, instances where introduced species can not be subdued in this manner, by the importation of their ancient enemies, but, generally speaking, this appears to be the rational method of accomplishing this end. The history of the introduction of the Orange Scale, *Icerya Purchasi* (Fig. 5), from Australia into California, is probably familiar to most, if not all, of those present. The orange industry of the United States and, as was afterwards learned, of other countries also, was threatened with a most destructive enemy to citrus fruits. In California orange groves were being destroyed to such an extent that it looked as though the cultivation of this fruit would have to be abandoned. But a natural enemy of this pest was discovered in Australia and imported, artificially, into this country, and as a result the pest has been subdued, and with us, before it had spread beyond the Pacific coast. Not only this, but

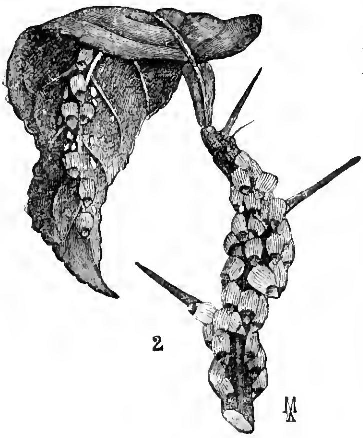

Fig. 5.

this natural enemy, one of the Coccinellidæ, has been sent wherever the Orange Scale ha been introduced and the effect has been the same as in this country. All of this has been an object lesson in the application of Nature's forces in overcoming the evil results of man's influences in the artificial diffusion of destructive insects. In North America and also in Australasia, men are at present wrestling with another important pest, allied to the Orange Scale, and introduced into California many years ago, but in this case probably from Japan. I refer again to the San José Scale, *Aspidiotus perniciosus*, which has, with us, spread over a vast range of country and already caused great losses. From all that I have been able to learn by observation of this pest, both in the orchards of the United States and on nursery stock immediately on its arrival from Japan, and also from the writings of others, it would appear that the natural enemies of this pest have been left in their native homes. Probably, as with the Orange Scale, these are Coccinellids whose habits are such that it would be impossible to get them in connection with their hosts at the time when the trees are packed for shipment to this country, as this is done at the season of the year when these insects have finished their development and abandoned the trees, if not wholly, remaining only in the adult state and would promptly desert the trees on being disturbed. If there had been important internal or fungous enemies we should certainly have gotten these with the host insect long ago. Now, it would certainly seem that in the introduction of Aspidiotus and its suppression we have a problem in applied international entomology, precisely like that presented by Icerya, and it would as certainly appear that, with our past experience, the very course of all others to pursue would be to learn what the natural enemies of this insect are in its native home and then introduce these as promptly and diffuse them as widely as possible, not only in one state or province, not in the United States or British America alone, but in North America.* It is Americans that are suffering from the ravages of this pest, where they are located, geographically or politically, does not matter in the least. International boundary lines cut no figure in this problem whatever, and have no more influence on these natural objects than they have on the winds. We should seek to introduce living organisms from the Palæarctic Life Region into the Nearctic Life Region, no matter what or how many nations may lay claim to the territory of either one or both of these regions. What we are really trying to do is to help natural selection to keep pace with artificial selection, and, if we accomplish anything in this direction, it will be by aiding nature and not in any sense by attempting to circumscribe her by imaginary lines of separation which have no existence in fact.

Now, lest I be misunderstood, let me say that true naturalists can only exist among loyal men and women. We must, all of us, be true to the nation that protects us by its wise and judicious legislation. Science stands for truth and right and honesty, and, for this very reason we must stop whenever and wherever these national lines cease to represent the truth, and be guided by others. In matters political, we must respect political lines, but in dealing with natural phenomena, we must abandon these and be guided by such as have been laid down by the hand of the Creator, who outranks either Queen, President or any other human potentate. Therefore, we must lose sight of national boundary lines and unite upon those laid down by nature. Here, in North America, there should be the closest relations between the United States Department of Agriculture and similar Departments of the various Provinces of British America, and absolute unity of action wherever this is possible. This quarantining of one State, Province or Nation against another may possibly do in cases of isolation, like New Zealand or Cuba, or as applied to some of the ills that we already have with us, but this sort of work will never protect in the sense that a combination certainly would, if we were to throw aside

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*Note—Since the above was written I have received the following from the Rev. H. Loomis, of Yokohama, Japan, which will be of interest in connection with this paper. "I see in the *Canadian Entomologist*, for July, an article in which you recommend that some one be sent to Japan to make a study of the enemies of the San José Scale. I think it a most excellent suggestion. There are many varieties of Lady Beetles here, and I am quite sure that it is due to them that the Scale is not more injurious in Japan. I am strengthened in this opinion because the Gypsy Moth is found all over Japan, and yet it is not especially harmful. This is entirely due to a parasite that feeds upon the larvæ so universally as to prevent its rapid increase. I have watched the results with great interest and would recommend that both insects be made a matter of careful study."

arbitrary lines and unite on others laid down by nature. This is a phase of international entomology that will sooner or later be thrust upon us by the necessities of international commerce in articles that harbor injurious insects. We must have broader measures of protection than we have had in the past. We must take necessary precautions against the introduction of injurious species, and, after the most thorough and searching investigations, introduce the beneficial species. In all of these matters, Canada and the United States are one, and, this being true, there must be no lines of separation between the entomologists of these two countries. We must work together, shoulder to shoulder, and God speed the day when we shall do this, to even a greater degree that we are now doing! The coming century will be fraught with work for the entomologist, and his loyalty to his country will be best shown by his careful, conscientious labors.

On concluding the reading of this paper Dr. Fletcher said that he thought it was one of unusual importance and particularly so just at the present time when such great efforts were being made to prevent the spread of the San Jose Scale, a danger the magnitude of which was by no means appreciated by the fruit growers and fruit consumers of the Dominion. It was, too, eminently proper that the subject should be introduced by the writer of the pages which he had had the honour of reading to the meeting, for few people had done so much to present the subject to the public of America as Prof. Webster. It was well pointed out that the political limits of the two great countries mentioned were not recognized by the natural denizens of the faunal and floral zones which we had as naturalists to study, although by accident owing to the great lakes this was somewhat the case. International economic entomology was only in its infancy, but it was being rapidly acknowledged at its right value of importance owing to the vast interests at stake. Dr. Howard, in his letter regretting that he could not be with us to-day, had been good enough to say that he considered the relations existing between the entomologists of the Dominion and of the United States to be of an ideal nature. The speaker felt sure that all present would agree with him that this was actually the case, and further, that this happy state of affairs was largely due to the constant and unfailing courtesy of Dr. Howard himself and his assistants at Washington, too numerous to mention now by name separately, but well known to every student who required help with regard to any special family of insects; to such men as the late Drs. Riley and Lintner, to Professors Webster, J. B. Smith, Comstock, Slingerland, Hopkins, Alwood, Johnson, Cockerell, Fernald, and many, many others who were not only always ready to help, but had in the past frequently helped with most valuable papers published in our reports and in the *Canadian Entomologist.* In his official position he was brought frequently into contact with these gentlemen and found invariably the utmost kindness and ready assistance. Last spring he had by invitation taken part in a conference of economic entomologists, fruit growers and nursery men held at Washington, for the purpose of laying before Congress the advisability of passing legislation for the suppression of the San Jose Scale. A committee waited upon the Congressional Agricultural Committee and explained the wishes of the conference and a favourable report was made by the Agricultural Committee to Congress. Legislation would undoubtedly have been enacted almost identical with our federal San Jose Scale Act but for the unfortunate outbreak of the Spanish-American War—Canada however had done her part and Dr. Fletcher believed that this law was a most useful provision. The Minister of Agriculture had considered the matter most carefully and the present popular measure was due to the minister's careful enquiries and legislative skill. The Hon. John Dryden had also put forth strenuous efforts for the protection of the fruit interests of the Province of Ontario. Too much could not be said of the excellent work of Mr. W. M. Orr the Superintendent of Spraying and of Mr. G. E Fisher who had pushed most energetically and tactfully the inspection of orchards for the San Jose Scale.

Dr. Fletcher congratulated the members of the Montreal Branch on the splendid work they were doing; he paid a well merited tribute to the persistent work which Mr. Lyman the president had been doing during many years and characterized the many papers which had appeared from his pen as being prepared with the greatest care as to detail, completeness as to research, and richness as to scientific facts they contained; his example had done much to stimulate the other members of the Branch to continue the good work they were doing for the Science of Entomology, particular attention being drawn to some of the collections exhibited at the present meeting, as those of Mr. Dwight Brainerd, who had prepared some beautiful cases illustrating the life-histories of several species of insects, of Mr. A. F. Winn, Mr. Dunlop, Mr. Williams and Mr. Norris, all of which contained many specimens of great interest. In conclusion the speaker begged to move a hearty vote of thanks to Professor Webster for his suggestive, timely and valuable paper.

This being seconded by Rev. Dr. Fyles, was carried unanimously.

NOTES ON PAPILIO BREVICAUDA, SAUNDERS.

By A. F. Winn, Montreal.

This species is either extending its habitat or has always had a wider range than credited to it, for I can now record its occurrence at Kamouraska, Que., a village on the south shore of the St. Lawrence about 85 miles below Quebec. (Lat. 47° 33″ N.)

Its locality as given in Scudder's Butterflies is "Newfoundland and the shores and islands of the Gulf of St. Lawrence both north and west," but I think Percé (Gaspe Co.) is the only recorded place on the south coast.

In July, 1889, a specimen was sent to me from Bic (Rimouski Co.) and arrived in a battered condition, but during the many seasons that I have spent my fortnight's vacation at Metis, about 30 miles further down, I have never seen the butterfly on the wing.

Rev. Dr. Fyles stated that a specimen had been taken last summer on the Island of Orleans, P. Q., by Mrs. Turner, of the Quebec Branch.

In 1896 I had not made up my mind where to spend my holidays and wrote Mr. L. Reford at Metis, asking him whether he was finding any good specimens and whether there was any hotel accommodation. He replied that he had taken a number of good things, among others a Papilio larva, and that there were plenty more to be found on a beach plant resembling celery.

I left for Metis on August 16th and found on my arrival that most of the larvae were nearly full grown, but a few were in their third stage. Some that Mr. Reford had in his house were just entering the chrysalis stage. We boxed all the mature larvae we could find and left the younger ones to feed on the archangelica plants during our stay, and before starting home gathered all we could find along with a supply of growing plants in tomato tins. The plants stood the journey well and grew nicely in the garden and we had no difficulty in getting all the larvae into chrysalis, but neither of us was successful in breeding a butterfly. All of my chrysalids were attacked by the parasite, which destroys so many P. asterias chrysalids—*Trogus exesorius.*

Thinking the species might be different I sent a specimen to Mr. Harrington of Ottawa, who has kindly determined it as the dark form of T. exesorius.

From larvae obtained the following year (1897) Mr. Reford managed to get one fine imago, which hatched in midwinter.

During the past summer I spent my vacation at Kamouraska, arriving there on August 13th and remaining until the 28th, spending part of 13th with Dr. Fyles at Levis. On the morning of the 14th while walking along the beach I noticed some rocks of the same slate formation that we had found the food plant of *brevicauda* among at Metis and after a few moments was pleased to find two or three plants but could find no larvae. A few yards further on, however, there were a number of plants and on them several larvae in their second stage, some in the first and some eggs.

The eggs are pale yellow, smooth and spherical except that the base is considerably flattened, and are attached mostly to the upper surface of the leaves, but sometimes to the lower side and on the stem and a few were on surrounding objects including a stick which lay across the rocks and on the rock itself.

Before hatching the egg becomes slate color. The larva has already been described and is so like P. asterias in all its stages that I could observe no points by which the two species could be distinguished.

I sent some larvae to Dr. Fyles at Levis and some eggs to Mr. Brainerd of Montreal, keeping a few eggs myself, and of these the first hatched August 15th and the first chrysalis was formed August 31st, making a larval period of 16 days—a remarkably short one, as Scudder observes, for such a high latitude. A number of larvae and eggs were found during the whole of my stay and when I examined the plants for the last time on the 28th the full grown larvae were crawling over newly laid eggs, and larvae of all sizes were side by side.

The first butterfly I saw was on the afternoon of the 14th, a little way back from the shore, but I afterwards found that the foodplant grew in a ditch in the same field. I failed to capture this female, and saw no more until the following Sunday (21st) when a party of us went to Tache's Point, a rocky promentary covered with trees, about a quarter of a mile north of the church. Several broken males were caught, but not having my net I could not catch the few that were in good condition. After lunch I returned with my net and caught one male in fair condition, and a number that were otherwise. On the 22nd I took a run on my bicycle along the main road towards Riviere du Loup, and got off at the bridge crossing the St. Paschel river, and followed the dyke, which the farmers have built to keep the sea out of their fields, and along the dyke the Archangelica grows in profusion. Eggs and larvæ were plentiful, but in no case more than four larvæ on one plant. I put my net together and waited for butterflies, but a strong wind was blowing which almost made me give up for the day, when a female fluttered through the fields, stopping to lay an egg here and there. I saw that the specimen was a damaged one, and thought that it would be best to watch it for a while, so got into a ditch where the food plant was most abundant, and the butterfly soon settled close to me and laid an egg on the top of a leaf, then went underneath and laid another, and finally crawled down the stem, or rather backed down, laying a third egg at the juncture of the three footstalks of the leaves. As it was flying off I caught it and boxed the eggs. Two of these hatched August 31st, the third did not hatch, although the larva was fully formed within. The egg stage is thus about nine days, and from laying of eggs to chrysalis is less than a month under favorable circumstances.

Regarding the feeding habits of larvæ, Scudder says (authority Mead) that "they are very susceptible to cold, prolonged darkness, or confinement of any kind, and when not feeding they either rest on the leaves in full sunlight or bask on the hot stones." My experience at Metis and Kamouraska does not corroborate these statements, for not having any proper breeding cages with me I kept my larvæ in the absolutely light-proof boxes used for photographic plates, and though I had at times as many as sixty in a box, I never had a healthier lot of larvæ. The young larvæ when at rest certainly lie on the top of the leaves in the sunshine, though you will rarely find a full-grown one in this position, but search the stem and the old ones are easily seen, and smelt too. Several times I visited the plants before breakfast, about 6.30 a.m., and found that all were at work and none at all on the stems, and on August 26th some were seen feeding at 8.30 p.m., though moonlight is not good for observation of this kind.

In the chrysalis there are two distinct forms, the green and yellow, and the light and dark brown, and I find that all my larvæ which suspended themselves on stems of the plant have produced green pupae, while those that crawled into boxes and shelters that I provided for them have assumed the brown form.

The species is regarded as single brooded, quoting Scudder again, "flying in June and the first half of July, and is most abundant the latter half of June. Eggs have been obtained from June 14th for a month, some chrysalids carried south gave out the butterfly the same year, one in eighteen days."

If in the northern part of its range the butterflies fly through June and begin to lay eggs before the middle of the month, it seems probable that it should occur in a warmer region, such as Kamouraska, even earlier, and there would be ample time for a second brood before the middle of August, but to settle this point it would be necessary to see the butterflies on the wing and eggs laid in June, and chrysalids in July, and some member of our newly formed Quebec branch could easily solve the matter. Finding the species in so many stages at the same time seems to me to favor the idea that there are two broods, as in my experience in species that are single brooded the imagos appear for a short period with great regularity, and in the early stages the moulting and pupating of all are within a comparatively short time of one another, but in two brooded species the first brood is regular and the second not, while in many brooded species, such as *Pieris rapae* and *Grapta interrogationis*, the last broods seem hopelessly mixed up.

The last female that I saw on the wing at Kamouraska seemed to be a perfect specimen and if single brooded must have spent at least eleven months in the chrysalis, which Gosse states (Can. Ent. XV, 45) is the period of this species in Newfoundland.

Dr. Fyles, in commenting on the paper, said that he had received some of the larvæ from Mr. Winn, with a supply of food-plant; when this was exhausted he endeavored to find a substitute, but the larvæ were very hard to please. Eventually he succeeded in getting them to eat the leaves of parsnip, though they would not touch carrot, on which the larva of *P. asterias* feeds. He found that the chrysalids formed on the stem of the plant were like it green in color, while those which transformed in the box were brown. (Specimens of both were exhibited). He had five chrysalids in good condition, from which he hoped to obtain the butterflies,

Dr. William Saunders, the original describer of the species, upon being called upon said his specimens were sent to him from Newfoundland by a collector there, and he had never met with it personally. He was very much interested in the careful work detailed by Mr. Winn; just such work should be done in every species, studying it in every stage until its life history was completely known. The society has shewn by its publication of so many original papers in the *Canadian Entomologist* that it fully appreciates this line of work, and he believed that in no other publication had so many and such valuable papers appeared as in our own magazine.

The meeting then adjourned, it being six o'clock p.m.

THE CONVERSAZIONE.

On the evening of the 8th November a very enjoyable Conversazione was held at the Natural History Society's Museum.

This was got up by the Montreal Branch in celebration of the 25th anniversary of its formation, and with the kind assistance of the Natural History Society and Microscopical Society of Montreal and the Parent Entomological Society, which all gave grants towards the expenses as well as other assistance.

Unfortunately there were other powerful attractions as Lord and Lady Aberdeen were making their farewell visit to Montreal and it was also the opening week of the much advertised new theatre, Her Majesty's, but in spite of these other attractions about two hundred guests accepted the invitation. The guests were received by Mr. Henry H. Lyman, President of the Entomological Society, and Mrs. Clarence Lyman, Dr. F. J. Adams, President of the Natural History Society, and Mrs. Adams, Mr. Albert Holden, President of the Microscopical Society, and Mrs. Holden. Among those present were noticed Mr. Samuel Finley, a Governor of McGill University, and Mrs. Finley, Dr.

and Mrs. Wm. Saunders of Ottawa, Mr. and Mrs. Fysshe, Mr. and Mrs. Beaudry, Dr. Girdwood, F.R.S.C., Prof. of Chemistry in McGill University, and Mrs. Girdwood, Rev. Dr. and Mrs. Campbell, Mr. J. H. Joseph, Prof. MacBride, Prof. of Zoology in McGill University, Mrs Cox, Mr. Sumner, Mr. J. D Evans, C.E. of Trenton, Mr. and Mrs. G. C. Dunlop, Prof. and Mrs. Donald, Mr. F. S. Lyman, Q.C. and Miss Lyman and Miss Cassels, of Washington, Mr. and Miss Scott, the Messrs. and Miss Brainerd, the Misses Dunlop, Dr. Shirres, Dr. Deeks, Mr. Winn, Mr. Clarence Lyman, Mr. Walter Lyman, Mr. and Mrs. Plimsoll, the Misses Redpath, Mr. and Mrs Lighthall, Mr. De Sola, Mr. and Miss Cramp, Mr. and Mrs. Gibb, Mr. C. T. Williams, Mr. Stevenson Brown, Mr. J. B. Williams, F.Z.S., Mr. Dearness and Mr. W. E. Saunders, of London, Mr. Gibson, of Toronto and many others.

Shortly after 9 o'clock the three presidents proceeded to the platform, which was decorated with palms and chrysanthemums, along with Rev. Dr. Bethune of Port Hope, Dr. Fletcher of Ottawa, and Rev. Dr. Fyles of Quebec. Mr. Lyman called the gathering to order, the guests seating themselves to listen to the addresses, and in a brief address welcomed the guests to this celebration and traced rapidly the history of the Branch from its formation on the 16th October, 1873, pointing out that so far as he could ascertain it was the third senior existing entomological society in North America, being only antedated by the American Entomological Society of Philadelphia and the parent society at London, Ont., and stating that 217 meetings of the branch had been held, at which over 200 original papers had been read, of which some 80 had been published.

Mr. Lyman briefly referred to the vast economic importance of the study and as an illustration mentioned that during the current year the State and Federal authorities of the United States were devoting no less a sum in the aggregate than about $350,000.00 to the prosecution of economic entomology.

Mr. Lyman expressed his regret that he had been unable to secure the attendance of any entomologists from the neighbouring Republic although pressing invitations had been sent to Dr. Howard, Dr. Holland, Prof. Webster, Mr. Slingerland and Mrs. Slosson.

After announcing that Dr. Bethune, Dr. Fletcher and Dr. Fyles would also deliver addresses, Mr. Lyman resigned the chair in favour of Dr. Adams.

The Rev. Dr. Bethune, Port Hope, one of the founders of the original society, and second President, spoke briefly of the work done by the parent society, and of the rise and progress of entomology in Canada.

Dr. Fletcher, the Dominion Official Entomologist, Ottawa, touched upon the economic aspect of the subject, and the value of a knowledge of entomology.

The Rev. Dr. Fyles, President of the recently formed Quebec branch, spoke briefly of the work done in that city. He also presented greetings from his branch to the Montreal branch.

On the conclusion of the addresses the majority of the guests repaired to the museum up stairs, though some lingered in the reception hall to examine the many beautiful objects, chiefly of an entomological character, which were exhibited under a large number of powerful microscopes by members of the Microscopical Society. The stairway and entrance to the museum had been tastefully decorated with flags, butterfly nets and other entomological paraphernalia, two long handled nets for working electric arc lights being especially noticeable.

The orchestra under the direction of Mr. Charles Reichling, which had been playing during the reception of the guests, took up a position in the gallery and discoursed sweet music during the remainder of the evening.

In the museum hall a fine exhibit of insects, chiefly Lepidoptera, was displayed the show cases being further embellished with potted plants.

The exhibits were chiefly furnished by the members of the Montreal branch, Mr. Lyman, the President and Mr. Winn, the Vice-President, each showing 30 cases exemplifying all the families of North American Lepidoptera except the micros. Mr.

Brainerd showed six cases beautifully illustrating the life histories of a number of interesting species, while Mr. Dunlop contributed an equal number of cases of striking exotic species. Mr. Norris showed about half a dozen drawers illustrating Montreal species as well as the method of preparing and spreading lepidoptera, while Mr. J. B. Williams exhibited an interesting case showing the life history of the Walking Stick (Diapheromera Femorata). In addition to these exhibits by members of the branch, the Museum Committee of McGill University contributed six large cases of strikingly beautiful tropical butterflies mounted on the Denton tablets, while the Natural History Society showed its collection of Canadian Coleoptera and a few drawers of exotic Lepidoptera.

Refreshments were served about half past ten o'clock and a very enjoyable evening was brought to a close shortly after 11 p.m.

ELECTION OF OFFICERS.

After a meeting of the Council had been held for the transaction of business, the general session of the Society was resumed at 11 o'clock a. m., Dr. Bethune occupying the chair at the request of the President. The first proceeding was the election of officers for the ensuing year, which resulted as follows: See page 2.

THE FARMERS' GARDEN AND ITS INSECT FOES.

Rev. Thomas W. Fyles, D.C.L., F.L.S., South Quebec.

Once upon a time some new tenants came to a farm-house in the neighborhood in which I was residing. A former owner of the place had enclosed a piece of ground on one side of the house and had formed a lawn and flower-beds, and planted fruit bushes and ornamental shrubs. The place was a quarter of a mile from my home; and one day I walked down to see the new-comers. I found them busily engaged in driving half-a dozen hogs into the enclosure I have mentioned. I ventured to suggest that the animals would play sad work with the flowers. This was the reply—"from a heart as rough as Esau's hand,"—"Flowers, flowers! The only flowers we care about are cauliflowers!" The answer expressed the prevailing contempt, in that comparatively new settlement, for everything like home adornment. I ought not to say *everything*, for an exception must be made in favor of bed-quilts. The females of that neighborhood spent much of their spare time in the manufacture of bed quilts. The choicest kinds were white, and had Turkey-red flowers and fruits, and intensely green leaves of impossible shapes trailing all over them. The possessor of a dozen varieties of such "spreads" was a proud woman. She would occasionally hang her art-treasures in the open space in front of her house, to excite the envy and admiration of her female neighbors, who would occasionally light their pipes and stroll round to examine the patterns.

The typical farm-house, at that time, and in that part of the country, was a story-and-a-half, oblong building, covered with rough, unpainted, hemlock boards. The main door was at one end and opened into the living-room. It and a trap-door into the cellar were, in some instances, sheltered by a rude veranda. In the door, near the bottom, was usually found a circular hole with a lengthened slit above it, in which a light shutter fitted to the opening, was suspended on a wire to allow egress and ingress to the cat. A story was told of a man who had two such openings made—a larger and a smaller—for the convenience of the cat and the kitten.

This primitive dwelling usually stood on a knoll in a yard open to the road. The yard, which was the receptacle for the refuse of the house thrown from windows and doors, was encumbered with logs drawn up for fuel, and was littered with chips. It was the common play-ground—if I may be allowed so to *generalize*—of the poultry, pigs and pickaninnies; and in it, in the summertime, one or two "smudges" were kept burning to drive away the mosquitos and black-flies.

The vegetables used by the people of that locality at that time were chiefly of field growth,—potatoes, Swedish turnips and pumpkins. The fruits were apples, from seedling and ungrafted trees, and the wild berries of the country,—strawberries from the meadows, raspberries from the pastures and roadsides, and "high-bush" cranberries from the swamps. The raspberries were spread on sheets of hemlock-bark, and dried in the sun for winter use; the strawberries and cranberries were preserved with maple-sugar. I remember my only experience of cranberry jam. It was at a party to which I was invited. I found myself incommoded by the large, flat, crustaceous seeds with which the preserve abounded. I stole a glance around to see how my neighbors disposed of these seeds and I found that the orthodox plan was to swallow them whole. I tried this for the occasion, but from that day forth I carefully avoided "cranberry sass"—as it was called in the vernacular.

Happily the race I have spoken of have passed away. Many of them were seized with the "Western fever," and moved to North Dakota and other distant places, to retard civilization in them. Their rude dwellings also are gone, or have been altered out of recognition. The succeeding generation is more enlightened and refined. The change has been largely brought about by the agricultural association and county fairs, which, through their prizes given for the best-cultivated farms, the best gardens, the finest vegetables, fruits, and flowers, and the choicest productions in the arts of life, have done a vast amount of good. Improved schools, superintended by well trained teachers, have fitted the rising generation to appreciate the agricultural and horticultural literature that has been widely circulated—reports and bulletins from our Experimental Farms and Scientific Associations; papers and magazines on rural affairs; and last, and I venture to say not least, illustrated catalogues from our seedmen and florists. These last have done much to create and foster a taste for horticulture. Now moreover improved machinery and garden implements enable the farmer to carry on his gardening operations with ease and expedition; so that good results around the homestead may be obtained without detriment to the operations on the farm at large.

My ideal of a farmer's homestead is this: a house facing the road, but a little back from it, having convenient verandahs—that to the front being furnished with wide-meshed wire netting extending from its base to its roof, for the support of such climbing plants as the English honeysuckle and Jackman's clematis. The Virginia creeper, which is a favorite on account of its free growth, is apt to hold moisture and rot the wood-work. If grown at all it should be often trimmed.

Behind the main building should be an extension connected with the dairy, wood-shed, etc., and facing this a yard, approached by a sideroad, and bounded by a shed for vehicles. Beyond this shed should be the cattle-yards with shelter for the animals, and then the barns.

In the lee of the buildings, though not in their shadow, I would have the ground for small fruits, and beyond it the orchard. The bushes should be planted in rows, and far enough apart to allow a steady horse with a cultivator to pass between them. Nothing is gained by crowding plants. The use of the cultivator and hoe should keep the ground around and under the bushes clean.

The kitchen-garden proper should be unincumbered with bushes and permanent paths, so that the manure carts may be driven anywhere over it, and the ground thoroughly ploughed in the fall, and again in the spring. I would have no partitions of beds except such as might be made with the hoe or shovel as occasion required.

The drive to the front of the house should come with a sweep round the central bed, and be flanked with flower-borders. Beyond these would be the lawn, with ornamental shrubs planted singly or in clumps: syringas, Tartarian honeysuckle, viburnum plicatum, the purple-leaved berberry, and lilacs white and purple.

In the front bed the house-plants moved from the windows when the green blinds were replaced would find suitable summer quarters, and a vase in the centre of it containing trailing and other plants would add to its beauty.

For the flanking beds, plants that require little attention and make a good show are desirable. To my mind the old favourites are the best—low shrubs like the Mahonia, moss-rose, and flowering currant; St. Joseph lilies; perennials such as iris, Chinese pœony, dicentra, perennial phlox and bee-larkspur; biennials as the Sweet William, Canterbury bell, foxglove and hollyhock—the last named, judiciously placed, produces a fine effect. Such plants require but little time for their cultivation. The forking in of a dressing of manure, an occasional shifting of place and dividing of them to prevent overgrowth, are the main operations required.

Around the whole should be a sheltering belt of evergreens—young pines, hemlocks, and Norway spruce. A few inexpensive rustic seats placed here and there under the trees would give an air of repose to the scene.

Supposing the buildings, yards, gardens and orchard to occupy five acres out of a hundred acre farm, the space will be well and profitably taken up.

Now what insect foes would the owner of such a property have to contend with The insect spoilers are numerous. For convenience we may group them into—

(I.) Those that suck.
(II.) Those that bite.

Each group may be sub-divided into—

(1) Open workers.
(2) Hidden workers.

And the methods to be taken against them may be spoken of as:

(*a*) Preventive.
(*b*) Destructive.

Of insects that suck the different kinds of plant-lice and scale-insects are most to be dreaded. They belong to the families APHIDÆ, COCCIDÆ and COCCINÆ in the order HEMIPTERA.

Some species of them are familiar to many persons. Their fondness for house plants has brought them into notice; and the difficulties experienced in exterminating them have created a desire for further information as to their nature and habits.

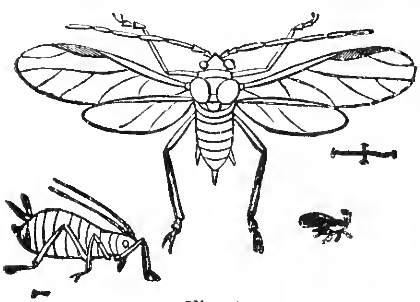


Fig. 6.

The perfect male and female aphides appear late in the year (Fig 6). The female deposits egg-like capsules upon the stems and branches of the food plant of her kind. Each capsule contains a perfect louse, which, in early Spring, bursts from its envelope and becomes a stem-mother capable of producing 90 or 100 creatures after her own likeness, and as prolific as herself. Seven or eight generations of such agamic producers succeed each other—their numbers increasing by geometrical progression till they count up to billions.

The stem-mother of the aphis has a flask-like body from which project two small spouts. Its head is furnished with a proboscis, which the insect drives into the substance of the leaf or bark of its food-plant, for the purpose of imbibing the sap. In the process of digestion, the sap imbibed is converted into the "honey-dew" which the insect now and again ejects from the spouts above metioned.

The plant is injured, in the first place by the withdrawal of nourishment from it, and in the second, by the clogging of its stomata, or breathing-pores by the accumulation of the viscid honey-dew.

Now it is evident that the aphides cannot be assailed through their mouths by poisonous spraying, as the leaf-eating insects can. They cannot be poisoned, but they can be suffocated. Whatever effectually closes their spiracles brings death to them. Spraying with kerosine emulsion, applications of whale-oil, size, pyrethrum, tobacco smoke, are all effective.

To witness the deadly effects of oil upon an insect, apply with a feather or camel's-hair brush a drop of linseed oil to the body of a troublesome hornet or bumble-bee buzzing in the window. The end comes quickly! The oil is not taken into the stomach of the insect, but is spread over its body, and clogs its breathing-pores, and the insect dies.

The aphides left to run their course, at length give rise to a generation of winged insects; and these proceed to make the preliminary arrangements for the next year's round of aphidean gatherings and festivities.

The aphides are named according to the plants they frequent. Thus we have :—

The aphis of the apple, *A. mali*, Fabricius.
" " plum leaves, *A. prunifolii*, Fitch.
" " currant, *A. ribis*, Linnæus.
" " cherry, *Myzus cerasi*, Fabricius.
" " cabbage, *A. brassicæ*, Linnæus, etc, etc.

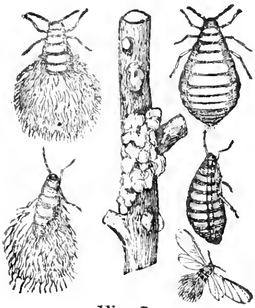


Fig. 7.

An easy way of smoking a house-plant is to turn an empty flour barrel over it, at the same time inserting a suitable vessel containing two or three pinches of tobacco and a small live coal. The smoke will soon do its work.

For the destruction of that troublesome insect the woolly aphis or "American Blight" (*Schizoneura lanigera*, Hausmann) (Fig. 7) which is found in white patches on the apple trees, the use of a scrubbing brush with diluted soft soap is recommended. By this means the insects are crushed and the tree cleansed at the same time. The house plants may be freed from that trouble-pest, the common mealy-bug (*Dactylopius adonidum*, Linnæus) by more gentle treatment of like nature.

The aphides have many natural foes. Among them are various kinds of lady-birds, the lace-winged flies and syrphus flies, all of which are predaceous upon them—destroying them from without; and an aphidius which is parasitic, destroying them from within.

Insects even more difficult to deal with than the aphides are the scale insects. The scrubbing-brush and soft soap may be used for their discomfiture. All the insects that we have yet considered work in the open air. There are others that live by suction, but operate under ground. The most formidable of these is the Dog-day Harvest Bug, *Cicada canicularis*, Harris.

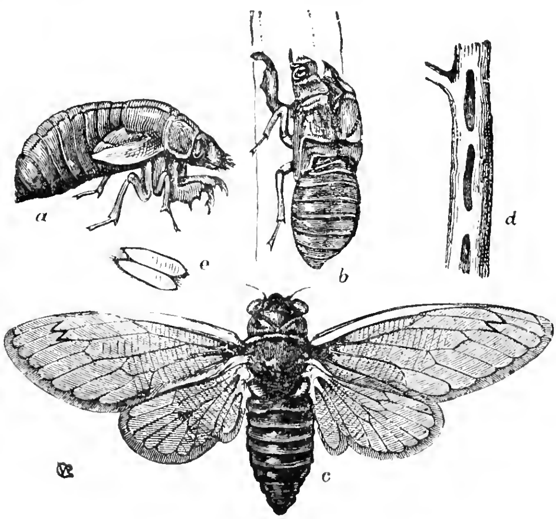


Fig. 8.

I made acquaintance with this insect many years ago, in Montreal. I was walking up Mountain Street, and, when near the top of it I saw a very seedy looking individual of the bug tribe creep from the soil at the foot of a large elm-tree (Fig. 8a) and begin to climb the trunk. I sat down and watched it. After ascending about two feet it dug its claws (It was very well provided with claws!) into the irregularities of the bark and took a firm hold. It then commenced to writhe and twist as if it were taken with a violent internal disorder. Surely something will come of all this commotion I said to myself; and something did result—its skin was suddenly rent from the head to the abdomen (Fig. 8b), and the creature began coolly to crawl out of its own skin, drawing out its legs as if it were taking off its boots. When quite free it shook out its wings, and in a few moments presented the appearance of a perfect cicada. (Fig. 8c.)

The female cicada is furnished with a remarkable organ, one part of which resembles a double key-hole saw. With this she cuts into the bark of the tree and forms a receptacle for her eggs. These eggs she carefully deposits. After a while they hatch, and the larvæ which come from them find their way to the roots of the tree, into which they thrust their beaks. Then commences the work of suction that lasts for a length of time—the juices of the tree being the only nourishment the creatures receive. One species of cicada (*C. septemdecim* Linneus) spends 17 years at this employment.

It is in orchards of some standing that the cicadas are most likely to establish themselves; and it may be that the operations of these hidden foes have more to do with the occasional shortage of fruit than people have an idea of. How to reach the spoilers is a problem. Probably one of the best suggestions that has been made is, to enclose the orchard with a sufficient fence, and then, to do as the people above-mentioned did with the garden—turn the hogs into it. The animals will grub (*grub* is a very appropriate word!) about the roots, and destroy a variety of larvæ and pupæ. They will loosen the sod and let in the air; and their droppings will help to fertilize the soil. The use of the bush-harrow and the rake, and the scattering of a little grass seed after the animals have been removed will repair the damage they may have done.

Against the biting insects the campaign should begin after the leaves have fallen. The fruit-trees should then be carefully examined for the eggs of some kinds and the cocoons of others. The beadlike eggs of the Brown Vapourer (*Orgyia antiqua*, Linnæus,) attached to the vacated cocoons of the mother insects, and the egg-patches of the Gray Vapourer (*O. leucostigma*, A. & S.), covered with a protective that resembles sugar frosting, will be found readily enough where the creatures are plentiful. The brown elongated masses of the eggs of the Lackey Moths (*Clisiocampa Americana*, Harris, and *C. disstria*, Hubner,) should be looked for on the twigs (Fig. 9), and when found cut away and destroyed, as should also the cocoons of the Saturnians.


Fig. 9.

As soon as the buds appear in the spring, Paris green and water well stirred should be applied to the fruit trees by means of a force pump and spraying nozzle. This spraying will destroy the injurious "bud-worms," "leaf crumplers," "canker worms," etc., and later applications will overcome those troublesome pests the "tent-caterpillars" and "fall web-worms," and other less conspicuous foes.

White hellebore, applied with a dredger, or mixed with water and sprinkled with a can over the fruit-bushes will kill the larvæ of the "currant saw-fly" (*Nematus ventricosus* Klug) Fig 10, and those of the span-worm (*Enfitchia ribearia* Fitch) Fig 11. A like application to the rose bushes will free those plants from "slug-worm" (*Selandria rosæ* Harris), and from the leaf-crumpling caterpillars of the pretty little brown and white Tortrix *Penthina nimbatana* Clemens).

With one notable exception our butterflies can hardly be said to be injurious. The larvæ of most of them feed on weeds or plants of little value. A few of them feed on cultivated plants.

Papilio turnus Linnæus, feeds on the apple, etc.

P. asterias Fabricius, feeds on the parsnip, carrot, etc.

Pieris oleracea Bd. feeds on the potherbs.

Grapta interrogationis Fab. feeds on the hops, etc.

G. progne Cramer, and *G. gracilis* G. and R. feed on the currant.

Thecla strigosa Harris, feeds on the plum.

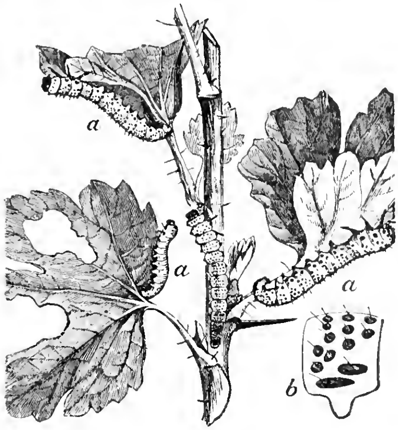


Fig 10.

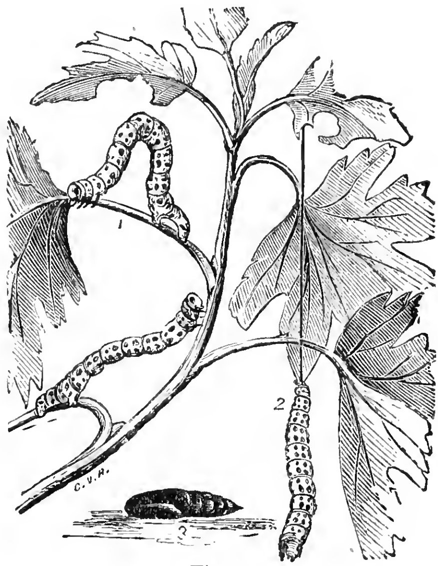


Fig 11.

But these insects are few in number, and so widely scattered, that they do little, if any, harm.

Fig 12.

The one exception is *Pieris rapæ* Linnæus, the "cabbage-butterfly" (Fig 2). This is an exceedingly troublesome insect. The best method to check its ravages that I know is to set an intelligent child to work to pick off the caterpillars (Fig 12 *a*) from the plants, and to crush them under foot. The chrysalids (Fig 12 *b*) of this species, and of others, may often be found attached to fences and buildings.

I lately had the opportunity of witnessing the proceedings of a Papilio brevicauda larva when about to change to a chrysalis. It spun, on the side of a twig, a little pad, to which it attached itself, having climbed into a proper position for doing so. When it had settled itself, it turned its head to its back and ejected, through its mouth, a drop of mucous which it drew out in a silken thread, and attached to the twig. It then turned its head round on the other side, and deposited another drop on the same spot, drawing it out and fastening it as before, thus making a complete loop. The ends of this it strengthened with a branching web. Having completed its arrangements it curved its shoulders, drew in its head, and remained quiescent for two or three days—that is, till its loop and other fastenings were firm and dry. Then its skin was rent at the thorax, and, by a succession of heaving and swaying motions, was worked back, segment by segment, till it reached the extremity or cremaster, from which, in a little while, it fell away, leaving a delicate green chrysalis with a row of yellow knobs on either side, and with pretty salmon-coloured spiracles.

The farmer no longer dreads the Colorado potato-beetle, *Doryphora decem-lineata* Say (Fig 13). He knows how to deal with it; and its numbers are diminishing, thanks to the information spread through the country by entomologists, on the use and efficacy of Paris-green.

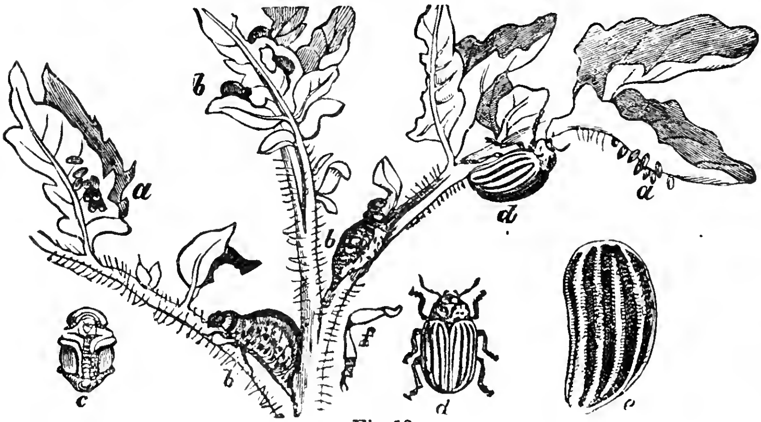


Fig 13.

It was a remarkable sight, in the early days of the potato-bug visitation, to see all the available members of a farmer's household busily engaged in beating off the "bugs" with small sticks, and catching them in milk cans; now and again emptying their prey into the fire over which soap was in the making, or pig's food in the cooking. "*All was fish that came to net,*" and so beetles and their parasites—"friends and foes," were—

——— "in one red burial blent."

Men are sometimes surprised to find the potato-beetles feeding on the tomato and tobacco plants in their gardens. The insect in its native haunts fed on the wild potato, *Solanum rostratum*. Of the *Solanceæ*, or Nightshade Family, to which the potato belongs, there are in north America six genera—not counting the South American genus Petunia, now so largely cultivated in gardens. They are (1) *Solanum*, nightshade; (2) *Physalis*, ground cherry; (3) *Nicandra*, apple of Peru; (4) *Hyoscyamus*, henbane; (5) *Datura*, thorn apple; (6) *Nicotiana*, tobacco. The first of these includes the potato, the egg-plant, and the tomato, all of which are eaten with avidity by the beetle. Deprived of its favourite supplies, the insect turns to such other members of the family as may grow within its reach. I have found it upon Physalis and Datura, as well as upon Nicotiana.

Of enemies working covertly, the cut-worms are among the most troublesome. They are larvæ of certain kinds of Noctuid, or night-flying moths. Whenever a farmer sees a

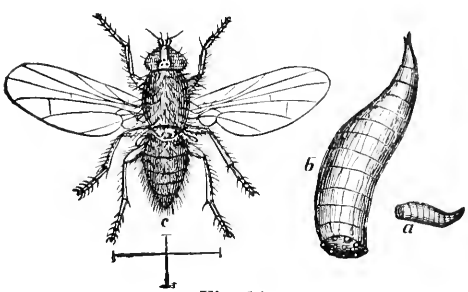


Fig. 14.

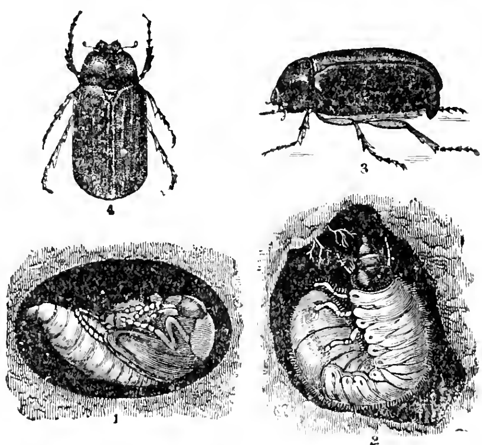


Fig. 15.

blade of corn falling over and turning yellow, or a cabbage-plant bitten off near the ground, he may be very sure that a cut-worm is working there, and should use a spud or pointed stick to unearth the spoiler. To foil these pests the young plants should be earthed up as soon and as far as possible, for the creatures crawl over the surface, at night, and cannot ascend a mound of crumbling earth.

Young onions are damaged both by the cut-worms and by the maggots of the onion-fly, *Phorbia ceparum* Meigen (Fig. 14). The former work singly ; the latter, in groups. Both should be carefully dug out and destroyed. Dry soot scattered over the onion-bed is believed to be serviceable in keeping away the fly.

The "white-grubs," or larvæ of the May-beetle, *Lachnosterna fusca*, Frohl. (Fig 15) are well-known pests. In the fields the plough unearths them ; and the poultry, following in its wake, hold high carnival, and become fat and well-liking. In a thoroughly-worked garden the grubs find but little harborage.

The hidden pests above mentioned can be dealt with more easily than some others.

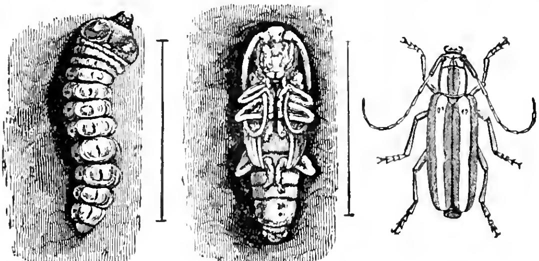


FIG. 16.

The apple-tree borer, *Saperda candida* Fab. (Fig. 16), works near the ground, in young trees, and so weakens the stems that sometimes, in a high wind, the trees are snapped off. The larvæ betray their presence by their *frass*. When this is the case a wire should be thrust into the tunnels, for the destruction of the occupants. A thick wash of soft soap applied to the stems in June will deter the beetles from laying their eggs upon them.

There are other borers that injure other trees. It is in search of these that the woodpeckers work so systematically around the stems. The woodpeckers are among the fruit-grower's allies, and should not be molested.

Fig. 17.

The borer of the currant stems is the larva of a pretty little clear-wing moth, *Ægeria tipuliformis* Linnæus (Fig. 17). Late in the fall all unhealthy-looking stems in the red, white and black currant-bushes should be cut out and burned. The moths appear in June, and consort for safety with the small black wasps of the genera *Odynerus* and *Gorytes*, which they somewhat resemble. A child can soon learn to distinguish them from these, and can spend a few bright midday hours profitably in capturing the moths with a butterfly net. The capture of one female will save many currant stems from damage.

We have, then, glanced at some of the worst of the insect pests that frequent the farmer's garden. The study of them in their native haunts will be found full of interest and a knowledge of their proceedings and the various methods of counteracting them will prove of great value, and ought not by any to be lightly esteemed.

ON THE NOCTUIDÆ OCCURRING AT TORONTO.

BY ARTHUR GIBSON, TORONTO.

For some time past, in fact ever since the season of 1896, I have considered the Noctuids to be my special favourites amongst the Lepidoptera, and in view of this I thought a few remarks under the above heading might interest those present.

The Noctuidæ comprise that large family of Lepidoptera known as the "Owl-let" moths, or night-flyers. As a rule, the members of this family feed by night and rest during the daytime. Some of the larvæ of these moths, commonly known as cut-worms, are amongst the most destructive of our caterpillars. The ravages which they have been recorded as making, resulting in the losses of certain agricultural products have been enormous. Around Toronto, as far as I know, their devastations have not amounted to very much, comparatively speaking. In the regions most infested with these pests, the loss to agriculture is tremendous, but the ravages thus caused have been reported so fully in Government publications that it is not necessary for me to say anything further about their destructive propensities. It might not be out of place, however, to mention that on account of these larvæ being night feeders, all of their devastations are perpetrated after dark, in the daytime the caterpillars hiding under crevices, stones or any other article under which they can escape notice.

To the collector of these moths there are various novel ways of procuring specimens. The two most indulged in, in Toronto, are taking advantage of the electric lights, especially in the outer districts, and by the still better way of "sugaring" the trees. In the early part of the season, say until towards the last week in June, the Noctuids that are then flying seemingly prefer the electric lights to the "sugar"—such is my experience. By the first of July they start to come to the "sugar," and from then until the end of August, and even beginning of September, lots of good work can be accomplished. Some Noctuids which are often taken at "light" are seldom captured at "sugar," while on the

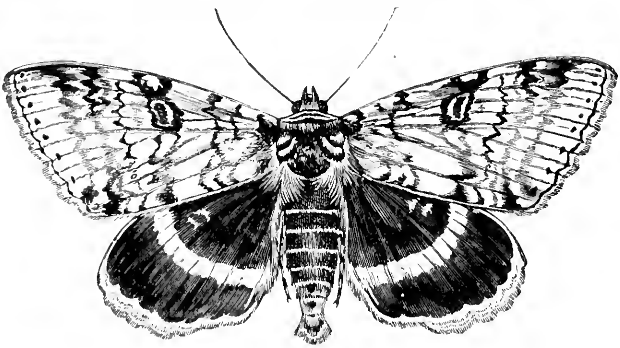


Fig. 18.

other hand specimens like the catocala are generally taken at "sugar." Relicta (Fig. 18) is about the only catocala which I have noticed around the lights to any extent. During the end of August of last season quite a number of Relictas were to be seen at "light," while I have, as yet, only met with one specimen at "sugar." Collecting with the aid of "sugar" is much the better way, not only as regards the number of specimens taken, but also in view of the variety of Noctuids secured. The season of 1897 was an ideal one for "sugaring" purposes in Toronto. One evening as many as 26 specimens of catocalæ were taken by Mr McDunnough and myself while out together, besides a large number of smaller interesting Noctuids.

It is safe to say that among the Noctuids we find some of our most beautiful moths, but on the other hand some of them are most inconspicuous in color, being of a dull gray, brown, or black, or these colors combined.

In North America, according to Prof. J. B. Smith's List of Lepidoptera of Boreal America, there are recorded no less than 1841 distinct species of this great family of Noctuidae, and since the compilation of this list there have been several new species described On my list I have marked off about 160 different species, which I have taken at Toronto, besides quite a number of unnamed species. Probably there occur several hundred more representatives.

Among the various genera there are to be found some very interesting species. The first thing I have marked of on my list is Raphia frater. This moth is of uncommon occurrence, the specimens I have being taken at light.

The genus Acronycta is an interesting one, some of the members being beautiful insects. Around Toronto, I have taken 10 different species, viz., occidentalis (Fig. 19),

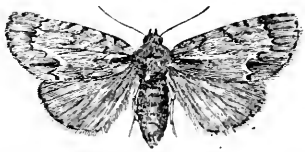


Fig. 19.

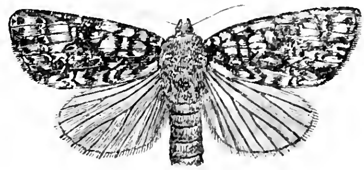


Fig. 20.

morula, populi, Americana, dactylina, hastulifer, luteicoma, brumosa, superans (Fig. 20), and funeralis. Of these probably funeralis is the most rare, while morula, dactylina and luteicoma are very scarce.

Harrisimemna trisignata, the only one of the genus, is a rather pretty moth; the three specimens I have were taken at light.

It is not necessary for me to mention every species of Noctuidae which I have taken, so I will just confine myself to the names of those which to me are considered of rare and of uncommon occurrence in the neighborhood of Toronto. In cases where it is possible I have mentioned whether the specimens were taken at "light" or at "sugar."

Microcoelia diphtheroides, fairly rare, taken at light.

Rhynchagrotis cupida, at sugar, very few taken. First time I took it was in 1896; very scarce since then.

Semiophora tenebrifera, one specimen at light.

Feltia venerabilis, only one specimen, taken at light.

Dicopis Grotei, one specimen taken at sugar, 13 June, 1896.

Mamestra imbrifera. Took one specimen of this beautiful insect, resting on the trunk of a tree, on the afternoon of 18th July, 1896.

Mamestra purpurissata, 1 sp. at light.

Mamestra grandis, 2 sp. at light.

Mamestra adjuncta, 1 sp. at light.

Mamestra latex, 1 sp. at light, 30th May, 1895, and one 9th May, 1896.

Mamestra rosea, very rare, two sp. at light, last capture 26th May, 1897.

Hadena lignicolor, rather uncommon, taken at sugar in June and July, 1895.

Dipterygia scabriuscula, 2 sp. taken at sugar.

Prodenia flavimedia, one sp. at light.

Trigonophora periculosa, 1 sp. at sugar and 1 at light.

Helotropha reniformis, fairly common, at sugar in 1896, rather scarce since then.

Hydroecia velata, 1 sp. taken at light.

Hydroecia cataphracta, 1 sp. at light, 9th May, 1894.

Pyrrhia umbra, 2 sp. at light, 4th May, 1896, and 2 sp. of the variety angulata on 20th June, 1896.

Orthosia ferruginoides, 2 sp. taken 21st Sept., 1895.

Scopelosoma Moffatiana, one of the early appearing Noctuids, 2 sp. taken at light, 20th April, 1896; also observed last season.

Scopelosoma ceromatica, also an early Noctuid, 4 sp. taken at light, 20th April, 1896. I have never taken either of the last two named, in the fall of the year, although I understand they hibernate in the imago state.

Calocampa curvimacula, very nice thing, 2 sp. taken at light, 20th April, 1896, and 1 sp. 17th May, 1897.

Cucullia asteroides, 2 bred specimens.

Cucullia intermedia, 3 sp. at light, 2 on 20 April and 1 on 16th April, 1896.

Among the Plusias there are some fine things. I have taken 8 different species marked off on my list, viz., ærea, aereoides, balluca (Fig. 21), striatella, bimaculata,

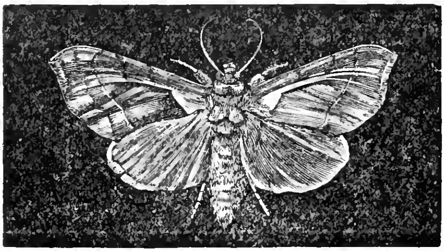


Fig. 21.

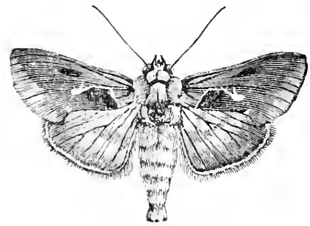


Fig. 22.

precationis, ampla, and simplex (Fig. 22), together with one un-named. Of these striatella, balluca, and ampla are the rarest, with simplex and precationis the commonest. All my Plusias were taken at light.

Heliothis armiger, one sp. taken 22nd Sept, 1895.

Alaria florida, very pretty moth, 4 specimens taken at light in 1894, never very common.

As to the Catocalas, I have taken 14 different species at sugar, the principal captures being, grynea, ultronia (Fig. 23), a beautiful variety of ilia, briseis, relicta, (Fig. 18), habilis, neogama (3rd Aug., '96) and retecta. The season of 1896 was by far the best I have yet experienced in collecting Catocalas, such species as ilia, cerogama, uniguga, and parta (Fig. 24) being very common. During the past season I did not notice a single specimen of ilia. I understand that C. cara was taken in Toronto last season.

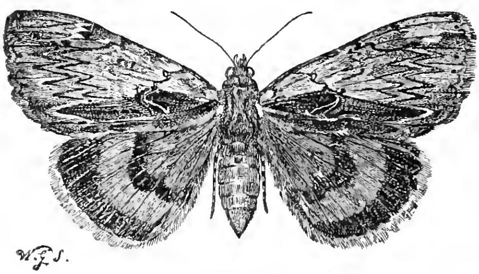


Fig. 23.

Panopoda rufimargo, one specimen, taken at light.

Homoptera nigricans, one specimen at light.

Bomolocha baltimoralis, 2 sp. at light.

Brephos infans, one specimen taken on 11th April, and one observed on 16th April, 1898.

I have brought to the meeting some of the species mentioned in my paper, also a few "uniques" which, as yet, I have not got identified. Some of these will no doubt interest certain of the members present.

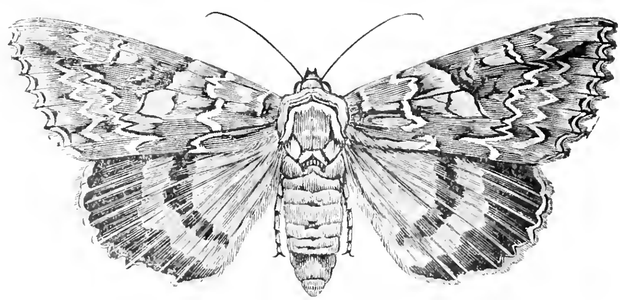


Fig. 24.

At a future date I may be able to relate, in a much better manner, something on the "Noctuidae occurring at Toronto," which may be of more interest than the article I have just read.

Mr. Gibson also exhibited specimens on the following very rare butterflies which he was so fortunate as to have captured at Toronto : Thecla Ontario, Pamphila Baracoa and Brettus; also Pyrameis carye, which was taken by Mr. Tyers. T. Ontario has only been twice taken before in the Province from which it is named; the other three are new to our Canadian list.

Mr. D. Brainerd disagreed with the writer of the paper regarding the superiority of light to sugar as an attraction for moths. Mr. Winn said that he had found sugar the best bait until June 15th, but after that flowers were the most attractive. He had taken 160 specimens between 7.15 and 8.15 one evening.

THE COLLECTOR AND HIS RELATION TO PURE AND APPLIED ENTOMOLOGY.

By F. M. Webster, Wooster, Ohio.

The insect collector may or may not be a professional entomologist. He may be a minister, doctor, lawyer, merchant, soldier or sailor. He may be confined within the walls of a counting-room, bank, office, study or other place of occupation, during eight or ten hours of the six days of the week, for eleven months of the year, or he may be camped for months in the wilderness, or spend months on the sea, with an occasional respite of a few weeks on shore. There are few professional collectors, the major portion of these being engaged in other pursuits, and spending the time generally devoted to rest or recreation by the majority of people, in the collection of insects, in itself a most pleasing and healthy sort of recreation, provided ones tastes trend in that direction. Thus it occurs that a collector may be confined to a limited area, or he may be able to carry on his work in widely distant localities. I know of a soldier, wounded and in a hospital, who managed to make a considerable collection of insects and especially such as are readily attracted to light, and another whose business, that of a commercial traveller, takes him from one end of the country to another. I have in my own collection, specimens taken at almost all hours of the day or night, under almost every condition imaginable, and in as great a diversity of localities.

Outside of professional entomologists, the collection of insects is largely a labor of love, with no hope or expectation of any compensation whatever. This, then, would appear to be the proper place to discuss the value of these self imposed labors to the science of entomology.

While much has been said and written, both pro and con, relating to the value of the services of those men and woman who collect but do not study insects, it has always appeared to me that in this, as in almost everything else, we should make a distinction between the careful collector and the one who, strictly speaking, could hardly be termed a collector at all. Of course industry and energy here as elsewhere, count for much, but care, neatness and accuracy are imperative. Then, again, there has existed a certain condition of affairs, happily now fast disappearing, under which a collector was obliged to humbly submit his hard earned material to a specialist for determination, which specialist, after condescending to go over it, retained the specimens for his trouble, and in the case of new forms, frequently forgot to give credit to the collector when naming and describing them. It was thought sufficient to state that specimens were from Canada, California or Texas. The description being sometimes drawn up from a single specimen, thought to be typical of course, because it was the only one in the hands of the describer, was often faulty, so that the danger to the pure science from discolored or deformed material getting into such hands was very considerable. It goes without saying if you place a lot of carelessly collected and prepared material in the hands of a specialist, who is simply a species maker, and whose judgment and accuracy is not above question, the result will be not only n. gen. et sp., *ad infinitum*, but time has shown that the sort of entomology that such work represents had best be spoken of in connection with an ?.

But this is one extreme and one that is fast being eliminated, all specialists of repute now giving full credit to the collector for material placed at their disposal, and frequently this is done at the request of the specialist himself. It seems to me that this is one of the most encouraging evidences of progress in entomological research, as the collector soon finds that with credit there, invariably, goes more or less responsibility, and we therefore get better and more careful collecting, while the specialist or systematist is placed in possession of better material and more elaborate data, and is thus better enabled to avoid mistakes and synonyms. But we must not lose sight of the fact that this material and data must be supplied by the collector, who may be so situated that he is not able to work up his material properly, while the systematist is often equally unable to secure these by his own efforts; and we thus have a division of labor, which, if faithfully carried out by both parties, can only result in much good, and material progress in our beloved science.

For my own part, I have come to look upon the labors of the careful collector, as having much the same relation to the science of entomology, as those of Livingstone and Stanley have to the advance of civilization in Southern Africa. These latter gentlemen did not fell trees and plow and sow, but they paved the way for these, and made civilization possible. The collector is the advance discoverer, who must be followed by the systematist before the biologist can commence his labors. We first must get our species, and then so define it as to prevent its being continually confused with other forms, else we cannot study either its own life or its relation to other species. In the history of the advance of civilization we have, first, the discoverer, next, the pioneer agriculturist with his log cabin, followed by cities and schools and churches and railways, all the accompaniments of civilized life, but all preceded by the one who first made his way through the trackless wastes and told of what he saw.

Now, about the collector and his work. He who cares nothing for habits, variations and geographical distribution, will accomplish the least for the advancement of the science, though, as has been stated, industry and push are neither one to be despised, and it is better to know that certain species are to be found in Canada, California or Texas, than not to know of their existence at all. It would be much more satisfactory to know just where in these areas the species were found, as all extend over a wide area and great variety of country. But just here let me call attention to a serious defect, and one that does not seem to be confined to the careless or inexperienced, viz., giving as localities of occurrence, isolated points, having local names which are unknown a few miles away, and are not to be found indicated on any of our maps. Such give no clue whatever to the one who is engaged in tracing out the geographical distribution of a species, as I have myself experienced after hours of fruitless search, finally giving up in despair. In all cases it is better to give exact localities with reference to their proximity to some point which is indicated on our maps; the approximate latitude and longitude will be the most stable and valuable of all, as the information can be used in any country and by the aid of very ordinary maps and charts. To those who object to taking the trouble to do this, let me suggest that other entomologists will there take up our work after we have followed Harris, Fitch, Riley, and more recently, Lintner and Maskell, on that long journey from which none return. We cannot, now, see what problems those who are to follow us may have to solve, nor can we determine the nature of the data that will be required for such solutions. Then, too, the foreign entomologist has frequently to turn to us for information regarding the distribution of both species and genera, and it is but justice to our fellows if we present our data in a manner that will be most intelligible to them. Some very good collectors, and not all of them American either, have overlooked this matter, and as a consequence we are sometimes left in the dark where we most needed light, and our colleagues really intended to supply it to us.

Altitude will not come amiss when you go over your notes, possibly twenty years hence, while food plants, food habits, relative abundance, and, indeed, almost any facts relative to the "sociology" of a species will be sure to be of use sometime, for someone. I am continually using data secured ten, fifteen, or twenty years ago, some of it at the time seeming to be hardly worth recording, but it is surprising how many good things in the way of specimens and facts we are continually turning up, by accident, as it were, oftentimes not realizing the full value of our "find" until years afterwards. A careful, faithful observation is never without value, as it either brings a new fact to light or else substantiates an old one. Insects do not necessarily act alike over the entire area of their distribution, and the man or woman who uses their own eyes is almost sure to see something that has not before been observed. Why! I have gone to your fellow member, Mr. W. H. Harrington, again and again for facts regarding some of our insects that I have been observing for years, but he, with his close observation, has observed things that, if they were to be seen in my locality, were overlooked by me. We do not see everything going on about us, by any means, even we that are most in the field, and I have gone several hundred miles from home, and found certain insects there doing certain things that they were not observed to do at home, but as soon as I returned they were found to be engaged in precisely the same way that I had observed them elsewhere, and probably had been doing so all the time, but I did not happen to be a witness to the fact.

Of late we are hearing much relative to life zones, and, while it is hardly probable that we have at the present time sufficient definite information regarding the exact localities of occurrence among insects to enable us to say much in regard to these, as it is very easy to say too much, yet we all know that our species are not all of them generally distributed. Almost every collector will get species in his immediate neighborhood, sometimes in abundance, that are to be found rarely, if at all, elsewhere. There are certainly areas, over which a certain species will be found to occur in a greater or less abundance, while a few miles away it will appear to have given way to another. In almost every locality there is sure to be some particular spot that will be found especially rich in insect life. These favored spots may be a bit of woodland, a bank, a shaded ravine or a secluded valley, to which one can go with the assurance that he will secure something rare or new. The vegetation here may not differ materially from that of hundreds of other places, seemingly equally favored also by climate and elevation, yet a greater number of species seem to have gained a foothold, so to speak, here than elsewhere, and, somehow, are able to retain their hold. Just why this is true is not exclusively an entomological problem, but involves animal and vegetable life as a unit, and the insect collector can, if he will, pile up facts that will go a long way toward the settlement of problems not at present considered in connection with entomology at all. In other words, before we can do much with mapping out life zones, we must have a vast amount of information that can only be secured by the careful collector and observer. Not only must this data be secured, but it must be made available by being placed on record where it can be found by the great army of scientific men and women. I am well aware that there is in some quarters, an aversion to publishing detatched notes and observations and a tendency to hold fast to all such until a mass of material is thus secured sufficient for an extended and exhaustive discussion, but it has always appeared to me in a different light. Let us suppose that the science of entomology is an immense vase, as large as Ætna or Vesuvius, and this is shattered into fragments and scattered over the face of the earth, and entomologists, without definite knowledge of its original form or dimensions, are set to work to gather up these scattered fragments and reconstruct the vase. The fragments will of course be of every conceivable size and form and when brought together fit into each other perfectly, but many of them will be much alike in form so that the misplacing of a fragment will not infrequently occur, the mistake only being discovered by the proper one being found and fitted into place. A fragment may include a species, or any fact connected with its life history or habits. Now, let us suppose that a collector in Canada or elsewhere discovers a new species, while an entomologist in some distant part of the world discovers an allied form. Here are two fragments of science, separated, how widely we cannot know, until the intervening space has been filled in by collections, breedings and observations carried on by perhaps a dozen different individuals, possibly speaking half as many different languages, each contributing his fragment that is to fill in the space that divides the two forms and cements the two together, so to speak. Let me illustrate again, taking this time *Diaspis amygdali*, which has recently been discussed by Mr. Cockerell, Mr. Tryon, Mr. Lounsberry and myself, each presenting some new phase of its habits in various parts of the world. But one of my contributions related to a parasitic foe, described by Dr. Howard and reared by myself from the Coccid just mentioned, on trees recently imported from Japan, and also by Professor Marchal in Paris, Mr. E. E Green in Ceylon, the late Mr. W. M. Maskell from Coccids received by him from Sydney, New South Wales, and at the United States Department of Agriculture, from an Aspidiotus from Georgia. Here we have fragments of our imaginary vase gathered from all quarters of the globe, not only fitting into the Diaspis fragment, but into others as widely separated as well. But suppose each one had kept his fragment to himself until such time as he could secure sufficient material for an exhaustive paper; how long would each have stood in the way of the other in attempting to make use of his information? "Rushing into print" is not to be commended, but a collector owes it to his fellows, and to entomology in general, to collect carefully and make all possible observations in connection with his material, placing the former on record for the benefit of his colleagues. The value of such work as is being done by Messrs. Harrington, Kilman, Bean, Fletcher, Lyman, Fyles and other Canadian entomologists, is not to be measured by our present knowledge, nor are the facts gained by these gentlemen to be taken separately, for, individually, they may be nearly or quite worthless and yet contain the very missing link that some other worker is hunting for, and through the lack of which he is unable to proceed in the solution of his own problem. Isolated from his fellows, working for the love of nature with little or no encouragement from those about him, it is not to be wondered at that a collector should think only of himself and his individual pleasure, becoming satisfied with dried corpses pinned in his cabinet and caring nought for the habits of these forms of life when active. But there is a world of riches at the door of every collector, isolation frequently becoming a blessing in disguise, for if he will but keep his eyes open and tell the world what he sees, he will ere long be surprised at the wealth of facts that he will accumulate.

The unknown in entomology may be likened to an ocean whose shores are lost in infinity, while the known is as a mill pond. There is so much to observe, so much to learn and life is so short. The collector, more than any one else, has opportunities for observation such as, if made with care and accurately recorded, may outweigh volumes of compilations that are too frequently permeated by the opinions of men, while original observations come direct from the hand of the Creator.

In conclusion, then, if there is any kind word of encouragement or of admonition that I can offer to the collector, whether he be located in city or country, let me do so here. Gather up these fragments of which I have been telling you, as you would grains of gold from among the sands, for sooner or later there will be a mint open for their reception and you will be surprised at their value. You will be more than once astonished to find that what you took for a worthless, fragmentary observation, will really turn out to be the keystone of an arch which has long been unfinished for lack of your fragment.

ENTOMOLOGY IN SCHOOLS.

By Wm. Lochhead, Ontario Agricultural College, Guelph.

The Annual Reports of this Society for 1896 and 1897 contain several very suggestive papers relating to the study of insects in our schools. Ex-President Dearness dealt somewhat fully with the subject in his two Presidential addresses, and the late Professor Panton outlined a method of presenting the subject from an economic standpoint. These three addresses, I remember, gave rise to a discussion among the members present on those occasions, and showed plainly that the time was ripe for introduction of nature-study into our schools. The members were unanimous in the opinion that insect life should form a portion of the children's study, at least, in our rural schools.

Mr. Dearness deserves much credit for his efforts towards the introduction of nature-study in his own County of Middlesex, and, in a general way, throughout the Province of Ontario. It is to be hoped that a little leaven will leaven the whole lump, and that every County Inspector will endeavor to the utmost to further this most desirable object. The compulsory study of Botany in the lower forms of our High Schools has already paved the way to a partial recognition of nature study as one worthy a place in our school curricula.

As a teacher of science for several years in some of our largest Collegiate Institutes, I may be permitted to use whatever influence I possess in urging on this good work, and towards this object this paper has been prepared.

This paper will consider the subject under the headings *Why?*, *How?*, and *When?*, *i.e.*, why should teachers introduce the study of insect life into their schools? Supposing its introduction is a wise procedure, how should it be taken up? and when should it be taken up?

WHY?

1. Because the study of insect life trains the eye to see, and the mind to draw proper conclusions from certain observed facts. The child learns clearly the relationship between causes and effects. It is remarkable the number of people who jump at conclusions without taking the time to relate cause and effect. Traditions and superstitions are still rampant, and many erroneous ideas of our forefathers are still too often accepted as truth in spite of the great advances that science has made during the last fifty years.

Pupils properly guided in their observations of nature will soon correct for themselves many of the errors that imperfect observers have made, and which have been handed down as truths. When the pupils have grown older, and have become engaged in the various pursuits of life, where alertness of mind, close observation, and accurate deductions count for much in the struggle for wealth, those who have been most carefully trained while young will, other things being equal, be most likely to succeed. It is a case of survival of the fittest in a struggle for existence. Comparisons, relations and judgment which are cultivated by a proper study of insect life are indispensable to the successful farmer, merchant and statesman. "If the farmer's boy learns how to accurately observe the process of nature with which farm produce deals, and the foes with which agriculture has to contend, are not the chances vastly increased that he will be successful in managing nature so as to get the greatest favors from this coy mistress of his life and fortune?"

2. Apart from the direct bearing on a successful life from a commercial standpoint, the study of nature reveals beauties and wonders all about us. Our eyes are opened to the wondrous transformation of insects, to the inter-relationships which exist between plants and insects, and among insects themselves. These are subjects of perennial interest, and the persons who have observed nature carefully will find in her not only "a resource and recreation, but an ever-faithful friend holding out comforting arms to those who are weary in soul and body." I think no one can be unhappy who has a true friend in nature, and can establish a living sympathy with everything about him, for Coleridge says:

> "He prayeth best who loveth best
>   All things, both great and small;
> For the dear God who loveth us,
>   He made and loveth all."

A writer with wide experience says: "The element of education which is at present most lacking in our common schools is the training of the powers of observation. The children need above all things else to be taught to observe carefully and correctly and to state their observations in clear and terse language. The ordinary child, whether on the farm or in the town, actually sees comparatively little in the world about him. The wonders of the trees and plants in park or meadow, of birds and insects flying about the house, float like shadowy visions before his eyes. "Seeing, he sees not." He needs a teacher who can open his eyes and fix his mind on the realities among which his daily life is passed. This accurate observation of natural objects and facts is the only foundation on which scientific attainments can rest. The scientist is chiefly a man who sees better than his fellow men. But it is also a great help in practical life.

3. "No branch of science means more in actual dollars to the people of the country than Entomology. At least one-tenth of our crops is lost owing to the depredation of insects." It is surely a proper thing to instruct our children about the insects. They should learn to distinguish insects which are enemies from those which are friends. If our farmers and gardeners understood the method of dealing with the foes, and acted promptly and efficiently, the money value of this knowledge and action would equal the richest Klondike ever discovered. When Governments spend millions, and individuals risk their lives in opening up a mineral Klondike, it is not unreasonable to ask that more attention be paid to this insect Klondike at our doors. Let us educate the children to take an interest in insects, for in a few years they will have the control of the great money-producing areas, viz., the farms of our land. Dr. Fletcher has already treated of the value of Entomology from an economic aspect at a previous meeting of this society, and Mr. C. C. James, the Deputy Minister of Agriculture of Ontario, has also ably handled the subject in several addresses before Farmers' Institutes.

How.

Every good teacher will have his own method of presenting the subject, the one best suited to his own individuality, but there are general principles which he must follow :

1. As far as our rural schools are concerned, Entomology should be studied "without reference to systematic order or relationships." The whole study should be thoroughly informal in every respect; it should be natural. No stated lesson should be assigned as a task beyond the general collecting of insects which the teacher may ask to be done occasionally. At first the teacher will simply guide the pupils by adroit questions such as these: Where did you find it? What was it doing? On what plant did you find it? Did you see it fly? How did it fly? Did you hear it sing or chirp, etc. The difference in structure among insects brought before a class should also be studied by means of questions put by the teacher, the number of wings,

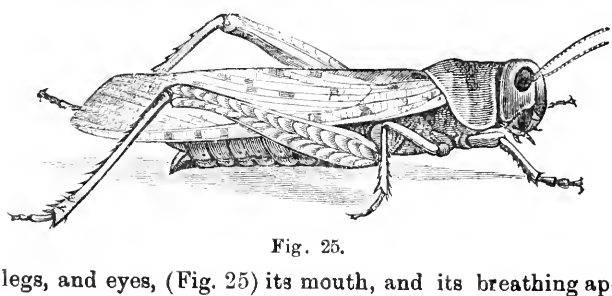


Fig. 25.

legs, and eyes, (Fig. 25) its mouth, and its breathing apparatus. The pupil will soon see that insects are unlike in many features, the observation of which will tend to increase his interest.

Occasionally injurious caterpillars will be caught in the act of eating leaves (Fig. 26); this occasion should be well used by the skilful teacher, and useful lessons learned. It is wonderful what a variety of insects will be forthcoming when the interest of the pupil is thoroughly aroused. Very often the best teacher will be incompetent to answer all the questions

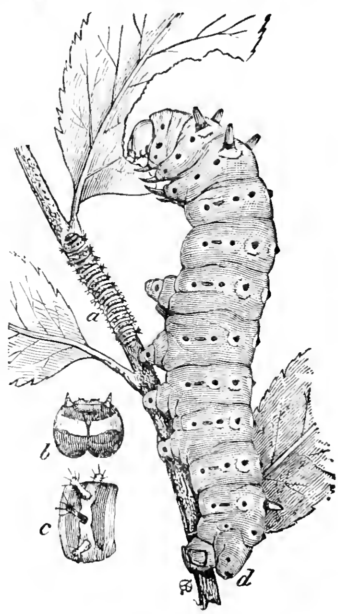


Fig. 26.

asked him by the curious naturalists, but that should not deter him in his work, for even experts will very often tell of their ignorance in matters relating to insect-life.

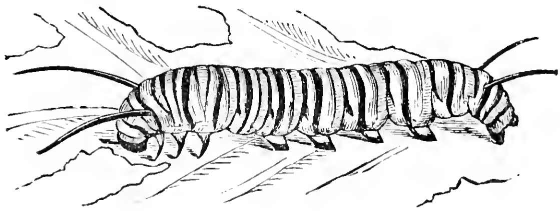


Fig. 27.

2. Encourage the pupils to make collections. Mr. Dearness has explained very clearly in his last year's Presidential address the simple method of collecting, so that every teacher who feels a living interest in this informal work, will find no difficulty in equipping both himself and his pupils with the necessary appliances.

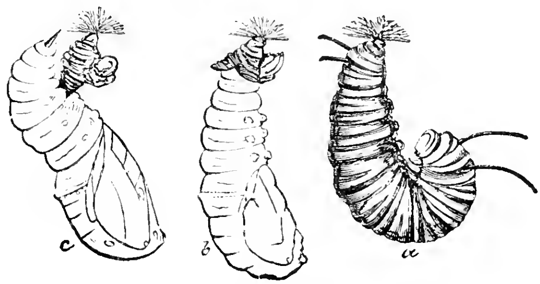
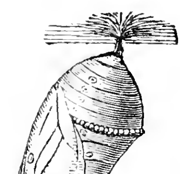


Fig. 28.

3. Encourage the study of life-histories, for after all this part is the most important in every respect. The wonderful transformations should excite intense curiosity, and accuracy as to the observations forms one of the most valuable trainings to be obtained in any department of science. (See Figures 27-32).

Fig. 27, the caterpillar ; fig. 28, the caterpillar changing into a chrysalis ; fig. 29, the chrysalis ; fig. 30, the perfect butterfly.



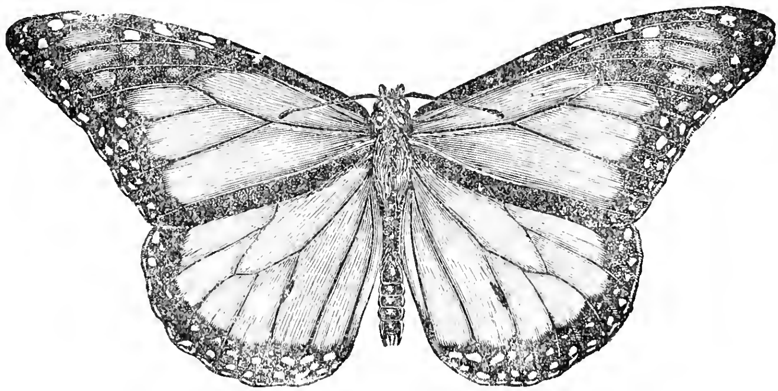


Fig. 29. Fig. 30.

4. Make this nature-study the basis of composition lessons, and informal talks, where good English form and style must be insisted upon. A child full of enthusiasm for a subject cannot help but talk, and write too, if required to do so. Let abstract and foreign topics alone till his reading has become wider and his mind more fully developed

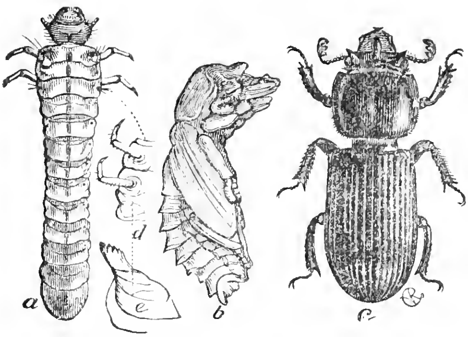


Fig. 31, grub, pupa and beetle (Passalus Cornutus).

The logical expression of the sequences in the development in insect life, if repeated frequently, will become one of habit, and will tell powerfully in many other ways. Not long ago the Principal of one of our largest Model Schools stated to me during a conversation, that almost invariably he could pick out the teachers-in-training under him who had received a science training in the High Schools. Science-trained pupils could develop a lesson along natural lines in proper logical order, so that they were thoroughly pedagogical in all their work.

5. Let the study of insects be one of relaxation from the more arduous duties of the school. The pupil must never have "Examinations" on the subject, else the knowledge of facts will soon be considered by pupils the chief aim of the study. Even the observations to be made must be incidental, just as the questions must be informal.

The child mind craves for informal instruction along such lines, and "the school becomes a delightful place, and the teacher an angel of light."

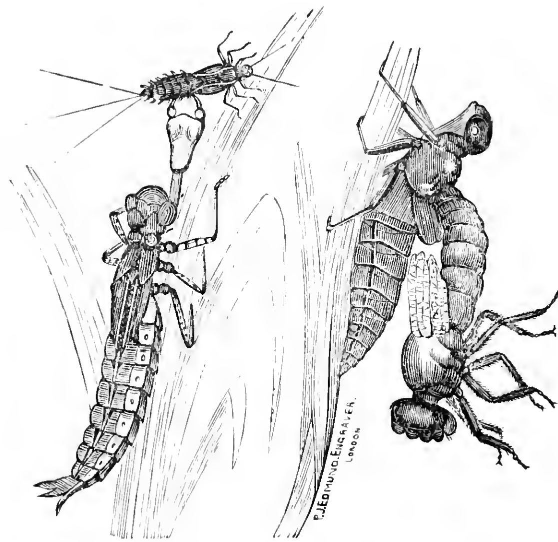


Fig. 32, transformations of a Dragon-Fly.

WHEN?

The amount of time allotted to this study should not be much. Let it creep in whenever the teacher feels that there is a need of relaxation, or when he has material for a good lesson. Some have advocated devoting a period to the work on Friday afternoons, but I would not limit the period to any particular time. It should not appear at all in the programme of studies. The youngest child is not too young to make observations and to try to give explanations.

TEACHER'S EQUIPMENT.

The greatest difficulty at the present day is to secure properly equipped teachers. This difficulty will gradually disappear as nature-courses are placed on the curricula of Normal and Model Schools, but a few words, I think, will not be out of place here regarding books with which the nature teacher should be familiar.

1. Comstock's *Insect Life*, published by the Appletons, is the best hand-book of suggestions, directions and methods for teachers that we have in America. Outlines of studies are given on pond life, brook life, orchard life, forest life and roadside life, while methods of collecting and preservation of specimens are sketched very clearly. Price $2.50.

2. Comstock's *Manual for the Study of Insects* takes easily first place as an Identification Book, and should be in every Entomologist's library. It contains keys to the

orders, and families, and gives brief descriptions and engravings of nearly all the commonly occurring insects. Price, $3.75.

3. Prof. Panton's *Insect Foes* (30c.) is a very convenient book for the busy man who would like to know the most injurious insects and the methods used in destroying them.

4. *Insecta*, by Hyatt & Arms, is a very neat and interesting book for beginners, and pays much attention to the anatomy of types from each of the orders. Price, $1.25.

5. Scudder's *Guide to Butterflies* and *Life of a Butterfly* are very useful books. The former pays much attention to identification of larvæ. Price, $1.50. Also Dr. Holland's *Butterfly Book*, with 48 coloured plates. Price, only $3.00.

6. Other special works are: *Williston's Diptera*, $2.25; *Cresson's Hymenoptera*, $3.00; *Leconte & Horn's Coleoptera*, $2.50; and *Banks' Neuropteroid Insects*, 50 cents; and *Packard's Works*.

7. In Economic Entomology there are Saunders's Classic Work, *Insects Injurious to Fruits*, price, $2.00; Harris' *Insects Injurious to Vegetation*; Smith's *Economic Entomology*, price, $2.50; Weed's *Insects and Insecticides*, price, $1.50.

8. Last, but not least in importance, are the *Annual Reports* of our own Entomological Society, in which will be found splendid accounts of the injurious insects from year to year. Every teacher should subscribe for the Canadian Entomologist, $1.00 a year; for in doing so he would get twelve monthly numbers of the Magazine and a copy of the Annual Report of the Society's Proceedings.

TWO AVIAN PARASITES: NOTES ON THEIR METAMORPHOSES.

By R. Elliott, Bryanston, Ont.

In the month of April, 1897, I noticed among the feathers of a Broad-winged Hawk which I was making up as an ornithological specimen several examples of a medium-sized fly that, judging from its peculiar structure, the faculty it possessed of passing rapidly through and hiding among the feathers, its reluctance to leave although provided with well-developed wings, must be a parasite, alive and well and quite at home.

Looking at a species of the highly organized order Diptera, in which the metamorphosis is complete, my first surprise at seeing the insect there soon merged into the second wonder: If the parasite remains for life on the host, and the metamorphosis is complete, in what manner is the routine of reproduction carried on? One could easily imagine eggs deposited on the feathers, an excellent environment to ensure development. But then, what would become of the larva? One could scarcely conceive of a maggot as living on the exterior of a living bird.

[In a Catalogue of Insects, under the family *Hippoboscidae*, I found *Olfersia Americana* Leach noted thus :—" Lives on *Bubo virginianus* and *Buteo borealis*."]

As the Broad-winged Hawk is a near relative of the last-named, is in fact *Buteo latissimus*, I assumed that I had found the name of the insect.

In September of this year, while manipulating a White-throated Sparrow for the same purpose as my hawk, I found another parasite fly, possibly of the same family, but of a different species from the first-named. It measured about five millimeters in length, with wings nearly, if not quite, as long as head and body, The thorax was flat and smooth; the skin leathery and tough; the legs (a light olive-green) long and strong and provided with curved hooks—an admirable contrivance to enable the parasite to travel through the maze of feathers while the troubled host travelled through the mazes of the northern forest.

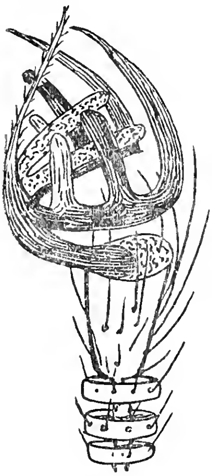


Fig. 33.
Foot of Parasite of White-throated Sparrow.

Through the kindness of my friend, Mr. Dearness, I am enabled to present herewith a drawing made by him under the microscope, which shows the structure of the fly's foot. (Fig. 33.)

The most interesting feature of the particular specimen described above lay in the fact that when found its condition gave me hopes that I might receive some light on its method of reproduction. Its abdomen was much larger in proportion than that of its congener found on the hawk.

Having placed the fly, living and uninjured, in a small phial, I watched and awaited developments. Within twenty hours I found the fly dead at the bottom, and a single large pupa (Fig 34) sticking to the side of the bottle. As it appears incredible that the young could have subsisted by itself in such a place, it seems reasonable to conclude that the egg and larval stages were passed within the body of the parent, thus accounting for two important phases in the course of its life. The pupa measured $2\frac{1}{2}$ x 2 millimeters, blackish brown, smooth and shining, flattish, oval, suggesting in form and outward structure some minute trilobite.

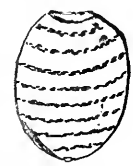


Fig. 34.
Form of the shining black pupa.

Mr. J. Dearness submitted the specimens of the two parasitic insects, and the curious larva, adding the following notes :

With the specimens submitted herewith, Mr. Elliott has afforded some of us our first opportunity of examining a pupiparous insect. He shrewdly suspected the curious fact in the life history of the insect under notice that the earlier metamorphoses take place in the abdomen of the parent, and that the young insect emerges therefrom in the pupal stage. The adhesiveness of the pupa, as shown by its sticking to the side of glass bottle, may be an important agent in keeping the pupa among the feathers during the brief time between its expulsion and its exit as an imago.

The only book I had at hand at the time of making these notes which relates anything of the Pupiparæ was Van der Hoeven's. Speaking of the Pferde-laus (*Hippobosca equina* L.) he says : "If we were told that a bird laid an egg that produced a young one at once as large as the mother we should think the account fabulous and ridiculous ; the fabulous part would not be diminished were the bird ever so small, or even a winged insect. Of this insect—the Pferde-laus—the story is actually true."

The smaller of the two parasites was the one that deposited the pupa in the bottle ; it is in the genus *Ornithomyia*, Latr., and is characterised by having distinct eyes, ocelli usually three, wings distinct, claws of tarsi tri-dentate. Hippobosca has no ocelli, and the tarsi are bi-dentate.

The author above quoted says of the family to which these insects belong that they lay no eggs, but are viviparous. That which seems to be an egg laid by these insects, and which is sometimes as big as the abdomen of the mother, ought to be regarded as a pupa. From it the perfect insect (imago) comes to view after an interval of time dependent upon the temperature to which the pupa is exposed.

A BIT OF HISTORY.

By J. Alston Moffat, London, Ont.

Early in 1898 the Rev. Dr. Bethune had received an enquiry from Mr. H. Bird, of Rye, N.Y., concerning certain specimens in the Society's collection. The Doctor naturally referred him to me. Shortly after I received from Mr. Bird a letter enquiring if *Hydræcia appassionata* Harvey, was represented amongst the species of that genius in our collection. I replied that it was not, and that I suspected that there was but one specimen of it extant; and that one was in the the British Museum; and that a re-discovery of it would be a matter of very great interest; and this opinion I afterwards found was also entertained by Mr. Bird.

This *Hydræcia appasionata*, Harvey, is a species that was taken at London, by Mr. E. Baynes Reed, and described by Dr. Leon F. Harvey in the August number of the *Canadian Entomologist* for the year 1876, page 155, under the generic title "Gortyna." The date of the description indicating that the capture had been made the previous year at the latest. There is no mention made of the number of specimens taken, or upon which the description was made; the presumption is, that it was a unique. At all events, a type specimen had gone into Mr. Grote's collection; Mr. Grote's collection went to the British Museum, and that specimen went with it, and there I presume it is now. It has generally been considered that some of the species of this genus are rather variable and run closely into each other. Reference is made by Mr. Bird in his paper (*Can. Ent.* Vol. 30, p. 130) to the difficulty that seems to have been experienced by the describers in deciding to which species certain forms belonged. Guenee is reported as considering *Marginidens* Guen and *Limpida* Guen as possible varities of *Rutila* Guen, whilst Walker regarded *Marginidens* as a doubtful variety of *leucostigma*. I have read somewhere a statement made by Dr. J. B. Smith, that as the genus then stood a specimen might be yellow or mouse-colored, with or without spots and yet be the same species. Dr. Smith had been convinced that the genus was in a most unsatisfactoy condition and wanted revision, and he undertook the task. The first thing to be done was to get as much material together for study as possible, so early in the year he requested the loan of the Society's specimens of that genus for comparison. I replied, that then they would have to be sent by express, and that he would remember that the unreasonable demands of the U. S. Custom officers had erected an effectual barrier to anything more being sent in that way. I sent to him a list of the genus as it was represented in the Society's drawers, and from these he choose those he wanted most to see, and they were sent to him by mail. Amongst them were three specimens which I had under the specific name "Rutila." One was from my former Hamilton collection. Another was taken by Mr. C. G. Anderson, of London, in 1895. And as it did not correspond to anything I could find, it was sent for determination and returned as "Rutila." The other was a specimen taken by Mr. Bice in 1896, of which he took several that season, and as I could not identify it, I sent it also for a name, which was also returned as "Rutila." This I considered was an illustrious example of the variability of the species, and quite confirmatory of Dr. Smith's statement already referred to.

In due time the specimens were returned with Dr. Smith's determination of the various forms attached to them. In his letter to me of August 15th, 1898, announcing his returning the specimens he remarks: "The specimen of *Appasionata* is the only decent example known to me in collections. *Circumlucens* is a new species of which there are only a few other examples known to me. So, though the lot was small it was not without interest." So there had been an example of the long lost *Appasionata* in the collection and I did not know it. This specimen of *H. Appasionata*, Harvey is Anderson's capture of 1895 *H. Circumlucens*, Smith, is the specimen from my old Hamilton collection, and "*Rutila*" is the 1896 capture of Mr. Bice. It would then appear as if "*Rutila*" had been a kind of general repository for anything that was known not to belong elsewhere. I believe there are two or three other specimens of *H. Appasionata*, Harvey in collections in London.

By my ordinary method of collecting fall moths, searching for them in the daytime, or beating bushes and weeds; all species of *Hydroecia* seemed to be rare and difficult to find, except *Nictitans*, which is more or less plentiful every season; whilst other species are obtainable only in single specimens at long intervals. In Mr. H. Bird's valuable paper on this genus (*Can. Ent.* Vol. 30, P. 126,) mention is made of *Nitela* as being a well known species; here it is seldom taken, and its variety *Nebris* has yet to be reported present. Referring to *Cataphracta*, Mr. Bird says: "At light the Imago would be considered a rarity." Here it is the most abundant form presenting itself at light. Dozens of it might have been taken in the season of 1897. It was less plentiful in 1898. *Inquaesita* would come next in point of numbers. This is an illustration of changed results in different localities.

THE GYPSY MOTH.

By E. H. Forbush.

Ever since the Gypsy moth exterminative work was placed under the management of the Massachusetts Board of Agriculture the plan of operations has been to work from the outermost limit of the known infested region toward the centre.

Obviously such a method, if properly executed, would best carry out the purpose of the State law, first, for the prevention of the spread, and second, for the extermination of the moth. In accordance with this plan it has been the policy of the Board to clear the outer towns from the moth and, at the same time, to reduce, so far as the money granted would permit, the number of the moths in the central towns. It was hoped that when the outer towns were cleared the force could largely be concentrated in the inner towns, clearing them also. If the Board had each year received the sums it has deemed necessary and annually requested this policy would by to-day, it is believed, have been carried on to complete success. But since the necessary legislative grant annually asked for by the Board has been cut down year after year from one-third to one-half, the moths have so increased in the central towns that they have been scattered into and have seriously threatened the towns cleared or nearly cleared in the outer belt.

Under these circumstances it has been found necessary during the seasons of 1897-98 to concentrate large bodies of men in the central towns to prevent a further wide dissemination of the larvæ into the outer towns; the outer towns, meanwhile, receiving less than their full share of attention.

The present year the full amount asked for ($200,000) was granted for this work by the legislature. Unfortunately the grant was so delayed that much of the necessary work of egg-destruction (by burning, before hatching time) could not be done. The heavy rains, too, which prevailed through May and June greatly hampered the spraying. Nevertheless, the burlap-work, which was done more extensively than ever before and over most of the territory known as infested, proved so successful that nowhere in the whole burlapped territory were any considerable number of trees stripped by gypsy moth larvæ

We have also this summer done extensive burning, beginning in August; burning will be continued where needed.

On the whole, the granting this year of the full sum asked will make it possible for us to accomplish far more in 1898 than has been accomplished in any previous year.

While it is true that two colonies of the moth (one in Lincoln, discovered in 1897, the other in Manchester, discovered this year) are known, immediately outside of the limits of the territory hitherto defined as infested, these discoveries, under all the circumstances, do not in the least surprise me, since I have believed from the first that a few of such extra-limital colonies might confidently be looked for. Still these discoveries emphasize the necessity of far more inspection work outside the limits of known infestation. We have been absolutely unable in past years, with the money hitherto granted, to do nearly all that needed to be done in this line of work. This year as much as possible was done in this line, revealing, however, no infestation.

Efficient work has been done both in Manchester and Lincoln. The centre of the Manchester colony appears to be stamped out. Much work will be necessary in its immediate vicinity this fall and the country surrounding it must be carefully watched next year. The Lincoln colony has been brought to such a condition that there is little danger of dissemination from it.

Nevertheless the moth is scattered through hundreds of acres of woodland there and extermination in Lincoln and the adjoining town of Weston, into which a few larvæ have been dispersed, will be costly.

The work of spraying and burning the past season has been greatly facilitated by improved apparatus prepared under the direction of Mr. E. C. Ware, of the Department, and in part invented by him.

Information about the Gypsy moth has been widely scattered through the region adjacent to the infested territory. People have learned to dread the moth and are on the watch for it. The Lincoln and Manchester colonies were discovered and reported to us by citizens. To secure still further the intelligent co-operation of citizens in this work, it is planned to distribute from house to house, within the towns immediately bordering the infested region, an illustrated bulletin descriptive of the Gypsy moth, its habits and something of its history.

In no previous year have we been able to speak so confidently of progress so early in the season. The great wooded tracts, especially in the eastern, western and northern divisions of the infested territory are now in excellent condition. More than ever this year have I been impressed with our power to cope with and in due time to utterly extirpate the Gypsy moth, when we are sufficiently supported by Legislative grants.

If the Legislature promptly provides for several years to come an appropriation strictly limited to the Gypsy moth work and equal to the amount granted this year, there can be no doubt of the final extermination of the Gypsy moth from Massachusetts.

Dr. Bethune, in commenting on the paper, said he had visited in August last the scene of operations of the Gypsy Moth Commission, and had been shewn all their appliances and methods of operation in carrying out the work of controlling and ultimately exterminating the destructive insect. He described the spraying of the foliage of tall trees with poison in order to kill the caterpillars, the scraping off and destroying egg-clusters, the burning by means of a hose discharging blazing kerosene of weeds and rubbish in rough localities which were known to be infested, and also the banding of trunks of trees with burlap. The apparatus employed was of the most perfect description and was largely the invention and product of the members of the force. He was especially impressed by the magnitude and thoroughness of the work; in traversing many miles of the State in different directions he noticed that every tree, large or small, whether in private gardens, public streets and parks, or woods and swamps, had its trunk wrapped round with burlap and a code mark painted upon it indicating the dates when it had been inspected. He felt sure that if the Commission is maintained with its present staff of workers the extermination of the insect will before many years be accomplished.

It was then moved by Mr. Dearness, seconded by Mr. J. D. Evans, and resolved: That the thanks of the Society be conveyed to Prof. Forbush for his interesting paper, and that this Society desires to place on record its admiration of the work done by the State of Massachusetts, under the able direction of Professors Fernald and Forbush, to restrain the spread of this most destructive insect, and if possible to exterminate it eventually. Had not such energetic measures been taken the consequences to neighboring States and even to our own country might by this time be appalling.

THE COTTON BOLL-WORM IN CANADIAN CORN.

By J. Dearness, London, Ont.

On the 10th of October Mr. E. T. Shaw, residing near Dorchester Station on the G. T. R., east of London, drew my attention to a larva which he said was damaging his corn by burrowing from the top downward between the rows of grain on the ear. I went over into the field—one of about four acres—and with his assistance soon obtained a number of specimens of the larva. I estimated that in the part of the field we were collecting them that about one ear in five was affected.

On taking the larvæ home I was surprised to find that it agreed exactly with the descriptions of the Cotton Boll worm (*Heliothis armiger* Hubn) and that in a Canadian latitude it could be so numerous as to possess an economic interest.

On making further inquiries I learned that the "worm" was reported in the corn-fields of most of Mr. Shaw's neighbors and indeed was said to be much more prevalent and injurious in a large corn-field of Mr. McNiven's than in Mr. Shaw's.

Last week Mr. Paul Hunter informed me that he had been husking corn in a field near Gladstone, Ont., a village in another part of the same township, and that "nearly every ear had a worm in it." He described the insect so well without any suggestions from me that I felt sure it was the same that had attracted the attention of the Dorchester Station farmers.

I visited Mr. Shaw's farm again on the 3rd instant (November) in the hope of finding some more specimens, the numbers of my first collection having been reduced by cannibalism. In confinement the larvæ seem to prefer the tissues of each other's bodies to the corn I placed in the jars with them. Possibly, indeed probably, they could not bite the rather hard shelled corn placed in one of the jars. In another jar in which two or three ends of ears of corn had been placed, when I returned after a week's absence only one specimen was living. Therefore, as just stated, I went last week to Mr. Shaw's to collect some fresh specimens to bring to this meeting. He happened that day to be hauling in unhusked corn. In the load just brought in we found relatively few affected ears, not more than one in twenty or thirty, but in the next load they were quite common, one in every two or three ears.

The affected ears usually had but a single larva in them, the largest number I saw in one ear was three. The damage done to affected ears by the burrowing and milling of the grain is not very great, less than five per cent., but some of such ears showed a mould that had made an entrance and was following the channel burrowed between the rows of the injured grains.

Dr. Fletcher informed me last night that a farmer near Orilla had reported damage to 75 per cent. of the ears of his corn by an insect which the doctor found to be the same species as the one under consideration. He will doubtless refer to it in his Notes of the Season.

The life-history of this interesting insect has been so well studied and so fully reported in the Fourth Report of the U. S. Entomological Commission and in subsequent bulletins of the Division of Entomology of the U. S. Department of Agriculture that but little remains to be done by Canadians. However its appearance here in the role above described may justify a brief synopsis of what has been recorded of its history and habits.

From the elaborate report of the Commission above cited we learn that in many parts of the Southern States the Boll-worm is regarded as more destructive to cotton than all other insects combined and that in some parts of the Southern and Western States it has been very injurious to corn. In the three years preceding the labors of the Commissioners they reported very marked damage to corn all through the South and West, it being a common experience to find fields in Virginia and southward in which almost every ear was pierced.

Glover, in 1866, wrote that a dissection of a female boll-worm moth showed that it contained about 500 eggs. Mr. F. W. Mally, who made an exhaustive study of this insect for the U. S. Division of Entomology obtained 687 eggs from one moth. The egg is oval in shape, whitish in color, and beautifully sculptured, fifty of them side by side would make a line an inch long. The eggs are laid singly on various plants, but preferably it would seem on the young silk of ears of corn. This preference is taken advantage of by the cotton growers who plant patches of corn here and there in the plantations to serve as a trap crop, the corn being harvested at a time when the planters think they will effect the maximum destruction of the larvæ. The egg hatches in 2 to 4 days. The larva which is variable in color undergoes well marked changes in its earlier moltings, some of these are noticeable in the specimens exhibited. The mature worm is an inch to an inch and a half in length and rather less than a fifth of an inch in diameter, the head is amber colored and the body is strikingly marked by a dark stripe along the back centred by a fine white line. On either side of the dark stripe on the back are paler ones and on the side a very distinct and whitish stripe in which the spiracles are found. On the sides are three or four rows of tubercles each bearing a rather stiff hair. The two legs (the six on the anterior segment of the body) are dark in color and the prolegs have each fifteen small hooks.

The first food of the young larva is its own egg shell, but it soon settles to work devouring the tissue of its host plant, whether that be cotton, corn, tomato or some other. In August it is said to pupate in about 21 days, and the pupal stage then to extend over two or three weeks. The last brood hibernates in the pupal stage. These remarks on the life history are condensed from Mr. Mally's reports.

The perfect moth like the larva is variable in color. It is fully described and well illustrated in the 4th Report of the Entomological Commission.

The series of specimens in our collections at London were taken by Mr. Moffatt, at Hamilton, some years ago. I do not find any Ontario record of it since until this year.

Although this year it is present in sufficient numbers to warrant the attention of the economic entomologist, I do not suppose there need be much apprehension on the score of serious injury in the future. The unusually prolonged season in Ontario may have permitted the development of an additional brood as compared with other years. Were it to remain and extend its area it would be most unwelcome as the question of remedy is obviously difficult. Its presence in the green ear of corn can be detected by an observant eye. When observed the tedious remedy of pinching or hand-picking might be resorted to. Obvious difficulties stand in the way of spraying with poisonous solutions.

After the members present had examined the specimens brought by Mr. Dearness, Mr. Dwight Brainerd reported that he had met with the insect in Massachusetts this year for the first time. Mr. Winn said that a few specimens had been found in Montreal and referred to the mention of the insect in Mr. Gibson's list of moths taken at Toronto. Dr. Bethune had found it this year also at Port Hope, where the larva burrowed into the fruit of the tomato.

MUSKOKA AS A COLLECTING GROUND.

By Arthur Gibson, Toronto.

In the month of August last I had the pleasure of spending two weeks in the "Highlands of Ontario," Muskoka, my destination being Port Sydney.

Port Sydney, with a population of about 50 inhabitants, is about 138 miles due north of Toronto, being situated at the southern extremity of Mary Lake, which is about $5\frac{1}{2}$ miles long and 2 or 3 wide.

To a person who has never visited Muskoka, the Lakes which abound everywhere in that district, and which as a rule, are filled with numerous small islands, beautifully arranged, so to speak, and the mainland with its wild picturesque scenery, the sight tha meets the eye is truly wonderful, and worth going some distance to see.

In Mary Lake there are seven small islands of various sizes, one probably covering an acre or even two, while another would only contain about enough room upon which to build a fair sized house. These islands for the most part are composed of solid rock, with only probably a few feet of earth on the surface. In fact throughout the whole district there is nothing but rocks, rocks, rocks. On some of the islands there is a considerable growth of trees, shrubs etc., while others seemed to be quite bare. A curious sight often observed in the Muskoka country is large trees growing out of a crevice in what appears to be solid rock. To a casual observer there is considerable mystery in this, and as I have not looked into the matter, I am unable to throw any light thereon.

Certain rocks, on the islands, as well as on the mainland, sink, as it were, straight down into the water often to a depth of 30 feet and more. These rocks are not loose, in the ordinary sense of the word, but are a part of and joined to the mainland or island as the case may be, and often reach a height of probably one hundred feet or more. It will be readily seen, therefore that even the most delightful resorts, are not always the safest, but have their treacherous surroundings, and it is a wonder more drowning accidents do not occur throughout the many lakes that make Muskoka the attractive place it is.

From an entomological point of view, Muskoka ought to offer grand inducements to the collector, as vegetation in most places is simply in the wild state, and many good captures could no doubt be recorded. The month of August, the time of the writer's visit, is too late for general work, but for the collector of Noctuidae there should be a good harvest during that month, as there are numerous good places for "sugaring" purposes. About the 1st of July, I think, would be the most profitable time to visit Muskoka, as insects generally are most to be had about that time.

However, during my vacation at Port Sydney I noticed the following species of butterflies, viz Argynnis Cybele, Atlantis, Aphrodite and Myrina, all of which seemed fairly common, with Myrina the most plentiful. The first three named were mostly worn specimens, only a few of those taken being presentable Pieris rapae, Colias Philodice and Chrysophanus Hypophlaeas were also common. The latter was the commonest of all those noticed. Everywhere this little butterfly was to be seen flitting about, and the majority of the specimens were in good condition. A few specimens of Danais archippus (Fig. 30), and Grapta progne (Fig. 35), were observed, and of the Limenitis, disippus (Fig. 36) seemed fairly plentiful,

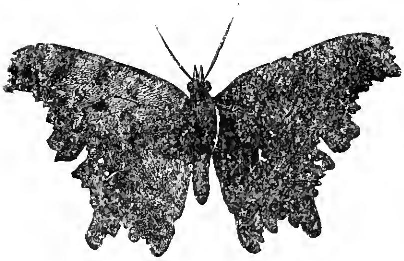


Fig. 35.

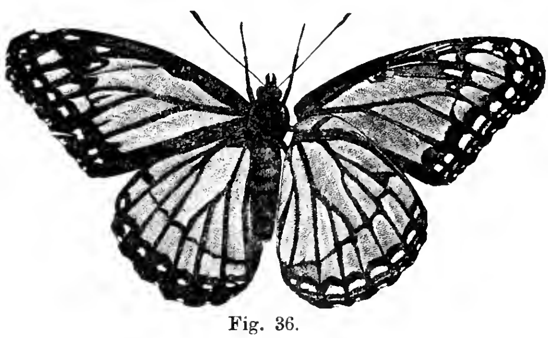


Fig. 36.

whilst but a single specimen of Arthemis came to view, no doubt owing to the lateness of the season. Besides these I noticed quite a number of specimens of Feniseca tarquinius, but could not manage to secure a single one. These interesting butterflies have a peculiar habit of flying anywhere but in the direction the collector is looking. They were all flying in close proximity to the alder bushes, on which their larvae feed upon a species of aphis.

Among the moths I took Catocala relicta and concumbens, also a few other noctuids, some of which were new to me, and I noticed the wings of Euprepia caja lying upon the sand, the body of which some enemy had secured.

Besides the above, some beetles were secured with the aid of the sweep net, but as everything was burnt up with the heat, nothing much was to be done. I did not take any notice of any of the other orders, so cannot say anything about them ; grasshoppers seemed quite plentiful, however.

Dr. Wm. Brodie of Toronto, the well-known entomologist, has, I believe, visited Port Sydney on several occasions and I understand has explored the neighboring vicinity. He stopped at a farm house a few miles down the Muskoka River from Port Sydney, the owner of which is an enthusiastic naturalist, his principal hobby being ornithology. In a conversation with Mr. Crew the doctor stated that during his recent visit during the latter part of June and first week or so in July he had made some interesting captures. One specimen of Euprepia caja was secured by him as well as another moth very similar to caja and probably of the same genus. Dr. Brodie spoke of the plentifulness of Limenitis Arthemis, and reported having taken quite a number of a Chrysophanus, which I understand does not occur at Toronto, and which appeared to be very common ; most of the specimens taken, however, were more or less in a damaged condition. Debis portlandia (Fig. 37) also appeared to be of common occurrence, the Dr. taking some 5 or 6 specimens. The habits of this butterfly are very similar to Neonympha Eurytris, which is our commonest representative of the "ringlets." On the whole the Doctor considered the past season to have been a poor one in the vicinity of Port Sydney, but I am satisfied that with a good season much interesting work could be accomplished there.

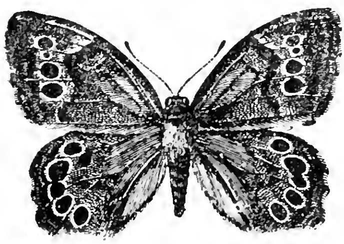


Fig. 37

The country to the north of Port Sydney and Huntsville which is about 12 miles from Port Sydney, contributes some fine specimens of insects. Mr. Tyers has received quite a large number of lepidoptera from the Muskoka region about 25 miles north of Huntsville, among which are some very nice things in the Noctuidae, which are not included in our local fauna, and the majority of which have not, as yet, been identified.

No doubt there are new species yet to be found in that country, which has not, as far as I know, been worked up to any great extent.

RANDOM RECOLLECTIONS IN NATURAL HISTORY.

By J. Alston Moffat, London, Ont.

The aphidivorous habit of the larvæ of *Feniseca Tarquinius* has been well observed and recorded. The striking portraiture of a monkey's face in the form and markings of the chrysalid has also been commented on, and even photographed, yet no one can form a correct conception of its wonderful naturalness until they have seen it. But there is a habit of the butterfly which it at all times indulges in that I have not seen noticed in print, which is quite in keeping with the peculiarities of its previous stages, and, as far as I know, is unique. A favourite situation for this butterfly to rest on, either singly, or in groups, is the open side of a wood, or the leafy branch of a tree projecting into an open space. I have seen a single individual take its position on the extreme point of such a branch, and from there it would dart a little distance to the one side of where it had been sitting, then back to about as far on the other side of it, then back and forth a number of times before it returns to rest on its perch again. The distance it traverses in this movement may be about ten feet, and at right angles to the branch on which it had been sitting. It brings up at each end with a perfect snap, and a perceptible rustle of the wings. It seems to throw itself with great violence, and stop as suddenly, as if it had struck a board ; then off to the other end of its course and back again, to and fro with such rapidity that the eye can scarcely follow it ; then after a short rest it will repeat its performance.

Whether it is the male or female that indulges in this sport, I cannot say, or if it may not be confined exclusively to either sex. I had the good fortune to see the performance enacted three different times, in two of which the exhibition was brought to a fatal termination, but no attention was paid to the sex of the performers. I should be inclined to surmise that it is the male and he only.

When reading some remarks upon the parasitic worms of the genus *Gordius*, more commonly called "Hair Snakes," from the belief entertained by many that they are horse hairs transformed in water into snakes; the writer animadverted upon the ignorance and superstition that still prevailed on this subject, which was considered not at all creditable to the superior education of the present day; which brought back to my recollection something of the tedious process by which my mind was relieved of its ignorance in this matter, and set me a-thinking that if the writer had been possessed of some further information it might have tended to moderate his estimate of himself and others; for there are few erroneous notions in natural history entertained by the multitude, that have such a reasonable excuse for their existence, in nature and in fact, as this one about "Hair Snakes." And seeing that a knowledge of facts is a more certain way of abolishing both ignorance and superstition than the denouncing of either; and as it seems to me that there are extenuating circumstances connected with this subject that are not as well known as they ought to be, I shall give an account of what I at one time saw.

When I was a small boy living in the country, which was at that time "Backwoods," and having no playmates of my own kind, I naturally sought for companionship with other kinds; passing my time in the woods and fields in search of something new, curious or attractive to me, and especially in observing the works and ways of living creatures, in which I found my chief enjoyment. On one hot summer day after heavy and continued rain I was amusing myself in a pasture field that had never been cultivated: and in which were numerous little hillocks with hollows on one side of them, indicating that there, in the long-by-past, trees had grown, been uprooted and decayed. The hollows were filled with pure water from the recent and frequent showers. Their bottoms were smooth and bright green, whilst their clear and crystalline waters reflected every passing cloud that floated over them in the brilliant sunlight. Whilst dreamingly watching the rapid passing of small white clouds reflected in one of these pools, my attention was aroused by an agitation of the water at one side; and upon examination I found a tuft of yellowish white hairs, which had evidently come from some cow's tail, partially in and partially out of the water. The hairs may have been between eight and ten inches in length, and there may have been fifteen or twenty of them together. There was about two-thirds of their length in the water, and the rest on dry ground. The part of them that was on land was a compact mass, as if they had been plucked out together and dropped there; whilst that part of them that was in the water had each individual hair as widely separated from its fellow as it possibly could get, whilst each and all of them were animated by an undulating eel-like movement which they kept up incessently, as if they were making an effort to get off and could not.

I had seen *Gordius* before that, and upon inquiry had been informed that they were "Hair Snakes," from which I inferred that they were hairs turned into snakes; and here sure enough I thought I had found a bunch of them in the process of transforming; but how one portion of a hair could become a living snake, whilst the other part still remained a dead hair, was to me a perplexing and mighty mystery, and remained so for many years afterwards. In some of my promiscuous reading I at length came upon a satisfactory solution of the enigma. It seems that there is an animalcule of some kind that breeds in water, and is in the habit of attaching itself to objects floating in the water, and if these creatures are sufficiently numerous, and the object sufficiently pliable, they can by united action produce an undulating movement, and give to the object an appearance of individual life; and this is what I had seen. Not quite an ocular delusion, but a mental deception of the most convincing kind. I had noticed when looking at the hairs, that the portion in the water appeared stouter than the other, but I satisfied myself with the thought that a living thing should grow; and in after years when I learned that an object in water appeared thicker than when out of it, I wondered if I had not been deceived in that way, but there was an apparent roughness of their surface which I could not account for, as I knew that hairs did not soften and swell in water; but what I had read explained most satisfactorily everything I had seen in connection with them.

If that tuft of hairs had been wholly in the water, and their full length endowed with motion as part of it was, each hair would have been moving independently of the others, and would likely have been scattered all over the pool; then in all probability my attention would not have been particularly attracted by them, further than to think that "Hair Snakes" were unusually numerous in that pool; and so I would have missed an instructive lesson, for what I read would not have impressed me as it did, but for what I had seen previously. This is an experiment that anyone favourably situated for obtaining the right conditions could easily carry out for themselves, and then they would have ocular proof of what a reasonable excuse there does exist for the belief that "hairs do turn into snakes."

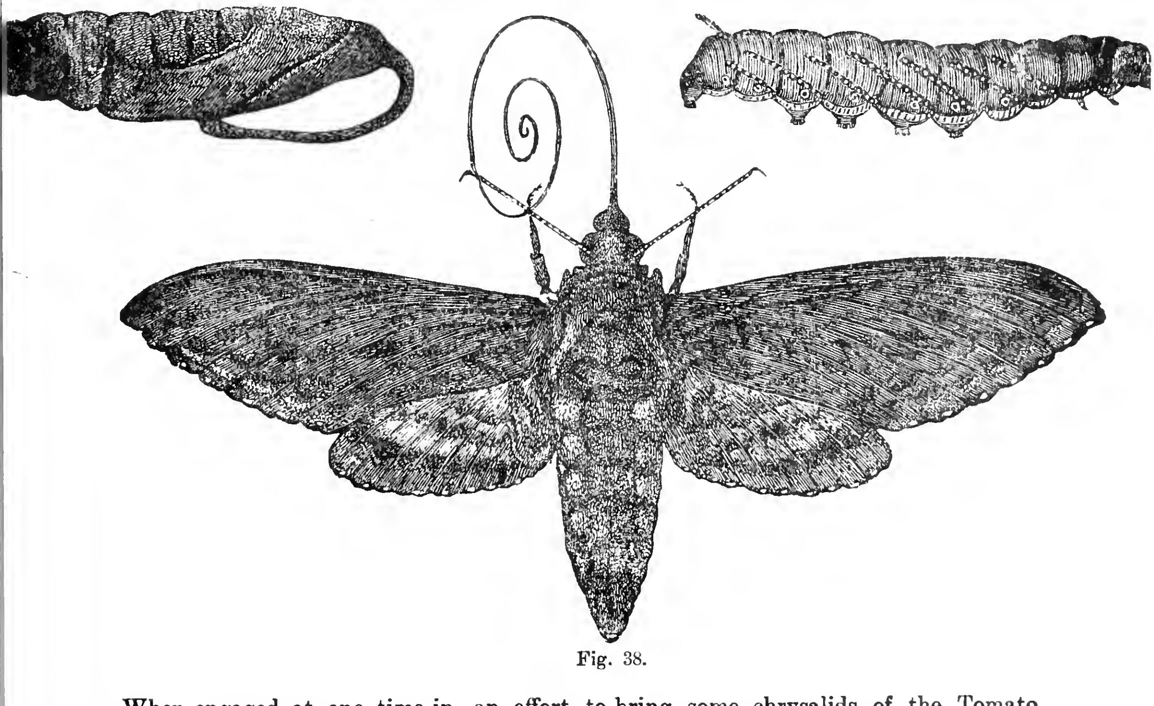


Fig. 38.

When engaged at one time in an effort to bring some chrysalids of the Tomato Sphinx (Fig. 38) to maturity, and obtain the moths, I noticed that one of them was dead, so laid it aside for a time. Upon my next handling it I found the outer skin dry and shrivelled, and upon removing a portion of it, which was an exceedingly thin and brittle scale, I saw that the moth within had been fully matured up to the point of emerging before it died, so finding that I had an excellent subject upon which to operate for discovering the position and arrangement of the various parts of the insect, as they were disposed of in the chrysalid prior to its assuming an active life, I commenced investigating. Carefully removing the outer covering, which came away as freely and as clean as if it had never been in any way attached to the corpse within, but upon which had been distinctly impressed every external feature of the coming moth, the matured pupa was disclosed scaled and coloured complete. The winglets, which were about three-quarters of an inch in length, pressed firmly—in what seems to be an unnatural position—on its breast, instead of on the sides where they are to be afterwards; and the long legs compactly gathered together under the winglets, occupying the least space possible. The external loop on the chrysalid, in which the proboscis, or sucking tube, generally called "tongue," is partly contained, interested me the most, so I gave special attention to it.

Upon removing the outer scale of the loop—which has often been compared to the handle of a pitcher, and to which it bears a striking resemblance—I found that the proboscis within was double. It leaves the head and reaches about two-thirds the length of the chrysalid in the loop, where it touches and is united to the covering of the abdomen; here it is doubled back upon itself, not sharply, but with an open curve, which produces that knob at the lower end of the handle. It then presses closely to the under, or inner side of the descending portion till it reaches the head, where it passes inward to the body of the moth, whence it proceeds downward again, under the folded legs and winglets of the moth to its full length of four and a half or five inches, tapering gradually but perceptibly from base to apex.

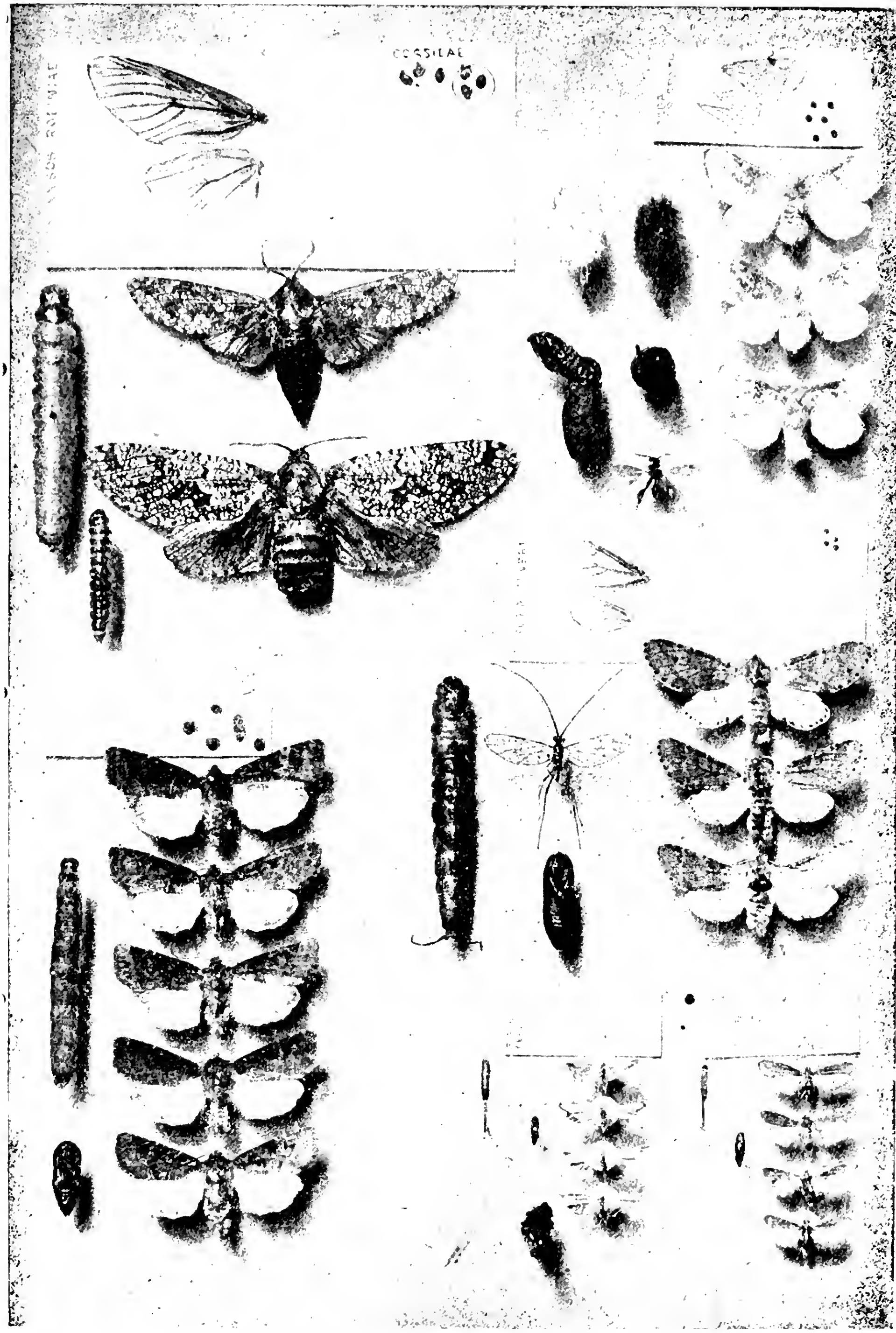
If such a chrysalid was broken open when newly transformed from the caterpillar, it would be found to be an unorganized fluid mass, seemingly held together only by the outer integuments—which parted so freely from what was inside, when matured—and upon which, even at that time, is imprinted all the external outlines of the coming moth, and from which the internal organical structure of the future solid body seems to radiate, and take on form and consistency. What a wonderful transformation is herein brought about by time and favourable conditions! From an unorganized fluid, to a diversified and complicated organism, adapted to a vigorous, active life. And the sucking tube, so delicately and yet so powerfully constructed, that the creature can extend it to its full length of five inches, or roll it up into a coil at its pleasure, not the diameter of a five cent piece. And yet more wonderful if we go back to the egg from which it all came, and within which lay "the power and the potency" for producing all that was to follow. "Never deviating from its course, but always producing a being like the parent." The proboscis is constructed of two longitudinal pieces with a groove on the inner side of each, which forms the cavity through which the moth takes its nourishment. These two pieces are firmly held together side by side by means of interlacing fibres, which yet admit of elasticity to the tube and allow the cavity to expand when food is passing through it, and may be used by muscular pressure in assisting to force it into the gullet. What wonderful adaptations of means to an end are to be observed in nature for the production of organs suited to the requirements of the creatures using them. One can at times see something like the exercise of the inventive faculty in evading or overcoming obstacles in the way of reaching the end required, when these are somewhat out of the ordinary, and with admirable success; impressing the mind with the thought that there must be somewhere, intelligent direction and supervision for the accomplishing of it.

THE PREPARATION OF SPECIMENS FOR THE EXHIBITION OF LIFE-HISTORIES IN THE CABINET.

By Dwight Brainerd, Montreal.

My brother and I arrange our cases in a rather peculiar way, and were complimented by being asked to describe it for the "Report."

The point that bothered us, was to break the lines ordinarily found in a drawer. We have four sizes of cardboard oblongs, cut proportionately, and use them instead of the common name labels. They are placed above each species, should be about half as long again as the wing span, and contain the bleached wings, frass and eggs corresponding to the name across their left hand margin. (See Plate).



Life Histories shewn in a Cabinet (D. Brainerd).

By this method, the drawers are cut up into little squares, each large enough to hold a series together with the caterpillar, ichneumons, etc. One can put a good deal of taste into the arrangement and the effect is certainly good. Outside of looks, I do not know that the system has anything to recommend it. Of course with white cards, the drawer covering must be colored: we employ a rough buff wall paper.

I am asked for some remarks on inflating and wing bleaching. Many books give instructions, but for novices it may be said that caterpillars are inflated or blown by slightly cutting the anal orifice, ventrally, squeezing everything out by the hole so made while holding them between the fingers in a soft cloth; binding a tube in this hole and drying them, inflated by a current of hot air. It is well to have a piece of blotting paper to absorb the drop or two of liquid ejected when the cut is first made, and care must be taken to clean the neck. Neglect of this makes an ugly black blotch.

Benzine is the best thing for killing, as some kinds of caterpillars seem to fatten on chloroform. The stripping and drying should be done immediately the caterpillar is dead. If not, it draws up into all sorts of knots, and if left until relaxed, is too tender. Partially dry the skin before giving it much air pressure or it will get out of shape, and stiffen up the tail end before paying much attention to the head.

I never could make much success of the straw recommended by experts, and always use a glass tube drawn to a point to furnish the air. Lap it with silk three or four times, run slightly into the caterpillar, make a turn or so in front of the last pair of legs and fasten the silk back on the tube. With very small things, this glass can afterwards be cut off by a file, and a headless pin, bent at right angles, stuck in with a drop of gum. Larger species should be slipped off by the thumb nail and pinned through the middle.

The less heat used, the better will be results. A lamp chimney fastened horizontally on a metal coat hook, makes a first class oven. And a candle is the best source of heat as by snuffing it the temperature can be regulated. The flame should be kept at least two inches below the oven, and the segments you are working held over the hottest place. Druggists sell a double bulb inflator now, which is much better than the breath for giving the empty skin its shape.

In bleaching wings, to show the veins, the only suggestion I can offer is the use of wood rather than common alcohol for washing. The oil in it increases the transparency. If bleaching has not been described in past Reports, the wings are torn or snapped off close to the body, soaked a minute in alcohol, and then, to remove the color, in Labaraque olution. When clear, wash again in alcohol, dip in water and mount on a card.

THE BROWN-TAIL MOTH (*Euproctis chrysorrhœa*, L.).

By Dr. James Fletcher, Ottawa.

The specimens of the new pest of fruit and forest trees in Massachusetts which I am able to show to-day, have been kindly supplied for this purpose by Mr. A. H. Kirkland of the Gipsy Moth Committee. They consist of the male and female moths, the egg mass, the full-grown larva and the hibernaculum in which the larvæ pass the winter.

This insect is well known in Europe and has about the same range as the Gipsy Moth. Thirty years ago, when I was a boy, it was not an uncommon species for one season at Rochester, Kent, in the south of England, but I learn that it is now rare. The first notice of its occurrence in America was when Prof. Fernald announced that he had been working on it in Massachusetts in 1897, but it had been noticed by some for four or five years before that date. It is thought to have been imported with nursery stock perhaps as early as 1885. Early last spring it was sufficiently abundant for Mr. Kirkland to point out to me several of the winter nests of the larvæ as we travelled from Boston by railway to Malden, Mass. Most of these nests seemed to be in pear trees. Prof. Fernald has published a bulletin on the subject, and also an extensive article in the proceedings of the last meeting of the Association of Economic Entomologists which was held at Boston. Both Prof. Fernald and Mr. Kirkland consider this insect as a serious pest and urge that drastic measures should be adopted to exterminate it. The latter writes under date, Oct. 5, 1898:—

"The Brown-tail Moth was not a severe pest here the past summer because of the thorough work done last winter in destroying the winter webs of the young larvæ. Where this was neglected the caterpillars proved quite a scourge and from these neglected spots no doubt the moths spread to no small degree in the flying season. The female, you will remember, flies freely. A hopeful feature is the parasite help. We found the pupae parasitised to quite an unexpected degree by *Diglochis omnivorus*, Walker, and by a few larger hymenopterous parasites. Of course, I have only two years' experience to go by, and from this as a basis no strong predictions can be made, but I should not be surprised to see this insect spread gradually over New England and become a pest of about equal rank with the Tent Caterpillar, perhaps worse. Since the female flies so well and is doubtless carried on gales of wind, I can see no prospect of exterminating the insect. While we know that the insect breeds well on many shade and forest trees, I doubt if it becomes a pest at any great distance from orchards."

Kollar, the Austrian entomologist, in his "Insects Injurious to Gardeners, Foresters, etc.," says of this insect which he treats of under the name of the Yellow-tailed Moth: "It may justly be reckoned among the most destructive insects of the orchard. The larvæ often infesting fruit trees to such a degree that not a leaf or fruit remains uninjured, as was the case in the year 1828."

The caterpillars have a very wide range of food plants including nearly all of the large and small fruits; they will also attack a great many of the common perennial plants. The favourite food seems to be the pear. Compared with the Gipsy Moth, as both the male and female moths fly easily, the Brown-tail Moth has greater powers of spreading. The life history of the species is as follows. The winter is passed by the partially grown caterpillars, which hatch in August and feed for about six weeks upon the upper surface of the leaves, stripping them of the skin and cellular tissue in the same way as is done by the Pear Slug, leaving the skeletonized leaves brown and dead. The winter shelter consists of several leaves spun together with silk, and a colony of the young caterpillars retires into this shelter in the latter part of September and remains dormant until the following spring. They revive again just as the buds are bursting and do much harm at that time, devouring the young leaves, flowers and forming fruit. When full-grown in June they spin light cocoons among the leaves, and the moths emerge about three weeks or a month later. The moths appear in July and the curious and beautiful egg masses covered with golden fur-like down may be found on the leaves during this month. They are elongated, depressed, and rounded above, more regular in outline than the egg masses of the Gipsy Moth, but like them protected by a densely felted covering consisting of the golden brown hairs from the anal tuft of the female. Not only are the caterpillars of this insect voracious feeders upon the foliage of many kinds of trees and plants; but they are also the cause of much annoyance from the stinging hairs of the larvæ and pupæ. This stinging is of much the same nature but more intense than that caused by the hairs of the species of *Halisidota*. Prof. Fernald states that many persons in the infested region suffered so severely as to require the aid of a physician and the irritation was so annoying to some of the Gipsy Moth employees that the chemist was directed to investigate the matter to discover the cause and to find out if possible an antidote. Prof. Fernald concludes his article (Bull. 17, New Series, U. S. Dep of Agriculture, Div. of Ent.) as follows. "The nettling of the skin may be caused by contact with the caterpillars, both old and young, or the cocoons, but in the latter case contact is not necessary, as the hairs from the cocoons are blown about by the wind. An English journal mentions the fact that travellers are often affected when the wind blows strongly from infested hedges along the side of the road."

By examining the specimens which I have here, it will be seen that the egg mass is about half an inch long by a quarter of an inch wide. The eggs cannot be seen under their furry covering, but they are round, of a golden color, and there are between 200 and 300 in a heap. The caterpillars vary in appearance during the different moults. The young caterpillars are described as of a dirty yellow color, with a black head and a black ring around the neck. They are thickly covered with hair and have four rows of black dots along the back. They are social in their habits throughout their larval life. From the first they spin a web over themselves, and as a leaf is destroyed another is attached to it by silken strands and gradually becomes part of the nest. The leaves attacked are also fastened securely to the twigs. The nest is never entirely forsaken; when the caterpillars get larger they sally out in search of food but return from time to time to their refuge. The mature larva (as exhibited) is rather a handsome creature, velvety black lined with brown and bearing on each segment tufts of golden brown bristles. Along each side is a conspicuous lateral interrupted white stripe with tufts of curious hair-like processes. On segments ten and eleven are spherical reddish yellow tubercles, one on each segment, similar to those found on the Gipsy Moth. These the caterpillars can elevate or depress at pleasure. The head is black mottled with brown, and the full-grown larva is nearly an inch and a half in length.

Köllar speaks of pupation taking place by preference upon damson trees, the caterpillars leaving apple and pear trees to pupate upon the damsons. He also speaks of the mode of pupation as follows: "After the last moult, which the caterpillars undergo either in the old nests under the new web or in the open air, they disperse over the different fruit trees in the garden. Pupation takes place in June; several again unite, roll some leaves together into a ball, make for themselves jointly a brownish web and become dark brown pupæ. There are from four to twelve in a ball."

Among remedies, this author recommends highly the collecting of these balls, which are generally found either on damson trees or, when these are not present, upon the lower branches of the trees which have been attacked. The Brown-tail Moth is a night flying insect which is very active at night, but sits quietly without movement during the day time. The four wings and thorax are of a snowy whiteness; the antennæ are golden brown, white above, and in the male widely pectinate. The abdomen is dark brown in both sexes, that of the female bearing at its posterior extremity a round mass of golden yellow hair, which entirely disappears by the time egg laying is completed, the component hairs having been deposited by the female over the mass of eggs as a covering.

The work which has been done in connection with the Brown-tail Moth is another instance of the grand service which is being rendered to the State, the Union and the cause of economic entomology by the Gipsy Moth Committee. The laws which have been enacted in Europe, and already in Massachusetts, show the necessity of attending to this enemy at once before it gets beyond control. It is well for the country that chance has introduced it within the area so well watched by the expert entomologists and officers of the Gipsy Moth Committee. The careful experiments which have been carried on by these gentlemen show that the destruction of the webs in winter and the spraying of trees when the caterpillars are active, supplemented with lantern traps, are effective means of keeping down the numbers of this insect, and, further, that if the matter is neglected we have in this new pest an enemy with great capabilities for spreading and doing harm, which should stimulate effort on the part of everyone living in the infested areas to do what is advised by the Committee promptly, so that, if still possible, so destructive an enemy may be prevented from spreading over a large area of country. The experience of some districts which were systematically worked by destroying the conspicuous winter shelters with the caterpillars inside them in 1897 8, is very instructive, for there were practically no moths in these districts last summer; but in adjacent places where no effort was made, the moths have increased to such an extent that these cleared districts will probably be re-infested and all the work will have to be done over again.

INJURIOUS INSECTS IN 1898.

By Dr. James Fletcher, Ottawa.

The crops of the Province during 1898 have not suffered generally from any unusual or even locally severe outbreak of injurious insects. There have been, of course, losses in all crops from the ordinary annually-recurring pest s; but the wide awake Ontario farmer now knows pretty well what to do or where to get the necessary information, when he notices an unusual abundance of an insect enemy. We may again be thankful for a season of good crops, and for the most part these were got in in good condition. The general results of the year are given concisely in the excellent Crop Reports for November, issued by the Deputy Minister of Agriculture, Prof. C. C. James. The only drawbacks of the season were exceptionally hot weather with drought in some sections in July and August and a rather wide-spread and almost unheard of frost in the month of July, which affected some tender crops. The autumn was long and fine, with no severe early frosts, thus allowing all root crops and fodder to pick up well.

Cereals.

The cereals throughout the Province have made an excellent showing. Owing to the increase in the price of wheat last autumn, a large area was sown to this staple crop. The hot, dry period referred to, although it ripened up some oats rather prematurely, produced wheat of exceptionally fine quality. Mr. W. Scott, of the McKay Milling Co'y of Ottawa, a large buyer of grain, tells me that he has not seen for many years wheat of such high quality as he has this year received from some parts of the Ottawa Valley, some samples running as high as 64½ lbs. to the bushel, without any sign of injury by the Wheat Midge or other insect enemies.

"Poor yields were exceptional, and large yields were common. The plumpness of the grain is frequently alluded to, in many cases the weight going over the standard, and as high sometimes as 63 or 64 lbs. to the bushel. Here and there only did correspondents complain of rust, midge, or other injury to the crop. The yield is 24 bushels per acre for Fall Wheat. . . . . The crop of spring wheat has been over an average in yield, and the quality is also good. The yield is 17.7 bushels per acre."—(November Crop Report, Ont. Bureau of Industries, p. 2.)

Barley yielded heavily, and the sample, for weight and color, has seldom been surpassed. I have not heard of any injury by insects.

Oats were in places light, and in some localities suffered from the attacks of the Grain Aphis, Wireworms, and Cutworms. The injury by the first of these was light. As is usually the case, the parasites which invariably accompany this plant-louse, increased in enormous numbers and the plague stopped. The parasite which did best service was *Aphidius granariaphis*, Cook.

Devastating Dart Moth. A rather bad attack of the Glassy Cutworm (*Hadena devastatrix*, Brace), Fig. 29, the caterpillar of the Devastating Dart Moth, occurred on the farm of Messrs. J. Yuill & Sons, at Carleton Place.

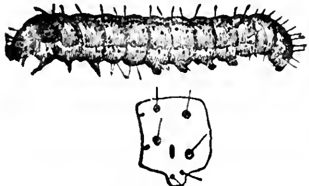


Fig. 39.

When insects attack a crop of grain it is always difficult to apply any remedy to the standing plants and the only resource is the practising of agricultural methods founded on the known life-history of the pest. Most insects feed upon closely allied plants; the wisdom, therefore, is apparent of following an infested crop belonging to the grass family with another consisting of plants belonging to a different botanical family.

Among the Cutworms, the two worst enemies of grain crops in Ontario are the species referred to above and the AMPUTATING BROCADE MOTH (*Hadena arctica*, Bois.), and although it is probablethat the latter of these may feed on other plants, the favorite food plants seem to be members of the Gramineæ or true grasses, upon the roots and lower stems of which they feed in a similar manner to the Glassy Cutworm.

This Cutworm is a more troublesome pest when it attacks grain crops, from the fact that the caterpillar does not become full-fed until some time later. In an attack of this kind it is, of course, necessary to examine the caterpillars to see how nearly they are full-grown. In the case referred to above the cutworms of the Devastating Dart Moth from Carleton Place were found to be full-grown by the end of the first week in June, and the owners of the field, who wished to sow their land again to oats, were advised that this could be safely done. The land was cultivated at once, and on the 8th of June was seeded down again to oats and grass. This crop was not attacked at all because the caterpillars were all in the chrysalis condition. This would not have been the case if the infesting Cutworms had been the caterpillars of the Amputating Brocade Moth.

Even less amenable to remedial treatment than the above are the various species of WIREWORMS (Fig. 40), which attack grain crops particularly on timothy sod. No satisfactory remedy for these has as yet been discovered. Sowing rye or barley on infested land has been found useful by some, and late ploughing is highly recommended; but no applications to the land or poisoning of the seed are of any avail.

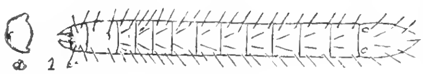


Fig. 40.

An interesting discovery has been made during the past summer at Toronto, by Mr. C. W. Nash, and at Norwood, Ont., by Mr. T. W. Wilkins, of a parasitic fungus belonging to the genus *Cordyceps*, which was in both places destroying the wireworms in considerable numbers. This fungus was much more slender than the one which is frequently figured as the parasite of the White Grubs (*Cordyceps melolonthæ*, Tulasne) (Fig. 41). So far, the identity of the wireworm destroying species has not been obtained. It is probable that it is an undescribed species.

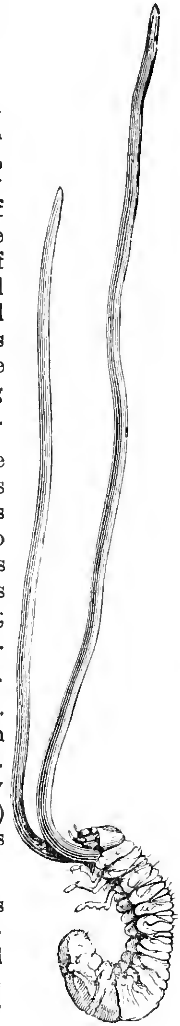


Fig. 41.

THE WHEAT MIDGE (*Diplosis tritici*, Kirby), which a few years ago worked such havoc in the wheat crop, seems almost to have disappeared from Canada; however, one district seems to have suffered severely from this pest last season. This was along the shore of Lake Ontario in the Niagara peninsula. Another pest, which did not appear at all in 1898, is the American Frit Fly (*Oscinis carbonaria*, Loew.), which in 1890 injured wheat very much in the eastern portions of the Province. For three years before that it had also been an enemy of meadow grasses.

THE WHEAT-STEM MAGGOT (*Meromyza Americana*, Fitch), although present in most localities where looked for, seems lately to have gone back to a large extent to its natural food plants, the wild native grasses.

The most important attacks upon wheat, and these were by no means extensive or severe, were by the old and well-known culprits, the Hessian Fly (*Cecidomyia destructor*, Say) and the Joint-worm (*Isosoma tritici*, Riley).

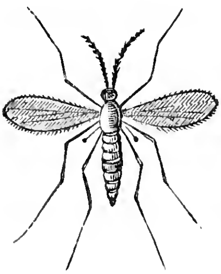


Fig. 42.

The Hessian Fly (Fig. 42—greatly magnified) is probably more prevalent than it is generally thought; but as its depredations in most places are not serious they are not observed. The injuries to fall wheat in the autumn are greater than by the more conspicuous attack on the stem during the summer by the spring brood. Occasionally the spring brood attacks the wheat plants in the succulent root shoots just as is done by the autumn brood; this would be due I think to a late spring holding back the development of the wheat plants, The eggs would be laid on the leaves, and the young maggots might attack the shoots too severely to allow of them developing into stems. It has been frequently noticed that insects are not belated to the same extent as plants by cool spring weather,

The Wheat Joint-worm (*Isosoma tritici*, Fitch). (Fig. 43—the fly highly magnified). In 1895 specimens of injured wheat straws bearing many galls in the bases of the sheathing leaves of the stems were sent from Meaford, on the Georgian Bay, by Mr. Thomas Harris; these were considered to be *Isosoma hordei*, Harris. The injury to the infested crop amounted to 5 per cent. There was no recurrence of the attack last year at that place; but a somewhat similar attack upon wheat appeared at Verdun, Bruce Co., on the opposite side of the peninsula. Many specimens were sent to me by Mr. William Welsh, both in the autumn of 1897 and last spring. The galls were different from the Meaford specimens in that there was little swelling, and the cells of the larvæ were almost entirely in the tissues of the stem proper, short sections of which were rendered hard, woody, and brittle by the operations of the insects. From some of these stems a large number of the flies were reared. These have been identified by Dr. L. O. Howard and prove to be *Isosoma tritici* of Fitch. The injury was serious, attacked stems producing fewer and smaller grains than the others. From the Verdun material, in addition to the gall makers, two kinds of parasites were reared, *Homoporus chalcidiphagus*, Walsh, and *Eupelmus epicaste*, Walsh; but these were not present in sufficient numbers to affect the outbreak to any appreciable degree. During the past summer loss from this Joint-worm was not so great as in 1897, so it is to be hoped that its natural enemies may have increased. The eggs of the joint-worms are inserted into the young green straws in June by the female flies. Wheat, oats, rye and barley are damaged. There is only one brood in the year, a few of the flies issuing in the autumn, but most of them not till the following spring. Most of the galls are situated in the first or second joints of the stem above the root, and, as the normal time of emergence is in the spring, any treatment of the stubble such as burning over or ploughing down deeply, by which the insects are destroyed or smothered, must reduce their numbers considerably. Mr. Welsh noticed that many of the hardened portions of the stems were broken from the straw in threshing and were found among the rubbish or in the grain. These pieces from half an inch to one inch in length contain from five to ten larvæ. This shows that, besides treating the stubble, these pieces of stem as well as the straw must also be attended to. The broken-off hardened pieces should be collected at threshing and cleaning and burned. Likewise straw from fields where the joint-worms have been found should be destroyed by either feeding or some other means before the time at which the flies should appear.

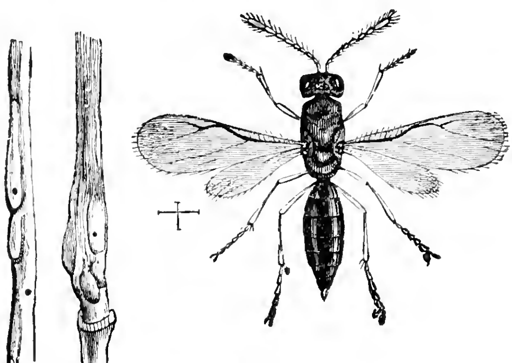


Fig. 43.

The Pea Weevil (*Bruchus pisorum*, L.). As in previous years many inquiries have come in for the best means to kill the "pea bug" in seed pease. The life-history is well-known; the eggs are laid on the young green pods; the grub on hatching eats its way in and penetrates one of the forming pease. There it remains until full-grown, consuming the interior of the pea and passing through all its stages from a white fleshy grub to the chrysalis and then to the perfect beetle. A small proportion of the beetles emerge the same autumn and pass the winter under rubbish or in barns and other building. The larger number, however, remain in the pease and do not emerge until the next spring, so that they are frequently sown with the seed. The perfect insects fly easily and resort to the pea fields about the time the blossoms appear. They feed for some time on the flowers and leaves, and egg-laying takes place as soon as the pods are formed.

Remedies.—The best remedy for this insect is, undoubtedly, to treat the seed with bisulphide of carbon. Nearly all the large seed houses have special buildings for this purpose, and few seed pease are sold which have not been treated. Should it be found, however, when sowing pease, that they contain living weevils, it is an easy matter to treat them. Perhaps the most convenient way for farmers is to take an ordinary 45 gallon coal oil barrel. Into this 5 bushels of pease may be put at one time. According to the quantity of seed to be treated, use 1 ounce of bisulphide to every 100 pounds of pease; therefore, if the barrel is filled, put 3 ozs. of the chemical in a flat, open saucer or basin on the top, or pour it right on the pease; cover up the top quickly with a damp sack or other cloth and put some boards over that. Bisulphide of carbon is a colourless liquid which volatilizes readily at ordinary temperatures; the vapour which is quite invisible, but has a strong, unpleasant odour, is heavier than air, therefore sinks readily and permeates the contents of any closed receptacle. This liquid is very inflammable; so great care must be taken with it. The pease should be treated under a shed out of doors, and should be kept tightly closed up for 48 hours. No light of any kind must be brought near, or an explosion may occur.

The late sowing of pease is sometimes practised to avoid the weevil; but this plan is not approved of, as the crop is small and is then frequently attacked by mildew.

Seed pease may be held over without injury for two years, and this is a sure remedy against the Pea Weevil; for the beetles must emerge the first spring, and if the pease are tied up in paper or cotton bags, as they cannot eat through these materials, they will all be dead before the second spring. Weevilled pease should not be used as seed, as they produce, if they grow at all, weak, spindly plants.

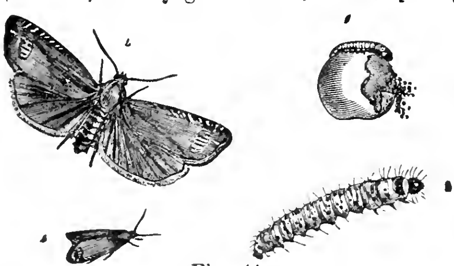


Fig. 44.

The Pea Moth (*Semasia nigricana*, Steph., Fig. 44). For many years pease in all parts of Eastern Canada have been much injured and sometimes rendered quite unfit for the table by the caterpillars of a small moth. The large, late garden pease have suffered most. Although its injuries were so considerable, it was only last year that the moth was reared and its identity determined. Maggoty pease are well known to the housekeeper; but it is only at intervals of some years that they are abundant enough to cause much complaint. The caterpillars are whitish and fleshy, with dark heads and some dark tubercles on the segments, from each side of which a slender bristle springs. When full-grown they are about $\frac{1}{4}$ inch in length; they then eat their way out by a small round hole through the pod and enter the ground a short distance, where they spin small oval cocoons in which they pass the winter, and the perfect moths do not appear again until nearly the middle of the following July. Dr. J. Ritzema Bos, in his Agricultural Zoology, says of the same or a closely allied European species: "The moths fly about in large numbers around the pea blossoms, always a short time after sunset. The females lay one, two, or at most three, eggs on a very young pod. In fourteen days the caterpillar is hatched, bores into the pod, and attacks the pease. The pease attacked are covered, while in the pod, with the coarse-grained excrement of the caterpillar and are often united, two or three together, by a web." The perfect moth is a modest-coloured but pretty species, $\frac{1}{2}$ inch long when the wings are closed, mouse-coloured, bronzed towards the tips of the wings, silvery gray beneath. The only markings are along the front costa and at the apex of the fore-wings. The costal marks consist of 10 or 12 short, black streaks separated by similar clear white dashes; near the apex is a flask-shaped mark which bears 4 or 5 short, longitudinal, black dashes. Last year the attacks of the Pea Moth upon pease in Ontario were considerable, Mr. John McMillan, M.P for Huron, even putting the loss at one-third of the crop in his district.

Remedy—As a remedy, deep ploughing has been recommended. It has also been found that early sowing and the cultivation of early varieties enable the pease to mature before the moths are on the wing. The perfect insects have been reared both in 1897 and last season. In the former year all the specimens emerged between July 12 and 15, and in 1898 between July 13 and 15. These specimens were kept under natural conditions, and these dates probably agree with the time the moths appear naturally in the field.

The Bean Weevil (*Bruchus obtectus*, Say, Fig. 45). From time to time notices appear in reports of entomologists and in the newspapers in the United States of injury to seed beans by a weevil similar to the Pea Weevil, but rather smaller. This is the Bean Weevil, a small, very active beetle, at one time thought to be a native of America but now considered to be a cosmopolitan species, which has been imported into this country through commerce. Authentic instances of this pest having occurred in Canada in injurious numbers have not, I believe, been recorded until this year, when it was found at Strathroy, Middlesex Co. As in the case of the Pea Weevil, the Bean Weevil occurs in the seed and is sown with it. The eggs are laid on young forming pods and the grubs eat their way inside and attack the seeds. There is, however, one important difference in the life history, namely, the bean weevils are able to propagate in the dry, stored seed, and two or three broods may come to maturity and entirely destroy the beans, whereas in the case of the Pea Weevil the young grub can only begin life in the soft, green pease; again, there is never more than one weevil in a pea, while in the case of the Bean Weevil, ten, twelve, or more, may occur in a single bean, according to its size.

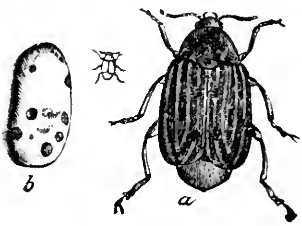


Fig. 45.

Remedy.—The remedy for this new enemy of the bean is precisely the same as for the Pea Weevil, viz., to fumigate the infested seed with bisulphide of carbon. If, however, it is found that the beans have been badly bored before the injury is detected, it is far better to destroy the whole by burning and procure new seed without going to the trouble and expense of fumigating.

Fodder Crops and Roots.

Fodder crops of most kinds have been remarkably heavy in most parts of the Province during the past season. In the Ottawa Valley such crops of clover have never before been seen, and with the exception of a little injury by the Black Army-worm, *Noctua fennica*, Tausch. in the spring, both crops were exceptionally heavy and were saved in the best of condition. In the west one or two occurrences of the Clover weevil (*Phytonomus punctatus*, Fab.) were mentioned but no appreciable effect upon the crop was made.

The Clover-seed Midge (*Cecidomyia leguminicola*, (Lintner) did a good deal of harm in the seed growing districts and some farmers speak of turning their attention to the Mammoth Red Clover and Alsike, because these varieties are not injured by this troublesome insect. The remedy of feeding off or mowing the crop before the 20th June has been found satisfactory by those who have tried it, because the maggots (Fig. 46) of the first brood mature and leave the clover heads to enter the ground and complete their changes soon after the date given, and if the clover is fed or cured before that date the larvæ are destroyed If left later the maggots leave the clover heads and produce the second brood which matures just as the second crop, from which the seed is reaped, comes into flower. About the time

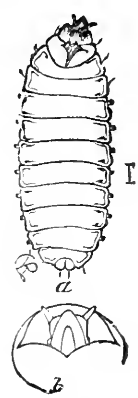


Fig. 46.

the seed is ripe these leave the clover and pass the winter in the ground, to emerge again the following spring just at the time the clover blossoms.

The hay crop has been little injured by grasshoppers or other pests. In old worn out meadows "Silver top," caused by leaf-hoppers and other sucking insects, has been noticed; but well worked land with a good rotation of crops suffers little from this injury.

Potatoes have been less attacked by the COLORADO POTATO-BEETLE than usual. Early in the season some correspondents thought that this pest was dying out, but the hot weather of midsummer soon brought it up to its usual abundance. The well tried remedy, Paris green, in either wet or dry applications, is now too well known to require more than a reference.

Injuries by White Grubs and Wireworms were more serious than is often the case, and unfortunately little can be done to counteract their operations.

Fig. 47.

THE CUCUMBER FLEA-BEETLE, Fig. 47, (*Crepidodera cucumeris*, Harr.) which frequently does great damage to potatoes by perforating the leaves, has been successfully treated again this year by spraying the plants with Bordeaux mixture and Paris green made with the formula 6 lbs. of copper sulphate, 4 lbs. of fresh lime and 45 gallons of water, to which $\frac{1}{2}$ lb, of Paris green is added. This remedy is now becoming well known, and on account of its usefulness widely used by our wide awake farmers to prevent the loss which is still enormous from the ravages of the Potato-rot. The first spraying should be done in Ontario not later than the 1st August, and this should be followed by two more applications on 15th August and 1st September. These sprayings also, of course, render unnecessary the treatment of the potatoes for the Colorado Potato-beetle, as those insects are killed at the same time.

A rather unusual injury to potatoes was this year reported from Carrville, York Co., by Mr. J. Lahmer. This was by the FOUR-LINED LEAF-BUG (*Pœcilocassus lineatus*, Fab.), and occurred at the end of May. The attack was, however, restricted in area and did not continue late into the season. The life-history of this pest has been worked out by Prof. Slingerland, of Cornell University. The eggs are laid in the terminal twigs of currant and other bushes in the autumn and do not hatch until the following spring. The bugs attack the leaves of the currant and some other shrubs to a certain extent, but are more injurious to various herbaceous perennials. The plants most often noticed as injured by this insect are Sage, Mint, Gooseberry, Currant, Dahlias, and the Japanese Honey-suckle (*Weigelia*), Potatoes and some other plants less frequently. It is hardly likely that this insect will ever prove a serious enemy of the potato crop. The mature insect is a bright greenish yellow bug three-tenths of an inch in length, with two black spots on the thorax and four stripes of the same color down the back. It is very quick in its movements.

Remedies.—As the eggs are laid in the twigs of bushes and are comparatively conspicuous, owing to the white tips protruding, wherever the bugs have been troublesome the eggs should be looked for and destroyed during the winter. The bugs and larvæ can be killed or driven away by dusting with pyrethrum insect powder, or by spraying with kerosene emulsion or whale-oil soap solution.

THE TURNIP APHIS OR CABBAGE APHIS (*Aphis brassicæ*, L.). Turnips in many sections have been badly injured by this plant-louse, which has been one of the worst enemies of root crops during the past season. Although much loss is due to this pest every year, as a rule, nothing is done by farmers to remedy the evil, many volunteering the information that nothing can be done. This, however, is not the case, for successful experiments have shown that, by spraying the plants bearing the first colonies which appear early in August, much may be done to protect a crop. At the time of thinning and hoeing turnips the colonies are small and may be easily treated by means of a knapsack sprayer with kerosene emulsion (one part to nine of water), or with whale-oil soap, one pound in eight gallons of water; or even by hoeing out the infested turnips and covering them with soil, an easy matter at that time with the hoe in hand.

VEGETABLES.

Vegetables in gardens suffered locally from the usual pests of the garden, Cutworms, Flea-beetles, Onion, Radish and Cabbage maggots. For cutworms, banding freshly set out plants with paper or tin collars was quite effective; and for plants grown in rows, bran poisoned with Paris green was most effectual, either slightly dampened so as to make the poison adhere and then distributed in small heaps along the rows, or with more bran added until it was almost dry and then drilled along the rows. Flea-beetles (*Phyllotreta vittata*, Fab.) on radishes, young cabbages and turnips were speedily disposed of by dusting the plants with Paris green, 1 lb. in 25 lbs. of perfectly dry land plaster. The ROOT MAGGOTS were unusually abundant and many experiments were tried to find a good remedy. Dusting Hellebore and Insect powder well down among the plants gave perhaps the best results with radishes and onions. For the cabbage maggot Hellebore 2 oz and Kainit 2 oz. were mixed in a pailful of water; about half a teacupful poured around the root of each cabbage after pulling away some of the earth, gave considerable protection but was not a perfect remedy. Kainit used alone, dissolved in water, or applied dry close to the roots of cabbages, onions and radishes and then covered with soil, or dusted on the surface close to the roots, had the effect of protecting the plants for a time, but did not give with me results sufficiently good to allow of its being recommended in the way some American growers have done. Last season, however, was an exceptionally bad one for all of the root maggots; radishes, onions and cabbages all being attacked severely from early in the spring until right up to the hard frosts of autumn. Kainit however is a quick acting fertilizer and a decided insecticide. Further experiments have been planned, and growers of vegetables can use it with advantage in ordinary years.

THE CARROT RUST-FLY (*Psila rosæ*, Fab). An attack upon carrots which has recently called for attention in Canada is by the European enemy of the carrot, called the Carrot Rust-fly. This has come under my notice occasionally during the last ten years in parts of Ontario, Quebec and New Brunswick, in all cases doing much harm in restricted localities, but as a rule disappearing after a year or two. The outbreaks, however, are, I fear, becoming gradually more numerous. During the past autumn infested carrots were sent to me from Knowlton and Beauce in Quebec Province and from Ottawa in Ontario. The attack is easily recognized. Early in the season the leaves of young carrots turn reddish and the roots will be found to be blotched with rusty patches, particularly towards the tip. These carrots when stored for winter use, although sometimes not showing much injury on the outside, may be found to be perforated in every direction by dirty brown burrows, in which are many semi-transparent yellowish maggots about $\frac{1}{4}$ of an inch long. These maggots are blunt at the tail end, but taper toward the head, where is a black hooked tip, forked at the base, by which the maggot makes its way through the roots. The pumparium is reddish-brown, and the maggots, as a rule, leave the carrots before assuming this form. The fly and its work are shown very well in the figure (Fig. 48) by John Curtis, which I am able to present herewith through the courtesy of Miss Ormerod and Messrs. Blackie & Sons. The mature fly is two-winged, $\frac{1}{4}$ of an inch long, bright shiny black, with yellow legs and red eyes. The wings are beautifully iridescent. The winter is passed either as a maggot or in the puparium.

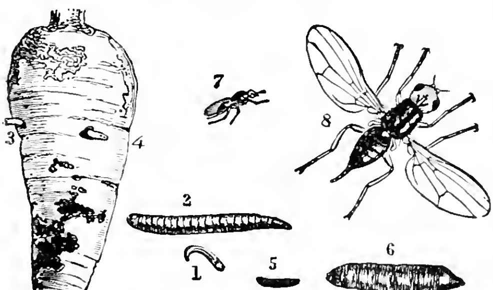


Fig. 48.—The Carrot Rust-fly—natural size (1, 5, 7), and enlarged (2, 6, 8).

Remedies.—The methods which have given the best results in preventing injury by the Carrot Rust-fly are (1). Late sowing. Carrots which have been sown late have been found much freer from attack than those sown at the ordinary time. When grown as a field crop it is usual to sow carrots as soon as possible, but for table use carrots of excellent quality may be obtained from seeding as late even as the middle of June. If field carrots grown for stock are only moderately attacked they can be fed but, of course, are not as good as sound roots. (II.) Preventive remedies consist of applications of strong smelling substances by which the characteristic odor of the carrots is masked. For this purpose, sand tainted with coal oil or carbolic acid, has been used to good effect. Kerosene emulsion diluted 1 to 10 and sprayed along the drills by means of a knapsack sprayer, also gave comparative immunity. In localities where the fly is known to have occurred, the ordinary precaution of sowing carrots as far as possible from the infested land will occur to all growers Where carrots have been stored away during the winter in sand or earth, this soil should be treated to destroy the pupæ, which leave the roots and enter it to pass their pupal stage. A convenient method is to put the soil into a wet manure pit, or, if this cannot be done, it might be buried in a deep hole, specially dug for the purpose, and, after covering up, the top soil should be firmly tramped down.

THE CORN-WORM (*Heliothis armiger*, Hbn.). Several correspondents have complained of the unusual abundance this autumn of the caterpillars of what Prof. Lugger calls the Sweet-Corn Moth or Tassel Worm. These are both good names, but the insect is far more generally known as the Corn-worm. It is also the same as the notorious Boll Worm of the cotton, to which crop it frequently does great damage. Unfortunately, no very good, practical remedy has been discovered for application in the cotton field. The injuries of the Corn-worm are in Canada almost confined to the fruit of tomatoes and to sweet corn, particularly the late varieties. Late in October, Mr. C. L. Stephens, the Secretary of the Orillia Horticultural Society, sent specimens of the caterpillars and injured ears of corn, with the information that the caterpillars had been very destructive, injuring as much as 95 per cent. of the ears of both sweet corn and yellow field corn. It was a new outbreak in the locality, and was the cause of considerable anxiety. Specimens were sent also from Sombra (Lambton Co, Ont.), and two rather bad occurrences came under my notice at Ottawa. The caterpillars do not appear until late in the season. In the month of October they were found of all sizes eating the young grains of corn, mostly near the tips of the ears. There were sometimes five or six caterpillars in a single ear, many of which were rendered quite unfit for the table. As the larvæ approached full growth, they would occasionally eat their way out of one ear by a neat round hole and travel to another ear. They were very variable in color, from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in length, of a pale-greenish or dark-brown color, marked with longitudinal dark stripes and with a conspicuous stigmatal band, white mottled with pink, the body bears the ordinary tubercles, which are distinct and black, each one supporting a slender bristle. The whole upper surface is marbled with white and the whole surface velvety, by reason of numberless and very short bristles, black and white in about equal numbers. When full grown, these caterpillars eat their way out of the ears and, entering the soil, spin cocoons, within which they change to chestnut-brown pupæ. This moth is by no means a common species in Canada, and all the specimens I have seen have been taken late in the year. Prof. Lugger states that the insect does not winter in Minnesota, but that all are killed late in the fall. This, he points out, would mean that the insect has to be re-introduced every summer from the South, where it can successfully hibernate. Whether this is also the case in Canada, I am not sure, but I think that some must with us pass the winter as pupæ. The moth, like the caterpillar, is very variable in color. It is usually of a pale, dull, ochreous yellow, with variable olive or ruddy markings on the fore-wings. The yellowish hind wings have a broad black band and are edged with pink. These moths expand a little more than an inch and a half. The caterpillars of the Corn Worm feed, besides, upon a great many other kinds of plants than those mentioned, such as pumpkins, tobacco, beans, peas and a large number of weeds and garden plants.

Remedies.—The only remedy which can be suggested is the hand-picking of the caterpillars. The destruction of the moths by lantern traps has been also recommended: these consisting of a lamp standing in an open pan containing water and a little coal oil. These traps are placed at night in fields where the caterpillars have been abundant. When an ear of corn is attacked, the silk shows the effect of the injury going on beneath the husks by being discolored prematurely. As soon as this is noticed, the leaves of the husk should be pulled back and the marauders destroyed. Fall ploughing will, doubtless, break up the cocoons and expose many of the pupæ to various enemies.

Fruit Crops.

Notwithstanding several adverse circumstances, the fruit crop of the Province was a good one, and satisfactory profits were realized. If the crop was short in one section it was abundantly made up somewhere else. "Notwithstanding all disadvantages, the returns from all over the Province, with the exception of a few northerly counties, show that the supply of fruit, more especially apples, was considerably more than sufficient for home consumption. very large shipments having been made to England and the United States from the western fruit growing section. Pears, peaches, plums and smaller fruits were also shipped from many localities." (*November Crop Report.*)

Insect enemies were the cause of much loss; but most convincing evidence was again given this year of the value of spraying, and undoubtedly one of the most instructive and interesting exhibits at the Toronto Industrial Fair was the display of fruit gathered from sprayed and unsprayed trees in the same orchard These orchards were those in which Mr. W. M. Orr, the Provincial Superintendent of Spraying Experiments, had carried on his work during the summer of 1898, and were situated in twenty-four different localities. There were in all 250 plates of fruit. The owners of the orchards were in no way interested in trying to prove that spraying was or was not beneficial, but were practical men anxious only to know how to get the largest returns of money from their property. They would, therefore, be the very people to acknowledge poor results. The superintendent had nothing to do with the selection of the actual fruit shown, and did not see it until it arrived in Toronto, where he took charge of it and displayed it to good effect as a most convincing proof of the efficiency of spraying. At the last meeting of the Ontario Fruit Growers' Association at St. Catharines on December 2nd, 1898, Mr. Orr read his report on the results of the experimental spraying work carried on for the Ontario Government under his direction during the year. This is a most valuable document, and will be published in full in the Report of the Fruit Growers' Association. Mr. Orr explains his method of work and gives extracts from the letters of some of the owners of the orchards. In estimating the percentage of perfect apples, a part of the tree was picked clean and the fruit carefully examined; every specimen that had a worm or a spot, no matter how small, being rejected as imperfect. Some of the facts given and the figures which substantiate them will certainly convince many that spraying does most decidedly pay. The spraying must, however, be done properly, without stint of labour or materials, with the best obtainable apparatus and at the proper time. I am more and more convinced that failure to protect crops by spraying is due to lack of skill or carelessness in applying the spray, disregard as to the exact date when the successive applications should be made and misdirected economy as to the pump and nozzle used. Occasionally, good, careful fruit-growers find that spraying does not always give the results which they expect; Mr. Orr, however, says, "The owners of every orchard in which we worked this year, with one exception,—Mr. Curwen, of Goderich—report that the Codling Moth was largely controlled by spraying."

I give the following quotation from Prof. L. H. Bailey's recent pamphlet, "Impressions of Our Fruit-growing Industries," because it bears directly on this point, he says: "Does spraying pay? The past season has given strange results in spraying; in very many instances spraying seemed to do no good. Does spraying pay, then? Certainly, the same as tillage and pruning do. We do not know why there were so many unsatisfactory experiences in 1898, but this does not lessen the fact that bugs and fungi should be killed. That spraying pays is as well demonstrated as it is that apple worms, tent caterpillars and potato blight are injurious. Markets often fail, but it does not follow that markets are a nuisance. The surest way is to make it a rule to spray everything every year." (*Cornell Bulletin 153*, 1898.)

In summing up the results of the spraying work of the season, Mr. Orr said at St. Catharines: "It appears from results obtained in experimental work that from 65 p.c. to 80 p.c. of perfect fruit can be secured when spraying is regularly and properly done, and when the conditions are favourable, such as an orchard standing high and dry on well-drained land, away from buildings or hedgerows, and the trees planted far enough apart so that the limbs do not come within 10 or 12 feet of touching, and have an abundance of sunshine and free circulation of air. It is also important that the trees be properly trimmed, all rubbish removed, and the land properly fertilized, for it is a fact that two-thirds of the orchards in Ontario are starving. With good apples at the price they have commanded this year and last, the orchard, if properly attended to, would be the most profitable part of the farm."

If the fruit-growers of Ontario, generally, can be made to appreciate the above statement of Mr. Orr, who is a practical fruit-grower, and will follow his advice, enormous advantage must accrue to the country from the good work which the Provincial Minister of Agriculture, the Hon. John Dryden, has done by having the spraying experiments and other work on injurious insects carried out. In fact, it is hard to find in the whole Provincial expenditure anything which has given such manifest and quick returns for the small amount of money expended. The great interest which was taken in this work of spraying is shown by the fact that over 3,500 fruit-growers attended the meetings when the spraying was being done, in order to see the work, to ask questions and to learn the the proper way to carry on operations for themselves. This was almost double the number that attended two years ago.

Spraying with arsenical poisons, such as Paris green, London purple, arsenate of lead, etc., was done, first of all, to lessen injury by the Codling Moth on the apple, and by the Plum Curculio on plums and cherries; but it is now used against all foliage eating insects. It has lately also become the custom to spray many plants with a combined mixture which will destroy both insect and fungous pests. For this purpose, the best mixture known is Bordeaux mixture and Paris green. The formula most widely adopted is one which is very easy to remember, as all its parts contain the figure 4. It consists of copper sulphate, 4 lbs., quick lime, 4 lbs., Paris green, 4 ozs., water 44 gallons.

Owing to the large amount of capital necessarily invested in and required to operate a fruit farm, and the permanent nature of fruit plantations, more attention has been given to those causes upon which failure and success depend than has been the case with ordinary farm crops, which change from year to year; consequently, more perhaps is known and more enquiries are received with regard to orchard pests than any other class of insects. The common enemies which occur year by year in orchards have been treated of over and over again in our annual reports, and there would be no advantage in speaking of them now at any length, but attention may be drawn to some of the more serious or unusual outbreaks.

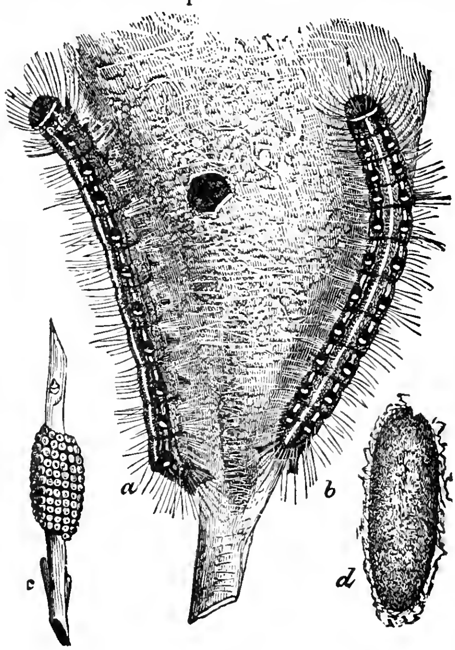


Fig. 49.

Tent Caterpillars have been even more abundant than last year in almost every province of the Dominion. In the Ottawa district groves of basswoods, maples, and aspens were stripped of every vestige of foliage, as well as the underbrush, consisting of numerous kinds of shrubs. Although the Forest Tent Caterpillar was slightly more numerous, the American Tent Caterpillar (Fig. 49), it was noticed, occurred with it in almost equal numbers, and, notwithstanding that close search was made for parasites, in this district at any rate, few were found. A large number of egg clusters were collected to see if the young caterpillars contained in the egg were in a healthy condition. These were kept in a warm office, and by the 1st of Januaryhundreds of young caterpillars had hatched and were gathered together in a large mat-like cluster on the side of the jar.

There is no indication of the presence of either egg parasites or fungous disease, and as the trees throughout this district bear enormous numbers of the egg clusters, the outlook is ominous; special effort must be put forth by fruit growers and gardeners during the present winter and next spring, or there will certainly be serious loss next season. The remedies which give the best results against these insects are (I.) the collection and burning of the egg cluster during the winter, (II.) the cutting off and burning of the nests of young caterpillars early in spring, when they may be easily detected by the conspicuous white tents which they spin in the crotches of branches, and (III.) the spraying with Paris green of all trees liable to be invaded in an infested district. The sooner the application is made the more effective it will be, for many insects which can be controlled while young are much more difficult to poison after they have reached a certain size.

THE APPLE APHIS (*Aphis mali*, Fab.) appeared in large numbers early in spring, and many enquiries were received about it from the western part of the Province. Little harm, however, was done either in the spring or late in the autumn, when most of the damage due to this insect generally occurs.

THE PLUM APHIS (*Aphis prunifolii*, Fitch) was less abundant by far than last year, although reported from a few places. Specimens of another plum aphis, (*Hyalopterus pruni*, Fab.,) were received from one or two Ontario localities.

THE BLACK CHERRY TREE APHIS (*Myzus cerasi*, Fab.) was certainly less wide-spread in the Niagara district last season than in 1897, and reports concerning it were very contradictory; nevertheless considerable damage was done, particularly in orchards of sweet cherries. It has been noticed that the dark-coloured plant-lice are more difficult to kill than the green ones. Of several remedies which have been tried, the one which has given the best results is whale-oil soap solution, one pound of Good's Caustic Potash Soap No. 3 in six gallons of water, applied warm as a spray. Kerosene emulsion, also an excellent remedy, must be used as strong as one part to six of water for these plant-lice. The eggs of the Black Cherry-tree Aphis are laid upon the twigs, particularly on the fruit spurs, by the last autumn brood. There is no doubt, therefore, that good work could be done by spraying the trees during the winter, or better still, early in spring before the buds burst.

Another enemy of the cherry, as well as of the plum and pear, which when neglected did much harm was THE CHERRY AND PEAR SLUG (*Eriocampa cerasi*, Peck). Th remedy which gives the surest relief is the prompt spraying of the trees with Paris green, one pound in 200 gallons of water, adding in all cases an equal amount of fresh lime with the arsenical poison, Paris green, to counteract its caustic effects on the foliage.

THE GREEN FRUIT-WORMS.—The caterpillars of three very similar moths belonging to the family *Xylina* did much injury to apples and pears, attacking specially the young fruit. These caterpillars are not regular pests of the orchard, but appear in numbers at long intervals; but, as they have a special taste for the green fruit, attacking it in preference to the foliage on fruit trees, the damage they do is much more important than that done by many other injurious insects. In addition to fruit trees they attack maple trees. At Niagara and at Aylmer, Que, near Ottawa, shade and forest trees, particularly the Silver Maple *Acer dasycarpum*, Ehrh.), were terribly disfigured and almost defoliated by these caterpillars over large areas. It was pleasing to see at the end of June that thousands of them were being destroyed by various insect-eating birds, chiefly warblers, but especially by the English Sparrow. In the streets of Niagara they were so vigorously assailed by the sparrows in the branches, and by chickens which waited for them below, that few could have escaped to complete their changes. Mr. Orr writes of the occurrence of this pest in the Niagara peninsula:—"The Green Fruit-worm, a comparatively new comer, and but little known here, is likely to become a serious pest: some growers reporting from 20 to 30 per cent. of their apples and pears ruined by it. By the middle of June it had destroyed much fruit."

Mr. N. H Cowdry also writes of its depredations on the fruit of apples and pears at Waterford, Ont. The same complaint came from Mr. J. A. Link, of Sombra, Ontario.

Remedy.—The only remedy is early spraying, while the caterpillars are small and while they are feeding on the buds and young foliage Luckily for the fruit grower these caterpillars are always accompanied when in large numbers by parasitic enemies.

THE ROSE BEETLE (*Macrodactylus subspinosus*, Fab.), Fig. 50.—This well-known enemy of the fruit grower, which every year does so much harm by eating the flowers of grapes, apples, pears, roses, plums, raspberries, blackberries, and in fact all plants belonging to the Rose family, as well as many other kinds of trees, did some harm this year in the hotter western sections of the Province. It occurred in large numbers near Niagara upon the young fruit of apples, in some cases actually covering the fruit. There is only one brood of this pest, the mature beetles last for about five weeks. There is perhaps no fruit insect known more difficult to combat than this is. The ordinary insecticides have little effect on it. Covering rose bushes with netting and beating the beetles from the bushes into pans containing coal oil can be practised on a small scale. The only remedy which so far has been found at all effective on a large scale "is to spray grape vines and fruit trees with a wash made by adding three or four pecks of freshly slaked lime and a quart of crude carbolic acid to 50 gallons of water." Dr. C. M. Weed.)


Fig. 50.

THE RASPBERRY SAWFLY (*Monophadnus rubi*, Harris), was more than usually abundant in the western counties of the Province, but where promptly sprayed with Paris green and water, and later when the fruit was forming with white hellebore, was easily disposed of.

SCALE INSECTS.—The advent of the San José Scale in Ontario had a remarkable awakening effect on the fruit growers of the province, and, as a consequence, there has been during the past season far more enquiry with regard to injurious insects than has ever been the case in a single year before. The vigorous policy of the provincial Government and the excellent conscientious work done by the Inspector, Mr. George E. Fisher, and his assistants, backed up by a rigorous application by the Federal Government of the San Jose Scale Act has undoubtedly had a good effect not only among the thinking fruit growers of the Dominion, but upon statesmen in other countries who have made several enquiries as to what steps were being taken in Canada to stamp out this most injurious insect and prevent further importations from infested countries. Having had ample opportunity of examining the districts which were infested, I can bear testimony to the great success which has attended these efforts. The investigations in connection with the San Jose Scale have brought to light other scale insects where their presence was not suspected; both the Forbes Scale and the Putnam Scale have been found to be widely distributed, but in very few instances have they occurred in injurious numbers. These two scales are of particular interest owing to their very close superficial resemblance to the San Jose Scale; the microscopic difference of structure, however, can at once be discovered when the scale-insects are taken from their scales and after proper preparation examined under the miscroscope. In addition, both of these species lay eggs at certain times of the year, while the San Jose Scale, it is alleged, never does so. The Forbes Scale (*Aspidiotus Forbesi*, Jnsn.) and the Putnam Scale, (*A. ancylus*, Put.) can be successfully combated by spraying the trees with whale-oil soap, one pound in two gallons of water. The best time to make the application is early in spring before the trees are covered with foliage.

THE SCURFY BARK-LOUSE (*Chionaspis furfurus*, Fitch.), Fig. 51., wide-spread, but not very abundant nor injurious has been found in many localities in the western part of the province, and, like the the very injurious Oyster-shell Bark-louse, can be destroyed with the whale-oil soap solution mentioned above, followed by high culture and good horticultural treatment of the trees.

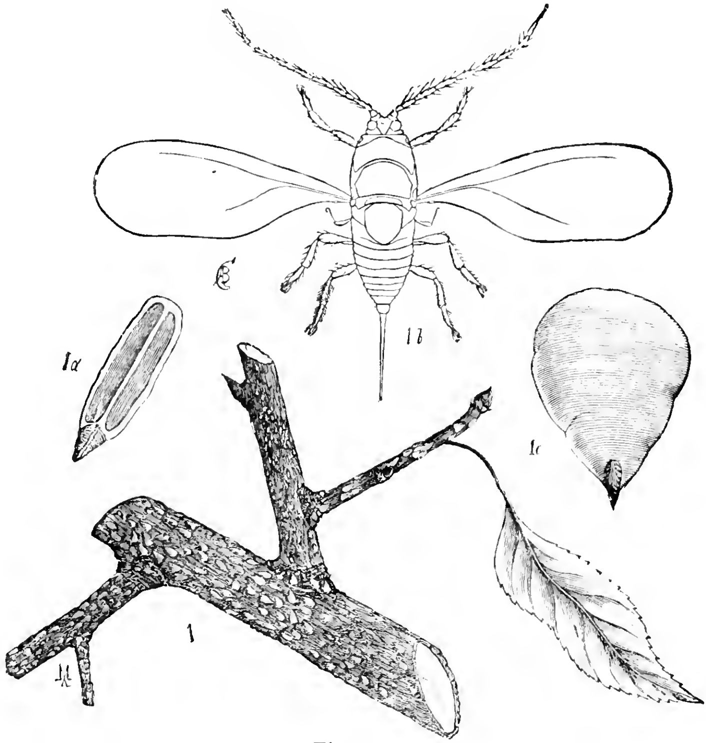


Fig. 51.

NOTES ON INSECTS OF THE YEAR DIVISION NO. I., OTTAWA DISTRICT.

By W. Hague Harrington, Ottawa.

The first insect to attract attention in the spring was the larva of the little Arctian *Phragmatobia rubricosa*, Har., the fuscous little woolly bears of which may be found scurrying over the snow in day time or coiled up in some small depression where they had rested from their wanderings of the day before. On bright days in April, *Aphodius prodromus*, Brahm, filled the air. This species has only been noticed at Ottawa for the last four or five years, but is now as common as *Aphodius inquinatus*, Hbst.

Cutworms.—The Black Armyworm (*Noctua fennica*, Tausch.) was abundant in some localities as near Hull, Quebec, and on the Central Experimental Farm, attacking many plants, but especially clover and peas in fields, and also doing much harm in gardens as a cutworm. This is an early developing species which is full-fed about the end of May, and consequently plays great havoc in beds of young seedlings of early vegetables, sometimes cutting off as many as six or eight peas, or mowing down eight or ten inches along a row of onions or carrots in a night. Occurring with this caterpillar, as cutworms in gardens, were the larvæ of the White Cutworm (*Carneades scandens*, Riley), uncommon at Ottawa, and our commonest cutworm The Red-backed Cutworm (*Carneades ochrogaster*, Gn.). These caused considerable loss in gardens among young vegetables and seedlings of flowers. This latter is also a large species when full-grown ; but as the eggs laid the previous autumn do not hatch till the following spring the caterpillars do not become full-fed till much later in the season than the Black Armyworm and the White cutworm, both of which pass the winter half-grown. For some reason the White Cutworm did not revive from hibernation last year till much later than many ther cutworms. Poisoning with traps made of bundles of weeds, grass, or clover dipped in a strong mixture of Paris green and water, or with poisoned bran, were very successful. Cabbages, tomatoes, and other young plants were easily protected at the time of setting out with rings of paper or tin.

The Codling Moth (*Carpocapsa pomonella*, L.) was unusually prevalent and injurious in unsprayed orchards. The standard spray for this insect is the poisoned Bordeaux mixture, with which not only the fungous disease "Black Spot of the Apple" is treated, but all foliage-eating insects, as well as the Codling Moth. The formula is copper sulphate 4 lbs., fresh lime 4 lbs., water 40 to 44 gallons, and Paris green 4 ozs.

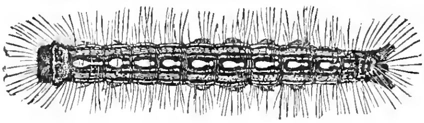


Fig. 52.

Tent Caterpillars.—The most remarkable occurrence of the season was of the two common species of Tent Caterpillars *Clisiocampa americana*, Harr. (Fig. 49) and *C. disstria*, Hbn. (Fig. 52). These two kinds of caterpillars which were about equally abundant, stripped bare many acres of Aspen Poplar, Basswood and Maple groves along both banks of the Ottawa River and along the Canadian Pacific and Canada Atlantic Railways in the counties of Carleton.

The Ash-gray Pinion.—Maples were also extensively injured at Aylmer, Que., and at Hull, Que., by the green caterpillars of *Xylina Grotei*, Riley, and *X. antennata*, Walker. These caterpillars are known as Green Fruit Worms, on account of their destructive habit of eating large holes in the sides of young apples and pears. In the Ottawa district they did little harm in orchards, but stripped almost bare large forest trees at the two places mentioned. This is an uncommon attack which has not occurred in anything like the severity of last season since 1885. The ashy-gray moths do not appear until late in the season. There are three species very similar in general appearance. All of these may be taken at sugar in the Ottawa District in September and October.

The caterpillar of the Eye-spotted Bud-moth (*Tmetocera ocellana*, Schif), Fig. 53, was rather common on apple trees in company with the Oblique-banded Leaf-roller (*Cacœcia rosaceana*, Harr), Fig. 54. The Cherry Web-worm (*Cacœcia cerasivorana*, Fitch), Fig. 55, was extremely abundant on the wild bird cherries on the Laurentian mountains,


Fig. 53.

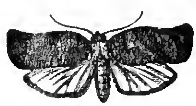


Fig. 54.


Fig. 55.

near Chelsea, Que., the unsightly webs attracting attention along the sides of the mountain road. Although so abundant on the wild cherries, this insect did no harm to cultivated varieties.

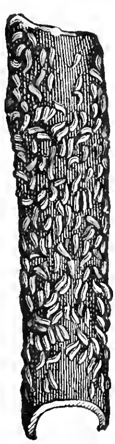


Fig. 56.

The Oyster Shell Bark louse.—(*Mytilaspis pomorum*, Bouche), Fig. 56, is very common and destructive in this district, occurring not only on apple trees but also on many other kinds of shrubs and trees in the garden and forest. It was noted as injuriously abundant on red and black currants, lilac, spiræas, ash, dogwood (*Cornus*), mountain ash and hawthorne. The Forbes scale was found on the fragrant currant (*Ribes aureum*, Pursh), and the Putnam scale on the elm.

The White Cedar Lecanium (*Lecanium Fletcheri*, ckl.) and "Red Spiders did some harm to cedar hedges.

Canker worms were noticeably less abundant than usual, but the Basswood Looper (*Hybernia tiliaria*, Harr), Fig. 57, was very common, the delicate male moths drawing the notice of the least observant by their clumsy flight and the late season at which they appear.

The Currant Saw fly (*Nematus ribesii*, Scop), was as usual abundant and destructive where the bushes were not treated with the well-known remedies, Paris green or White hellebore.

THE CURRANT APHIS (*Aphis ribis*, L.) was the most destructive insect on currants and gooseberries this season, many bushes being so much injured that they dropped their leaves and the fruit was ruined.

Fig. 57.

THE GRAPEVINE LEAF-HOPPERS (*Erythroneura* species) did much harm to Virginian creepers and grapevines, but particularly to the former. These insects, like the grapevine, flea-beetle (*Haltica chalybea*, Illiger), seem to prefer the Virginian creeper to the grape. This is sometimes very apparent where the creeper and wild grapevine are trained together over arbours.

Two more enemies of the Virginian creeper not often referred to as such, but which both occurred in some numbers this season at Ottawa in the same arbour, were *Saperda puncticollis*, Say, a beautiful longicorn, velvety black with golden yellow stripes down the edges of the wing cases and with spots on the thorax. These emerged from the larger living stems of Virginian creeper, while from younger stems many specimens of *Psenocerus supernotatus*, Say, were reared.

The Mourning Cloak Butterfly (*Vanessa antiopa*, L.) and the Interrogation Butterfly (*Grapta interrogationis*, Fab) were destructive y abundant on elms planted as shade trees. The caterpillars of the former also stripped large branches on willow bushes.

ROOT MAGGOTS in cabbages, radishes, turnips and onions were remarkably destructive right through the season.

Two injurious insects which it was hoped had "run their course" and which for the last year or two had not been nearly so abundant as in previous years, this year again showed up in decidedly increased numbers. These were the imported Larch Saw fly (*Nematus erichsonii*, Hartig) and the Cattle Horn fly (*Hæmatobia serrata* Rob-Desv). For the Horn fly perhaps the most convenient remedy is 1 lb, of pine tar mixed with 10 lbs. lard. A small quantity of this ointment rubbed lightly along the back and sides of cattle once a week during the fly season will have the effect of keeping flies away and will also have a healing and soothing effect upon any sores due to rubbing or licking.

NOTES ON INSECTS OF THE YEAR, DIVISION NO. 2, BAY OF QUINTE DISTRICT.

By J. D. Evans, Trenton, Ont.

Throughout this district the only crop which has suffered to any extent from insect foes during the past season (1898) is the seed pea crop.

For a number of years the cultivation of fancy or seed pease in this section for foreign markets has been very extensive, while a good demand and high prices ruled for such, extra precautions were taken by growers to have the weevil (*Bruchus pisorum*) killed by the seedsmen before they arrived at maturity or had destroyed the pease; but during the past three or four years, when prices have become lower, ordinary grades of pease have been grown to a greater extent than formerly and the grower becoming careless in housing and dilatory in marketing his crop, the weevil has greatly increased in numbers. This occurs not so much along the Lake front of the County of Prince Edward as in inland sections. While many farms may be entirely free from the pest, others will lose from 15 to 30 per cent., while instances occur, although rarely, in which the loss is 40 per cent.

Another destructive agency to the pea crop is a blight said to be caused by a fungous growth which oftentimes will utterly destroy a whole field in a single night. This disease has been very prevalent during the past season and has caused a great loss to the farming community.

NOTES ON INSECTS OF THE YEAR, DIVISION NO. 4, NIAGARA DISTRICT.

By A. H. Kilman, Ridgeway, Ont.

The past season has not been marked by any great insect depredations, at least as far as my personal observation and inquiry have reached, in this locality—Niagara District—but variations in the occurrence of insect pests, pointing either to an increase or a decrease or in the more startling direction of the approach of new foes, is always of interest to students of Entomology and to farmers and fruit growers.

Contary to expectation, the Northern Army-worm, *Leucania unipuncta*, was less in evidence than during 1896-7. In late August, when the imagines of this insect are nearly always to be found, none were observed. The grass-hopper, (*Caloptenus femur-rubrum*) was also conspicuously absent.

Cabbage butter-flies *Pieris rapae*) during the drought in the earlier part of the season, were scarce but late cabbages were much injured by the larvæ of this insect. Similar observations were made in regard to the Colorado potato-beetle. Early potatoes were not materially injured and unwary gardeners, deceived by the non-appearance of the slugs, relaxed their efforts and paid the penalty by seeing the plants of the later crop "sailing under bare poles."

Raspberry canes have been seriously injured in some localities, by a cane borer, probably *Oberea bimaculata*.

An inconspicuous green worm, doubtless the Raspberry Saw Fly (*Selandria rubi*, Harris), operated in spots all over the fruit section, completely destroying some patches of red-raspberries near Niagara Falls.

Neglected vineyards on sandy soil suffered an entire loss of crop from the ravages of the Rose Beetle (*Macrodactylus subspinosus*, Fabr.)

In this locality plums failed to blossom. The Curculio (*Conotrachelus nenuphar*), attacked the later cherries with the result that the fruit was wormy and useless.

Apples, especially in neglected and unthrifty orchards, were scarred by insects and fungi and wormy by larvæ of Codling moth.

The Tussock Moth (*Orgyia leucostigma*) is on the increase here. In the neighboring city of Buffalo, it has become a scourge, defoliating the horse-chestnut trees, and attacking other trees as well. To gather and destroy the cocoons or egg masses in winter seems to be the most feasible method of checking the ravages of this insect.

The birch trees in the parks are attacked by a new pest, an Agrilus. The species will be determined next summer.

Crioceris asparagi, Linn., the Asparagus Beetle, (Fig. 58) which according to Dr. A. S. Packard, is not a native but an introduced species has advanced in its attack upon asparagus plants as far north as Niagara River. Mr. Reinecke informs me that he has found the beetles in abundance on asparagus at Buffalo.

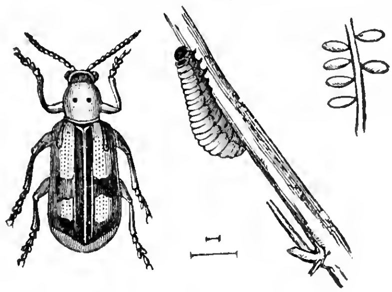


Fig. 58.

The Punctured Clover-leaf Weevil, *Phytonomus punctatus*, Fabr., in August last, appeared in great numbers on the side-walks and fences and on the shores of Lake Erie, but though I have repeatedly examined the clover fields for the purpose of determining the amount of injury done by this particular insect, thus far I have failed to find either the imago or the larvæ on a clover plant.

NOTES ON INSECTS OF THE YEAR.—DIVISION No. 5, LONDON DISTRICT

By R. W. Rennie, London, Ont.

In submitting my report as director for Division No 5 for 1898, I am very glad to state that there have been no additions to the number of injurious insects in this district, with two exceptions; in fact there has been a falling off in numbers of older pests that in previous years played great havoc with certain crops.

One exception is the Cottony Maple scale (*Pulvinaria innumerabilis*, Rathvon)—Fig. 59—which appeared in very large numbers this last spring; in fact, in such large numbers did they appear that on one of the finest streets in this city (London), the trees appeared to have been sprayed with whitewash.

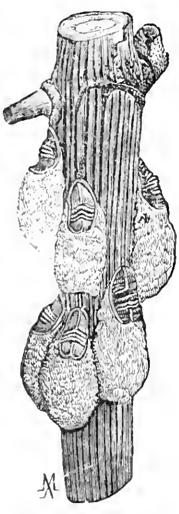


Fig. 59.

In the fifth report of the U. S. Entomological Commission, there is an article copied from Prof. Riley's report as U. S. Entomologist for 1884, page 412, in which he states that the females, before the falling of the leaves, migrate to the branches and twigs, and there fix themselves, generally on the underside. Such has not been the case in this city. They were found occasionally on the branches and twigs, but the vast majority were noticed round the spot where a branch had been cut or broken off; indeed, so thickly that they almost overlapped each other. They have not confined their attacks to the maple, but have also been working on the grape vine.

It has apparently been quite a study to find out in what manner this spreads. Some think that it is due to planting infested trees, others by birds, insects, water, etc., but if you were to get a colony under the microscope you will soon find out how they spread.

I have a table three feet in diameter on which I use the microscope. One evening I placed a colony on a glass slip under the microscope, which was at one edge of the table, and probably examined them for ten or fifteen minutes, and there left them. Going back again in about twenty minutes, there were none on the slip, but they could be found at the extreme edge of the table. They do not seem to care what they walk over, anything and everything is the same to them. How many reached the floor I do not know, but from the number left on the table fully two-thirds had got away. Take any insect as small as this is that will walk over three feet in the course of twenty minutes, or less. Surely there can be no doubt as to how they spread, particularly when they do not care what they walk over.

As to the means proposed for destroying this pest, they are various, such as heading in of the branches. (What is the good of this if they do not confine themselves to the branches?) Also spraying with whale oil soap this may be effective, but it is also very expensive. In my own opinion there is nothing better than kerosene emulsion, which I think is one of the best destroyers of insect life that can be used without excessive expense. There are also parasitic enemies, as there are in every other branch of animal life.

Abont the 24th of May last I noticed a small larva feeding on the eggs, but was unable to identify it in this stage Mr. Balkwill, the treasurer of our Society, succeeded in rearing a few, which were identified by Mr. J. Alston Moffat as Hyperapsis signata.

The other exception is *Graptodera chalybea* (Fig. 60), commonly known as the grape vine flea beetle. This insect appeared in great numbers this spring in this locality, although this is not a grape-growing district. This insect passes the winter in a mature state, attacks the buds of the vine as soon as they begin to grow, destroying both fruit and foliage at once. In about three or four weeks the mature insects disappear, but their place is taken by a small, insignificant looking larva, generally black in colour, which very soon makes its presence known by eating holes through the leaf, making the leaves look like sieves; not eating like some larvæ do, starting at one part and continuing until the whole leaf is devoured. They move from place to place on the leaf, apparently selecting parts in the leaf that are most acceptable to the palate of an epicure (as such they undoubtedly are.)

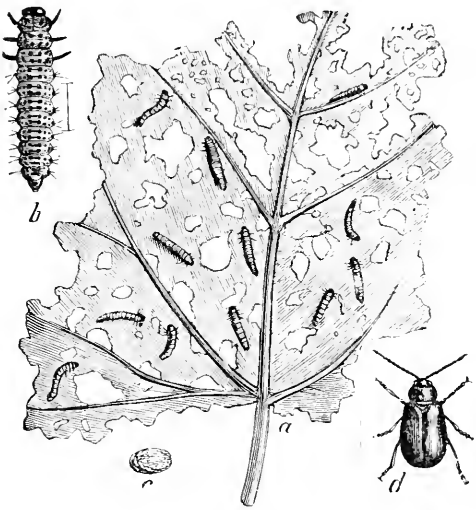


Fig. 60.

These larvæ attain their full growth about the end of July, pupate in the earth, and emerge in from ten days to two weeks in the mature state. The greatest injury is done in the spring by the mature insect.

The most effective remedies for this insect are: To remove all fallen leaves in the fall, and whatever other decaying vegetable matter has accumulated around the vines, and burn it; also in early spring to syringe the vines with a weak mixture of Paris green and water. Hellebore may be used in the summer against the larvæ.

In regard to other destructive insects, as I mentioned in the first part of my report, they have been less numerous than usual.

After remarks had been made by many of those present on the abundance or rarity during the past season of many familiar insects, the following resolution was moved and unanimously adopted:—

"That a most cordial vote of thanks be tendered to the members of the Montreal Branch for the exceedingly generous reception they have given to the Entomological Society of Ontario on the occasion of their annual meeting."

A FEW OF THE MOST TROUBLESOME INSECTS OF THE PAST SEASON (1898).

READ BEFORE THE COLLEGE OFFICERS' LITERARY AND SCIENTIFIC SOCIETY, BY H. L. HUTT, B.S.A., ONT. AGRICULTURAL COLLEGE. GUELPH, ONT.

As far back as I can remember, I have always taken a great deal of pleasure in studying insect life. On more than one occasion can I remember being punished and disgraced in school, for investigating the jumping capabilities of a grasshopper, or squeezing an involuntary song from a captive cicada. But that was in days gone by. Now the policy of the Educational Department is to encourage the study of such subjects as were then discouraged by hard knocks.

At this institution Entomology has probably always been a part of the regular course. When I began to study it systematically about ten years ago, under the direction of Prof. Panton, it appealed to me at once as one of the most interesting and practical subjects on the curriculum. And the first summer I spent at home after leaving the College, all the available beehives, boxes and glass-topped section cases were converted into breeding cages, where all transformations could be watched in the specimens within. My collection that year was not confined to insects alone, but it contained a variety of creatures from batrachians and lepidopterous larvæ to milksnakes and their eggs. And I might add that one of the most interesting methods of studying this most interesting subject is to watch the transformation and habits of the insects themselves, either in confinement, or as they occur in nature.

As there is no class of society that is exempt from the losses and annoyance caused by insects, a knowledge of their life history and habits is important to all, but to none is it of greater importance than to the farmer and fruit-grower.

During the past summer I received a great many letters enquiring about insects affecting a wide range of crops. To deal fully with all mentioned would necessitate writing a book, but as the subject of this paper I have taken a few of the more common ones that have been the most troublesome, and these, it will be noted, represent fairly well most of the orders into which insects are usually divided.

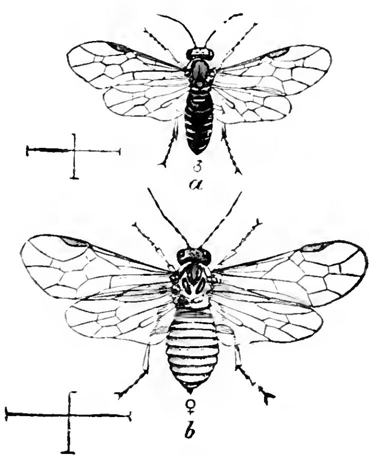


Fig. 61.

Fig. 62.

1. THE CURRANT SAW-FLY, (*Nemátus ribésii*). One of the earliest insects to make its appearance was the Currant Saw-Fly (Fig. 61, *a* the male, *b* the female). This belongs to the Hymenoptera, or membrane winged insects, and is closely related to that most industrious and beneficial of all insects—the honey-bee.

It passes the winter usually in the pupa state, in a slight papery cocoon spun beneath the surface of the ground or under rubbish or leaves. From its winter quarters it emerges early in the spring, about the time of the opening of the buds of the currant and gooseberry. Last spring they appeared in unusual numbers, and during the warm parts of the day might be seen in swarms about the bushes.

In appearance this saw-fly is a little smaller than the common house-fly, and has a yellow body. The male is considerably smaller than the female and is somewhat darker in color. During bright, warm days they are very active, but early in the morning or when the weather is cool and cloudy they are sluggish and may be easily captured.

Saw-flies are so called because of the saw-like ovipositors of the females. Speaking of these, Prof. Comstock says, "This is at least one instance of where the female wielding of a saw is done most skilfully, for the female saw-fly uses these nice tools in a very efficient manner, to make slits in the leaves and stems of plants in which she places her eggs." The eggs are deposited, from 20 to 40 in number, upon the back of the ribs and veins of the leaf, usually upon the lower leaves of the bushes (Fig. 62) They hatch in about ten days and the young larvæ begin to feed at once upon the tender leaves. They grow rapidly, and if unchecked will in a short time entirely strip the bushes of foliage. In the course of about three weeks, the larvæ become full grown (see Fig. 10), when they leave the bushes, spin small papery cocoons, and enter the pupa or resting state. From these the adult saw-flies emerge in a short time, and a second brood of larvæ follow, which strip the bushes again the latter part of summer.

This is probably one of the easiest insects to hold in check, as it feeds upon bushes that are easily got at, and it is readily destroyed by stomach poisons, such as Paris green or hellebore. The most important points in fighting it are to begin early, as the young larvæ are usually well at work by the time the leaves are full grown, and to force the spray up from the under side of the bushes so that it will reach the lower leaves where the caterpillars begin operations.

2. THE LARCH SAW-FLY (*Nemátus Erichsonii*). On the 24th of June last, my attention was directed to the scorched appearance of the foliage on the clump of European larches in the field in front of the College. Upon going to examine them closely, I found that they had been almost entirely stripped of their needles by some kind of insect. Upon further investigation I found one or two small trees on the west side of the clump upon which a few of the larvæ were still at work. It was a smooth, glaucous green worm which I had never seen before, but from certain characteristics, such as the seven pairs of prolegs and the curling under of the last segments of the body, I recognized it at once as the larva of some species of saw-fly. Upon consulting Packard's excellent report on "Forest Insects" I found it fully described as the Larch Saw-fly (*Nematus Erichsonii*), a new and much-dreaded enemy in the larch and tamarack forests.

Like the Currant Saw-fly, it is supposed to have been imported from Europe. The first notice of it on this continent was in 1881 by Dr. Hagen upon specimens found in Massachusetts. Two or three years later it was found in vast numbers in Maine, New Hampshire and other New England States, where it had stripped all the tamarack forests. In the report of the Ontario Entomological Society for 1885, Prof. Fletcher of Ottawa gives an excellent account of its life history, and of the devastation it had made in the tamarack swamps of Quebec and the Maritime Provinces.

It was then noted that the most western point that it had at that time reached was about Casselman, on the Canada Atlantic, about 30 miles east of Ottawa. Its appearance at Guelph last June would indicate that it had made considerable progress westward. In my travels over the Province last summer, I was particular to watch for indications of its presence, and I noticed from the scorched appearance of the tree tops, that it had stripped the tamaracks in many places between here and Walkerton, and that in the large tamarack swamp south of Bradford the trees in July were as bare as if a forest fire had swept through them.

The adult insect is a handsome saw-fly, somewhat resembling the Currant Saw-fly but is a little larger and darker colored, being mostly black with an orange band around the middle of the abdomen. The female deposits her eggs in incisions made in the young terminal shoots. The young larvæ feed voraciously upon the tender needles and develop with wonderful rapidity. Some idea of their voraciousness, vast numbers, and rapidity of growth may be gained from the fact that the active larval state lasts but a single week, and during this short time they often strip bare vast forests of tamarack.

When mature, they drop to the ground and pass the winter in a dark brown, oval cocoon spun in the moss or grass beneath the trees.

So far as we have learned, there is but a single brood of them during the season, and this is quite enough. As it is, the defoliated trees throw out a second set of needles, and are thus enabled to survive one or two attacks, but when they are stripped of their foliage repeatedly the results cannot be otherwise than fatal. One or two natural enemies have been found preying upon the larvæ, and it is hoped that they may be able to hold them in check, because it is usually impossible to fight them by any of the modern means of insect warfare on account of the inaccessible nature of the places in which they breed. On single trees they may easily be destroyed by spraying, or even by shaking them to the ground, as they cannot crawl back upon the trees again.

3. THE TENT CATERPILLARS (*Clisiocàmpa americàna and C. disstria*). Among the Lepidopterous, or scale-winged insects, none attracted more attention last year than the Tent-Caterpillars. There are two species of these common to this part of the continent, one known as the Apple-Tree Tent-Caterpillar, and the other as the Forest-Tent-Caterpillar. The latter appeared last year in several parts of the province in vast armies. At one place on the W.C. & B. they were reported in the papers as having been in such vast numbers that they stopped a train. And judging from the plague of them which I saw on St. Joseph's Island, I am quite prepared to believe the reports.

A comparative study of the life histories of the two species is of interest. The adult insect in each case is a reddish brown moth measuring when the wings are expanded from one and a half to one and three quarters inches across. In this stage they have no power of taking food, and live only long enough to provide for the generation to follow. The eggs are laid about the middle of July in ring-like clusters encircling the small twigs, usually from 200 to 300 eggs in each cluster. The eggs of the *Clisiocampa Americana* may be distinguished from those of the *Clisiocampa disstria* by the oval form of the clusters, those of the latter being squarely cut off at each end. In both cases the egg masses are covered with a thick coat of tough varnish which renders them waterproof, a wise provision of nature, as it is nearly nine months before the young caterpillars emerge from them. During the first warm days of spring they make their appearance, and after taking their first meal from the gummy substance which has protected them for the winter they begin to feed upon the opening buds.

The most striking difference in the two species now becomes apparent in the habits of the young caterpillar. Those of *Clisiocampa Americana* spin a tent in the nearest large fork of the branch upon which they are hatched. Into this they retire at night, during stormy weather, or when they are not feeding, in warm weather they often repose in a black mass upon the outside of it, leaving it regularly once in the forenoon and again in the afternoon to feed. Each caterpillar spins a silken web along the branch wherever it travels. Thus they never lose their way home although they may forage all over the tree The caterpillars of the other species do not dwell in tents and are more disposed to lead a wandering life. When young they often march from place to place in single file close procession. From the time they are half grown until they reach maturity they are wonderfully active and move about as if they were in a great hurry and had no time to lose.

Both species reach maturity in about six weeks, and are then handsome hairy caterpillars, about two inches in length. *Clisiocampa disstria* has a row of white spots down the centre of the back, which distinguishes it from the other species, in which the white line is unbroken.

The Forest Tent-Caterpillar is a general feeder, living on a great variety of forest trees and often doing considerable damage in orchards. The Apple-tree Tent-Caterpillar is not such a general feeder, and is more frequently found on the apple or wild cherry. For the latter it has a particular preference. In our forest plantation where there are 15 or 20 different species of trees, it was noticed last spring that every tree of the wild cherry had two or three nests of these caterpillars, while not another tree in the plantation was affected.

Another difference between these two insects appears in the construction of their cocoons. Those of *Clisiocampa Americana* are formed of a double web, the outer one loosely woven and filled with a powderly substance resembling sulphur. They are usually hid in some out cf the way place, as under rails, boards or rubbish. Those of *Clisiocampa disstria* have none of this powdery substance and are more frequently formed inside of the leaves hanging on the trees. On St. Joseph's Island last summer, I saw hundreds of maples and other forest trees upon which every leaf contained one of these concoons, even the native spruces were so full of them that they appeared as if packed in wool.

4 Canker-Worms.—(*Paleacrita vernúta* and *Alsophila pometúria.*)—Canker-worms have been very abundant in many parts of the country for a number of years past. There are also two species of these, but they resemble each other so closely that to the causal observer they differ only in name. One is known as the Spring Canker-Worm (*Paleacrita vernúta*) (Fig. 63), and the other as the Fall Canker-Worm (*Alsophila pometúria*) (Fig. 64). One of the most noticeable differences in the two species appears in the egg stage. The eggs (Fig. 63 *a* and *b*) of the Spring Canker-Worm are oval in form and are laid in the spring in irregular patches hidden under loose bark or in expanding buds.

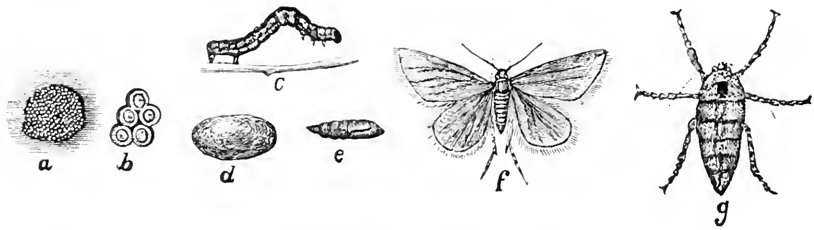


Fig. 63.

Those of the Fall species are shaped like miniature flower pots, are ranged in regular rows in masses (Fig. 65, *a*, *b*, *c*), and deposited in the late autumn in some prominent place on the tree. The larvæ of both species (Fig. 63 *c* and 65 *f*) make their appearance with the opening of the leaves in the spring. They reach their full size in about three weeks and are then about an inch in length. On account of their peculiar method of travelling, by alternately looping and extending their bodies, they are commonly spoken of as "measuring worms." They have another peculiar habit when disturbed of suddenly dropping from the tree and suspending themselves in mid air by a delicate silken web which is spun as they drop. Their appearance in this position is graphically described in the following letter which I received from a correspondent last June :—

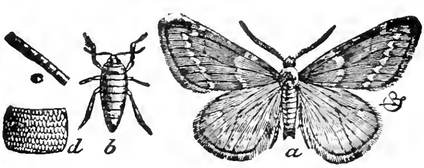


Fig. 64.

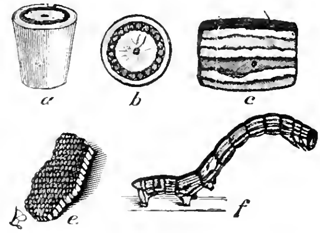


Fig. 65.

Brighton, June 6th, 1898.

Dear Sir,—Last evening my husband said, "Come with me, I wish to show you a sight." We went into the orchard. "Now," says he, "see that tree over there, the leaves are all eaten up." "Worms," says I. "Yes," says he, "but not the kind you know." He took a stick and gave a limb a tap, and in an instant one hundred worms were hanging by tiny webs. He then went around hitting all the limbs he could reach, and I think there must have been a million worms suspended in the air beneath that tree. "Now, May," says he, "what am I to do? I have manured and thoroughly worked this orchard for two years, have had it trimmeed, and the worms' nests all taken out of it once this spring, now just look at it." "I'll tell you," says I, "I'll write to the Agricultural College and see what they advise." An answer would be gratefully received, as the orchard is no small item in our accounts.

Yours truly;

——— ———.

In an orchard that is regularly sprayed they can give little or no trouble, as they are easily destroyed by Paris green, but in large shade trees, which are sometimes attacked, and where the spraying cannot easily be done, strategic measures have to be resorted to. From the fact that the female moth in both species is wingless, and after emerging from the pupa in the ground has to climb the tree to deposit her eggs, the placing of a tar band or other barrier upon the trunks of the trees at once suggests itself as a remedy.

5. THE COLORADO POTATO BEETLE.—(*Doryphora decem-lineáta.*)—The potato bug, or more properly, the potato beetle (Fig. 13) is with us yet, and he seems to be here to stay. Out of about ten thousand species of Coleoptera common to this country, the potato beetle stands out prominently as the one most generally troublesome. We have become so familiar with it that we seldom think of it but to kill it, yet a few facts as to its history in this country may be of interest. To the late Dr. C V. Riley, of Washington, we are indebted for the best account of it that has anywhere been published, and I have made free use of his little book on "Potato Pests," in the preparation of these notes.

The Colorado Potato Bug, as it has been commonly called, was first described under the scientific name Doryphora decem-lineata, by Thomas Say, in 1824. It was then to be found only in Colorado and the North-Western States, just this side of the Rocky Mountains. Its original food plant was the Sand Bur (Solanum rostratum) a species of wild potato peculiar to that region.

As civilization advanced westward and potatoes began to be grown in its native home, it gradually acquired the habit of feeding upon the cultivated potato, and began its eastward march from potato patch to potato patch. In 1859 it had reached to within 100 miles of Omaha City in Nebraska. In 1861 it invaded Iowa, and gradually during the next three or four years it spread eastward over the whole State. In 1864 and 1865 it crossed the Mississippi into Illinois, at four or five different points coming on in a column about 200 miles broad from north to south. It was then travelling at the rate of fifty miles a year and it was predicted that it would reach the Atlantic Sea board in 1881. On this side of the Mississippi, however, the potato fields were more plentiful and it began to make better time, actually arriving on the Atlantic coast in 1874, seven years ahead of time, its average rate of progress being 88 miles per year. This rate, however, was not uniform, the northern columns of the army made the most rapid progress; the southern oolumns travelling through a country where potatoes were not so much grown, and under a broiling hot sun, lagged far behind.

The invasion of Ontario began in July of 1870, at two points on the western frontier, namely, near Point Edward and near Windsor. During 1871 they came on in increasing numbers, and it was said that during that summer the Detroit river was literally swarming with them. They were crossing on ships, chips, staves, boards, or any other floating object that presented itself. By June of that year they were common around London, and, Mr. Squirrel informs me, that later that year they had reached as far as Galt. I can well remember the first one I ever saw; it must have been in the summer of 1872. I was then a little chap attending school on the historic battle field of Lundy's Lane, and I little knew then that I had met an enemy that would refuse to be driven from the country, for their invasion was one not only of conquest but colonization wherever they went.

A few beetles were sent to us last summer which were covered with a very interesting parasite known as *Uropoda Americana*. These are little mites about the size of a small pin-head, and of a flax seed brown colour. Each beetle was so thickly covered with them that hardly any part of its body was visible. The infested beetles were placed upon a potato plant along with some of their healthy relatives in hopes that their enemies might increase and subdue them, but after a few days the infested beetles had disappeared and the parasites with them, while the healthy beetles fed on serenely.

6. Grasshoppers.—The grasshoppers belong to the Orthoptera or straight-winged insects. Of these we have a great many species, but they may all be grouped into two families—the Acridiæ or short-horned grasshoppers, and the Locustidæ or long-horned grasshoppers.

There has been much confusion of terms in the common names applied to these insects. The term locust properly applies to the first family, and not to the Locustidæ, or long-horned grasshoppers. The term locust is also improperly applied to the Cicada, which belongs to another order altogether. To all but entomologists, however, the members of both families are usually known as grasshoppers, and for convenience in this paper we shall use that general term.

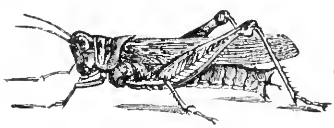


Fig. 66.

The most common species with us is the Melanoplus, femur-rubrum, the red-legged grasshopper, or, more properly speaking, locust.

The females of this species deposit their eggs in holes made in the ground by means of their ovipositors. The eggs are laid in masses in the fall of the year, and hatch during the following spring or early summer. The young do not undergo complete metamorphosis, or change of form, as do the insects of the other orders we have mentioned. There is no larval stage; the young make their appearance as little grasshoppers without wings. They pass through several moults, and the wings gradually develop. With the last moult they become full fledged, and their destructiveness is then increased by their increased powers of locomotion.

Grasshoppers are more or less troublesome every year in all parts of the country, but they are usually particularly plentiful in localities where there is much waste land or poor farming. Two years ago I wheeled through the country from Walkerton to Clarksburg, a distance of about fifty miles There was then in many places through which I passed almost another plague of locusts or grasshoppers. In conversation with a farmer whom I met I learned there were in some sections of that country quite a number of abandoned farms, where grasshoppers had been breeding year after year unmolested. Upon these farms they ate everything bare and then spread to adjoining farms. Good farming with clean cultivation and short rotation of crops is one of the best means of avoiding a grasshopper plague. On the College farm here Mr. Rennie tells me that since the fences have been removed, the permanent pastures broken up, and a short rotation of crops adopted, hardly a grasshopper could be found, whereas the old fence bottoms and permanent pastures were formerly alive with them.

7. Aphids, or Plant-Lice.—Probably the most widely distributed and generally injurious insects during the past two years have been the Aphids, or plant-lice. They are members of the family Aphididæ, belonging to the section Homoptera, in the order Hemiptera. This section or sub-order Homoptera includes not only the Aphids but all of the bark lice, scale insects, mealy bugs, and leaf hoppers, some of the most injurious insects, and at the same time some of the most difficult to fight.

They are characterized, in common with all the other insects of this order, by a suctorial mouth, with which they take all their food in a liquid form, sucking it as juice from the plants upon which they feed. They are further remarkable for their insignificant size and the wonderful rapidity with which they breed. There are a great many species of plant-lice, and they infest in one form or another a great variety of trees and plants. The tendency has been to name these according to the tree or plant upon which they feed. One of the most destructive species in this and many others sections last year was the *Aphis brassicae*, or cabbage aphis, which affects cabbage, turnips, rape, and other brassicaceous plants. Another was the Aphis mali, or apple aphis. On the cherry there was a very troublesome black species known as Mysus cerasi, or the cherry-tree aphis. These are only a few of them, but they are all alike very troublesome in sucking the sap and reducing the vigor of the plants upon which they feed.

Many species like those on the cherry, apple and plum, excrete a sticky liquid substance known as "honey dew," upon which ants, bees, and flies regale themselves. The presence of ants running up and down the trees is almost a sure indication that aphids are at work upon the leaves. Other species, like those infesting the cabbage and turnip, excrete a white powdery substance which covers their bodies. In the woolly aphis infesting the roots of apple trees, this excretion is so fluffy that the insects appear to be covered with wool.

The life history of plant lice is peculiar. The various species differ considerably in the details of the transformations, but the following may be given as applying to most of them. The eggs which are shiny black are very large for the size of the insect, are laid in the fall upon the food plant. From these hatch in the spring wingless females, which without the intervention of the males soon begin to bring forth living young. In five days or six days these young aphids begin to reproduce in the same way. This process of agamic reproduction and compound multiplication goes on so rapidly that in a short time the progeny of the original "stem mother" mounts up into the millions. If this production of wingless forms continued long, it would mean the starvation of all, by the destruction of the plants upon which they were feeding, but Nature provides for this by the development after a time of winged forms which "hie away to fresh fields and pastures new," and in this way they spread. Often in the fall the air is so full of these flying aphides that a person riding or driving quickly becomes covered them. As the cold weather approaches and vegetation ceases, sexual forms, male and female are developed, the females being wingless. Eggs are again produced to carry the species over to another year.

From the fact that Aphids and other insects of this order insert their beaks and suck their food from the interior of the leaves or stems, it is evident that the application of stomach poisons such as Paris green can be of no avail in destroying them. The material supplied must be something that will kill by coming in contact with their soft bodies. The kerosene emulsion, so generally recommended, has been found to be more or less satisfactory, because of the frequent injury it does to the foliage upon which it is applied. Another remedy much more satisfactory, is a strong decoction of tobacco, made by boiling a pound of tobacco waste in five gallons of water, and this is made doubly effective by dissolving in it a quarter of a pound of whale-oil soap. This should be applied as soon as the aphids appear, as after a time it becomes difficult to reach them because of the curling over them of the leaves upon which they are feeding.

Nature's most active agents in holding plant lice in check are the Lady Birds. Last summer these and their larvæ could be found actively at work devouring the lice upon almost every tree and plant infested.

7. House-Flies.—(*Musca domestica, et al.*) Of all the insects that bother and annoy the house keeper none are more common than the house flies. And notwithstanding this fact the woman, or man either, who can give a full account of the life history of these flies is as rare as the one whose house is free from them during the summer season.

All true flies belong to the order Diptera or two-winged insects. There are several species commonly found in houses, although but one of these should properly be called the house-fly. This is the Musca domestica, a medium sized grayish fly too well known to need description.

The life history of this species, which is fairly typical of the majority of them, may be briefly outlined as follows: It passes the winter in the house or some other building, hiding in sheltered spots anywhere between the cellar and the garret. A few specimens in the warmed rooms occasionally hum about in the winter, reminding us that they have seen better days. In the early spring the few sole survivors of the swarms of the preceeding year make their appearance. These are mostly females ready at once to become mothers and by the end of the season their children and great great grand children extend to the tenth and twelfth generations. Each female lays on an average about 120 eggs at a time, which are deposited in irregular masses usually in horse manure. The eggs hatch in about twenty-four hours and the larvae coming from them are white footless maggots about half an inch in length. In this stage of its existence the fly is beneficial as a scavenger. In from five to seven days the larvæ attain their full size, and enter the pupa or resting state. In its outward appearance the pupa is a smooth brown oval shell about a quarter of an inch in length and less than half of that in diameter. In manure heaps these may often be gathered by the shovel-full. In some investigations conducted at Washington last summer, as many as 1,200 larvæ and puparia were counted in one pound of horse manure. The pupa stage also lasts only from five to seven days. So that to produce a full fledged fly from the laying of the egg requires only about ten days or two weeks.

To trace the development of the fly through all of these stages is very easy, but to ascertain the length of life of the adult fly is more difficult, and as yet I have seen no data on the subject. The Washington experimenters declared that this was a bit of information almost impossible to obtain correctly, because of the inability of the fly to live in close confinement. Here then is a point in the life history of one of our commonest insects about which we are yet more or less in the dark.

A few of the other species of flies commonly found in houses may be mentioned. The one most closely resembling the house fly in appearance is the *Stomoxys calcitrans*, or stable fly, so troublesome upon horses and cattle. The most important difference in this species is that the mouth parts are formed for piercing the skin. A bite from one of these is just as painful as the sting from a bee, but it has not the same poisonous after-effects.

One of the largest species found in houses is the *Calliphora vomitoria*, or "blue-bottle fly," that big, blue, buzzing, bummy, beggar that goes tearing through the house from room to room as though he owned the premises. He is capable in a few minutes of arousing more fight in a woman than all the other flies combined. A favorite place for this species to lay its eggs, is in meat that has been exposed for a short time. As with most other flies, the time required for development is short, and the rate of increase is so rapid that it has given rise to the saying that a pair of these flies will devour an ox more rapidly than a lion,

One of the smallest species seen in houses, the *Homalomya canicularis*, is sometimes called the small house-fly. This species is largely responsible for the prevalent but erronous idea that little flies become big ones.

In closing this paper we should like to enter a plea for a more general study of this most interesting branch of natural history. In none do we find a greater range for observation and research, and in none can practical investigation be turned to more profitable account.

NOTES OF THE SEASON OF 1898.

By J. Alston Moffat, London, Ont.

One of the most noticeable peculiarities of the Entomological year about London, was the scarcity of diurnals; many of the more common forms being to all appearance entirely absent. There were some noticeable exceptions to the rule, *Pieris rapae* for instance. From the early part of May to the end of the month, it was in unusual abundance for the spring brood. More like what one is accustomed to see in the autumn about cabbage and turnip fields ; indeed it was more plentiful in the spring than at any other time of the year, something unusual in its history, and starting the inquiry, what had become of its faithful attendant parasite *Pteromalus puparum?* The yellow swallow-tail *Papilio turnus*, appeared in moderate numbers, also *Limenitis ursula*, whilst that nearly ubiquitous butterfly *Colias philodice* that helps to give life and animation to every rural scene was rarely seen. I am not certain that I saw a Milkweed butterfly, *Danais Archippus* about London until the middle of September. The larger silver-spotted frittillary *Argynnis* were noticeably scarce ; and so on through the entire list of common forms ; which made the meditative contemplation of a landscape dull and uninteresting by reason of their absence.

Collecting at electric light commenced early and continued good up to the end of June, many interesting and attractive specimens being obtainable by that method. The early geometers and some species of the noctuids were in abundance, whilst hybernated specimens of Scopelosoma and Lithophane were plentiful, and many of them were in excellent condition. *L. antennata* must be a very hardy insect, and capable of enduring extremes of cold ; Mr. Bice having found specimens of it about the lights during the months of January, February and March ; the least indication of mildness in the weather was sure to bring it out. July and August were characterized by more their usual unprofitableness to the collector, giving him plenty of hunting but little collecting. There were no reports of any serious injury having been done in this locality to crops or fruits from insect pests. Many of the ornamental bushes and shade trees of the city were rendered unsightly by the presence in great numbers upon their branches of the Cottony Scale, *Pulvinaria innumerabilis*, but the attack passed off without any apparent injury resulting.

On the 2nd of June I received from J. D. B. Mackenzie, Esq., of Chatham, N. B., a letter, stating that he had sent to me for identification, some insects that had appeared upon his cherry trees and literally stripped them of their foliage in two or three days. The insect proved to be *Ademonia rufosanguinea*, Say, of the Chrysomelid family ; an innocent enough looking little beetle that would not be suspected as being capable of working such destruction. It must surely be a rather unusual occurrence? Their numbers must have been great. He also wished for information as to where he could get a description of its life history? That I could not give him.

On the 27th of July I received from Clinton, Ont., a box six inches long by four wide and one and a half deep, filled with the remains of Web-worm moths, *Clisiocampa Americana* and *disstria* mostly ; said to have been the result of one night's capture in one street lamp—kind of lamp not stated, electric probably. I had read in the newspapers earlier in the season, accounts of the running of railway trains being interfered with in some localities, by reason of the swarms of caterpillars on the track ; that may have been one of the localities. At all events, that boxful gave evidence of great negligence on the part of those interested, in their dealings with their tent caterpillars.

On July the 22nd, I took a trip to Lake Erie Shore. I had heard a good deal about 'Rondeau,' the Government reserve and the public park there, and that it was easily reached by rail from Chatham, Ont., so I thought it might be a profitable place to spend a day or two. In anticipation I was going to a place well wooded and wild; but instead, I was landed far out upon a sand-bar almost entirely destitute of vegetation. This sand-bar is what separates Rondeau (round water, admirably descriptive) from Lake Erie, whilst the Government reserve is on the opposite side of the bay, nine miles or so away in a straight line and no convenient means of reaching it ; and as my time was limited I made no effort to do so. The sand-bar is being utilized for summer residences with its excellent boating and bathing privileges, and is locally known as 'Erieau,' a euphonious combination but lacking in correct significance. In such conditions there was but little opportunity for me to indulge in my favorite pursuit ; yet even there I came upon two insects which I had never met with alive before. One was that highly ornamented little dragon fly, *Celithemes Eliza*, Hagen, which was quite plentiful amongst the straggling milkweeds and wild rice growing along the bay side of the shore, and was in fine condition as if recently emerged. The abdomen of one sex is ornamented with bright red, the other with yellow, but their brilliance disappears in drying. In company with it, but in greatly inferior numbers was *Celithemes Eponina*, Drury, which used to be plentiful in one locality at Hamilton. The other find was that attractive Hemipteron *Lygaeus fasciatus*, Fab. Although milk-weeds were to be found for hundreds of yards along the bay shore, there was but one spot where I saw it, and that was a small clump situated between two cottages, and from which by frequent visits I secured seven of them. There I observed on the wing as the first of the season, a few fine fresh specimens of the milk-weed butterfly, *D. Archippus*, Fab.

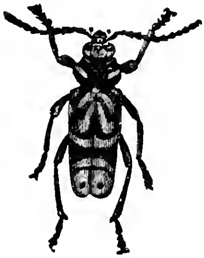


Fig. 67.

In July, Dr. W. J. Stevenson brought to me a fresh maple tree borer, *Plagionotus Speciosus*, Say, (Fig. 67) the first living specimen of it I have seen taken at London. I could obtain it at Hamilton by the dozen where the shade trees are nearly all hard maple, whilst in London they are as nearly all soft maple; and to that as a cause I have always attributed its absence here.

During the autumn there was the usual appearance in abundance of two or three species of the Cut-worm moths at light, whilst amongst them was to be obtained an occasional rare and desirable specimen of other kinds. About the end of September Mr. Bice secured a number of that attractive Pyralid, *Eudioptis hyalinata*, Linn. It was on the 29th day of September, 1881, that I saw at Hamilton my first specimen of it on the wing, and so far as is known, very few have been taken in Ontario since, and not more than a single specimen in a season. This disclosure of such a marked increase in numbers is of considerable importance to the community. as indicating the possibility of its becoming here, such as it has proved itself to be in the Western and Southern States a first class pest to the cultivators of that delicious fruit, the musk melon. In the Eleventh Report of the New York State Entomologist for the year 1895, after giving an account of the total destruction of some melon patches in the south, which had been cultivated for the market, at page 138 it is stated: "It would appear from the limited literature accesible, that *Eudioptis hyalinata* is more especially a southern insect. I have examples in my collection from Texas. It has also been taken in Michigan, is not uncommon in New Jersey, and has been taken in Canada. I have no knowledge of its occurrence in the State of New York." That it had not been reported from New York State was to me rather a surprise, and I started the question whence came it to us? It would seem as if it must have reached Ontario by way of the west, having found the conditions most favorable for its spreading in that direction. It is the habit in some quarters to speak disparagingly of "mere collectors." But an occurrence of this nature brings forcibly to view the great loss, that even now, our d partment of science is suffering from the want of more collectors; for it is upon their labors and observations that we are largely depending for our knowledge of the introduction and spread of injurious species. A knowledge of the flora and fauna of any particular district is of great general interest and advantage to all students of nature, whether the individual disclosing it has any time, inclination or ability to devote to the technicalities of the subject or not, and is well deserving of the grateful acknowledgements of all.

Almost the same time as the preceding, Mr. Bice took several specimens of another Pyralid, *Pilocrosis ramentalis*, Led. This species was represented in the Society's collection by a single specimen taken by me at Hamilton, and named for me by Mr. Grote, then of Buffalo, who had much of interest to tell me of the peculiarities of this insect, one noticeable thing about it is the long scales covering the costal margin at base of the front wings of the females, which can be raised so as to disclose the membrane. Mr. J. Johnston of Hamilton informed me that these two species are represented in his collection by a single specimen of each, taken by him there many years ago. Recently I have seen a specimen of *E. hyalinata* amongst some material sent to me for determination by Mr. C. E. Grant, of Orillia. In September the Tomato Sphinx, *S. quinquemaculata*, Hub, was quite plentiful, which suggests some interesting queries concerning the life history of this species. It is considered to be single brooded in this latitude; but it is known to mature occasionally in confinement the same season as produced. Were these

September specimens from eggs of an early brood, or were they from belated chrysalids of the previous summer's production? It has been observed that there is a great differance in the time of their appearance in nature, some showing themselves in early June, whilst fresh specimens may be obtained at the end of July; the location of the winter quarters of the pupæ influencing the time of maturing to some extent most likely. Again, if these late comers produced ova could they pass the winter safely? If not, then it would help materially to reduce the numbers for the following season. Of Sphingidae less frequently met with in this locality, Mr. Bice took specimens of *Ampelophaga versicolor* Harr. The Tobacco Sphinx, *S. Carolina*, Linn., and *S. Cingulata*, Fab., or *Convolvuli* of Linn. One thing secured by him, and determined by Dr. J. B. Smith, which is new to the Society's collection, is a single specimen of *Hydroecia limpida*, Guen., whilst several other Noctuids of the season's capture are not yet identified.

THE FREEZING OF INSECTS.

By Henry H. Lyman, Montreal.

In the 22nd Report of the Entomological Society of Ontario, being that for 1891, there appeared a paper from my pen under the title, "Can Insects Survive Freezing?"

I have recently come across further records of observations upon this subject, and deem them of sufficient interest to be republished.

In looking over an interesting book of travels, entitled "A journey from Prince of Wales's Fort in Hudson's Bay to the Northern Ocean, undertaken by order of the Hudson's Bay Company for the discovery of copper mines, a North West passage, etc., in the years 1769, 1770, 1771, and 1772, by Samuel Hearne," published in 1796, I came across the following interesting notes on page 397. :—

"Frogs, Grubs, and other Insects."

"Frogs of various colours are numerous in those parts as far north as the latitude 61°. They always frequent the margins of lakes, ponds, rivers, and swamps; and as the winter approaches they burrow under the moss at a considerable distance from the water, wher they remain in a frozen state till the spring. I have frequently seen them dug up with the moss (when pitching tents in winter) frozen as hard as ice; in which state the legs are as easily broken off as a pipe stem, without giving the least sensation to the animal; but by wrapping them up in warm skins, and exposing them to a slow fire, they soon recover life, and the mutilated animal gains its usual activity; but if they are permitted to freeze again they are past all recovery, and are never more known to come to life. The same may be said of the various species of Spiders, and all the Grub kind, which are very numerous in those parts. I have seen thousands of them dug up with the moss, when we were pitching our tents in the winter; all of which were invariably enclosed in a thick web, which Nature teaches them to spin on these occasions; yet they were apparently all frozen as hard as ice. The spiders, if let fall from any height on a hard substance, would rebound like a grey pea; and all the Grub kind are so hard frozen as to be as easily broken as a piece of ice of the same size; yet when exposed to a slow heat, even in the depth of winter, they will soon come to life, and in a short time recover their usual motions."

In Dr. H. Guard Knaggs' Lepidopterist's Guide, on page 44 of the 1871 edition, under the heading of "Ailments of Larvæ," I find the following :—

"Frost Bite.—It is well known that larvæ, which have been so stifly frozen that they might have been easily broken, have afterwards recovered. The chief thing to be remembered in the treatment of such cases, is that the thawing should be effected very gradually, rapid thawing being dangerous."

ODOUR OF THE SAN JOSE SCALE, *Aspidiotus perniciosus*

BY F. M. WEBSTER, WOOSTER, OHIO.

In the many accounts of this insect I do not recall that attention has been called to the odour that is associated with this insect and which in cases of excessive abundance, can be detected at a considerably distance away. Where the air is quiet it is often possible to detect the presence of a badly infested tree a yard away, and I presume that with more acute olfactories, such as insects are supposed by many to possess, even the presence of a more limited number of the scale might be detected at a much greater distance. As ants do not appear to be at all partial to this Coccid, at least in this country, it is not easy to understand what influence this odour can have in the economy of the species. It is possible that, in its native home, this odour might attract other insects and thus afford a means of diffusion, not at present so available to the scale in this country.

THE ODOUR OF COCCIDÆ.—Prof. Webster's interesting note leads me to offer a few remarks. The species of the subgenus of *Toumeyella* of *Lecanium* have quite a strong musky odour; but ordinarily I have been unable to detect any marked odour in species of Coccidæ. I suppose, however, that all possess some odour, and that its purpose is to attract the males to the females. This seems the more probable when we remember that in many species the male puparia are not on the same part of the plant as the females. Here at Mesilla Park, also, I have lately seen a male of *Margarodes hiemalis*, Ckll. ined., run over the ground until it detected a spot where a female was buried, and then dig down to the female. It must certainly have detected its mate by the sense of smell

T. D. A. COCKERELL.

LIFE HISTORY OF THE SHEEP SCAB-MITE, *Psoroptes communis.*

BY C. P. GILLETTE, FORT COLLINS, COLORADO.

I am not aware that the full life-history of this insect has been published, though I shall not be surprised to learn that such is the case.

In order to know how long a time should intervene between the first and second dippings for the cure of scab, we must know the period of incubation and also the entire time elapsing from the deposition of the egg up to the time that the mite from that egg, if a female, may be itself depositing eggs. These points were determined in a series of experiments conducted by the writer one year ago and were reported in a local paper, the "Fort Collins Courier," last spring. I took seventy-five eggs from a lock of wool drawn from the back of a badly infested lamb and, after dividing them in two nearly equal lots, placed them at once on the skin of the backs of two lambs that were not infested with the mites at the time. In order to irritate the surface a little and better prepare it for the little mites that would begin at once to hatch, a lock of wool was drawn in each case from the particular spot where the eggs were placed.

Mr. Ball, assistant in my department, made a special examination of these "cultures" once a day until the mites from the eggs were fully grown and themselves laying eggs.

At the first examination a few young mites were found, which was to be expected as a few eggs among so many would be about ready to hatch. At the end of the fourth day all the eggs had hatched. At the end of the ninth day a few individuals were found in copula, and on the eleventh day eggs were found. As it required four days for the newly deposited eggs to hatch, the entire time elapsing from egg to egg would be fourteen or fifteen days.

As there would be eggs in all stages of incubation upon a sheep when the latter is dipped for the cure of scab, I have set the limit of time for the second dipping at not sooner than five days and not later than ten days after the first dipping. If the second dipping comes at a time outside this limit, there will probably be eggs upon the sheep again.

OBITUARY.

Professor J. Hoyes Panton, M.A., F.G.S.

It is our sad duty to record the death of Professor Panton, which took place at Guelph, on the 3rd of February, 1898, after a long and very painful illness, which he bore with the utmost patience and resignation. He was born at Cupar, in Fifeshire, Scotland, and was brought out to Canada when a child; his father settled in Toronto at first, and removed, after some years, to Oshawa. He was educated at the Whitby High School and Toronto University, where he graduated with honors in Natural Science in 1877. The following year he was appointed Professor of Chemistry in the Ontario Agricultural College, but after a few years resigned the position and removed to Winnipeg, where he became principal of the Collegiate Institute. In 1885 he accepted the invitation of the Ontario Government and returned to Guelph, where he filled the position of Professor of Natural History and Geology in the Agricultural College till the time of his death. His work there had special relation to economic entomology and botany, on which subjects he issued many useful bulletins to farmers and fruit growers. He also published two small works on Economic Geology and "Insect Foes," which are valuable manuals of an elementary character. In 1896 Professor Panton attended for the first time the annual meeting of the Entomological Society of Ontario, though he had long been a member, and on that occasion read very interesting and useful papers on "Entomology for Rural Schools" and "Two Insect Pests of 1896—the Army Worm and the Tussock Moth." At the annual meeting in October, 1897, he was elected vice-president of the Society, but was unable to attend owing to the illness which had already seized upon him. The following resolution of condolence was adopted at a meeting of the Council held in March: "The members of the Council of the Entomological Society of Ontario have heard with profound regret of the death of their highly respected colleague and vice-president, J. Hoyes Panton, M.A., F.G.S., Professor of Biology and Geology in the Ontario Agricultural College, Guelph. They desire to place on record their admiration for his talents and attainments in natural science, and their deep sense of the loss which economic entomology in this Province sustained by his removal in the maturity of his powers and at an age when he was capable of performing much useful work. They beg to offer to Mrs. Panton and family their respectful sympathy in the great bereavement which has befallen them."

On the 18th of February, 1898, Mr. Johnson Pettit died at Buffalo, N.Y., and was buried a few days later at Grimsby, Ont. For many years Mr. Pettit was a most diligent and successful collector of Coleoptera in the neighborhood of Grimsby, and was well known amongst entomologists both in this country and the United States. After forming a very complete collection of the beetles of Ontario so far as known at that time, he gave up the pursuit and turned his attention to geology. Subsequently he sold his cabinet of insects to the Entomological Society of Ontario at a nominal price, in order that it might be kept in a place of safety and preserved from destruction. His work was characterized by remarkable neatness and painstaking accuracy.

Professor David Simons Kellicott was born at Hastings Centre, Oswego County, N.Y., January 28, 1842, and died at his home in Columbus, Ohio, April 13, 1898. In his boyhood his frail constitution and delicate health required him to spend much of his time out of doors, and it is to this, no doubt, that in part at least his love for nature may be traced. He graduated from Syracuse University with the degree of B. Sc., while the institution was yet known as Genesee College, teaching one year in Southern Ohio prior to his graduation. After graduating, he taught one year in Kingston Normal School, Pennsylvania, after which he was connected for seventeen years with the State University, at Buffalo, N.Y., being Dean of the College of Pharmacy, and also Professor of Botany and Microscopy. He came to the Ohio State University in 1888, where, for ten years, he has occupied the chair of zoology and entomology. At the time of his death he was General Secretary of the American Association for the Advancement of Science, President of the American Microscopical Society, and Treasurer of the Ohio Academy of Science. He had served as President of the Buffalo, N.Y., Academy of Science, and the Ohio Academy of Science.

Animal parasites of fishes, and the rotifera, from time to time claimed a considerable portion of Professor Kellicott's attention, but his entomological work won for him the admiration of the entomologists of America. Patient, conscientious and utterly devoid of selfishness, he was one of the most kind and loveable men the writer has ever met. Faithful and just with his colleagues and the idol of his pupils, seeking patiently and industriously after the truth, he won esteem while living, and in his death he has left numberless friends to mourn his loss. If there was ever a man who deserved the reward: "Well done, thou good and faithful servant," that man was David S. Kellicott; and the fruits of his labors will stand as an enduring monument to his faithfulness among his fellow men. He began to contribute to the Canadian Entomologist in 1878, his last article appearing in 1896. F. M. Webster.

Dr. Joseph Albert Lintner.

By the death of Dr. J. A. Lintner, which occurred at Florence, Italy, on May 6th economic entomology has lost one of its oldest, ablest, and most distinguished devotees. He was of German parentage, and was born at Schoharie, N.Y., February 8, 1822. He graduated from the Schoharie Academy at the age of fifteen, and for the next thirty years was actively engaged in mercantile pursuits in New York City, Schoharie and Utica. The study of natural history became a fascination for him early in life, and in 1853, he turned his attention especially to insects and rendered valuable aid to Dr. Fitch, who was then making an entomological survey of the State of New York.

Dr. Lintner's first paper upon insects was published in 1862, and six years later he became zoological assistant in the New York State Museum of Natural History. He continued in the service of the State until his death, working as assistant in the Museum for twelve years, and in 1880 receiving the appointment of State Entomologist. This thirty years of continuous, active service in an official capacity, in a useful and limited scientific field, and in a single State, is certainly a remarkable record, and one which speaks volumes of praise for Dr. Lintner.

He richly deserved the honour of the degree of Ph. D. conferred upon him in 1884 by the University of the State of New York. He was also honoured with the presidency of several scientific associations, and his name is enrolled among the members of many entomological and other scientific societies, both in America and in Europe. The publications of Dr. Lintner merit the highest praise and deservedly entitle him to the foremost rank among the economic entomologists of the world. He published more than a thousand miscellaneous articles upon injurious insects, besides his four important "Entomological Contributions" and his twelve reports as State Entomologist; probably the thirteenth report, for 1897, is in the printer's hands.

These reports are justly entitled to the highest rank among the scientific publications of the great Empire State. They represent the highest ideal or model of what such reports should be, both from a scientific and a practical standpoint. For typographical neatness and scientific accuracy, for the simple, yet elegant and dignified, way in which dry, scientific facts are made interesting and adapted to the understanding of the agriculturist, Dr. Lintner's reports have not been excelled in the world's entomological literature; such indexes as his reports contain are rare in any literature. One is still more impressed with the scientific and literary attainments of Dr. Lintner, when one understands that, practically, he never had any of the modern facilities, such as are found at many of our experiment stations, for studying the habits of insects; his office was his literary sanctum, laboratory, museum, library and insectary combined.

Dr. Lintner was a man of quiet and dignified manners, always courteous and pleasant to meet in social intercourse. He was ever ready to impart from his vast fund of knowledge; and being an expressive speaker, he always commanded the attention of scientific bodies which he was called upon to address. His frequent addresses before horticultural and agricultural societies in his own and in other States, and farmer's meetings of all kinds, were always full of information.

He had recently been granted a well-earned six month's leave of absence, and was spending it in sunny Italy when the death summons came. In Dr. Lintner the agriculturists of New York found one of their best and most helpful friends, and entomologists the world over, a true and sympathetic co-worker. His name well deserves a place in that list of names enshrined in the hearts of every American economic entomologist—Harris, Fitch, Walsh, Le Baron, Riley—and Lintner.

M. V. SLINGERLAND.

BOOK NOTICES.

TWENTY-FIRST REPORT OF OBSERVATIONS ON INJURIOUS INSECTS and Common Farm Pests during the year 1897, with Methods of Prevention and Remedy. By Eleanor A. Ormerod, London: Simpkin, Marshall, Hamilton, Kent & Co., 1898 (1s. 6d., pp. 160.)

We beg to offer our hearty congratulations to Miss Ormerod on the publication of the twenty-first of her Annual Reports. Twenty-one years is a long period for anyone to carry on a laborious work, but this talented and indefatigable lady has not only accomplished a most valuable and important work, she has done so without any assistance except that of her late lamented sister, and entirely at her own expense. On this side of the Atlantic, Reports of this character are published by the Government of the Province or State to which they belong, but in England no official recognition has been shown, and though the country has undoubtedly been saved hundreds of thousands of pounds by the instructions given in these Reports to the farmers and gardeners of Great Britain, whereby they have been able to intelligently cope with their insect foes and employ the best methods of prevention of their attacks, yet no aid has been afforded her from the public purse—no recognition of the immense value of her work has been vouchsafed by the powers that be. But while officially ignored, Miss Ormerod's name and work are held in the highest honour throughout Great Britain and treated by the press in every department with the utmost respect; and in many British colonies and several foreign countries her name is widely known and her talents fully recognized.

A single observer, however able and industrious, could not possibly pay attention to all the manifestations of insect injury throughout the British Isles, but Miss Ormerod has by degrees gathered together a corps of observers in every county and district throughout the United Kingdom; and is kept closely informed of all that causes injury or loss to crops or fruit, and to live stock as well. During the past year she received about 3,000 letters on Entomological subjects, and with the aid of a secretary was enabled to attend to them all. She thus conducts at her own charges what ought to be a Division of Entomology in the Department of Agriculture at London.

In the Report before us thirty-six species of insects are dealt with and figured, their ravages described, and methods of prevention and remedy fully given. Several of them are familiar to us on this side of the Atlantic, e. g. Apple Codlin Moth, Cockroaches, *Xyleborus Xylographus*, Mediterranean Flour-Moth (*Ephestia Kuhniella*), etc.

From the care and accuracy which characterize her desciiptions and figures, Miss Ormerod's work is of permanent value to economic Entomologists everywhere, and her reports are always received with welcome and gratitude by those who have the good fortune to obtain them. That she may long be spared to carry on her admirable work is the earnest aspiration of her many friends.

C. J. S. B.

Out Door Studies: a Reading Book of Nature Study, by James G. Needham; 1 vol. pp. 90. New York, Cincinnati, Chicago: American Book Company.

These are a series of stories of animal life, written in a charmingly interesting way, and designed to lead on a youthful reader to observe for himself the wonders of nature that are everywhere open to his view. It begins with an account of the common wild Snap-Dragon or "butter and eggs," and tells how the peculiar structure of the flower is designed for the visits of the bumble-bees who come for the nectar and carry off the pollen as well. The next chapters are on Chipmunks; Galls and their makers; the Golden-rod and its visitors and tenants; Crows and their Doings; Dragon-Flies which, as our readers may remember, have been special objects of the author's studies; Eye-spots on insects which aid in the protection of their owners; and Ant-lions. Any boy or girl, who takes up the book and dives a little way into its pages, will surely read on with delight and when the little volume is closed, be anxious to sally forth and see if he (or she) cannot find some similar marvels of nature and learn their meaning, while admiring their beauty.

The book is one of a series designed for the use of school-children who are about to enter the High Schools. It is beautifully illustrated with about ninety wood-cuts, the work of Mrs. Needham, the author's wife, and is provided with an index, and a list of the scientific names of the animals and plants referred to in the text.

C. J. S. B.

The Pterophoridæ of North America, by C H. Fernald, A.M., Ph.D., Revised Edition. July 30th, 1898. Boston: Wright & Potter Printing Co., 18 Post Office Square, 1 vol, 8vo, 84 pp., 9 plates.

Any one who has a copy of Professor Fernald's manual of the Crambidæ of North America will hardly need to be told that this later work is exactly what every student or collector of the Micro-lepidoptera wants, and that the way is now made easy for him when he wishes to identify his Plume-moths and learn all that is thus far known about the North American species. It is characterized by its author's well-known accuracy and conciseness of statement, and is a complete monograph of the family as far as this continent is concerned. It begins with an historical account of the family in the writings of European Entomologists and the more recent publications in America. This is followed by short chapters on the structure, habits, early stages and systematic position of the Plume-moths. The body of the work is taken up with descriptions of the genera and species, including very useful synopses in each case. Three of the plates illustrate the external anatomy and the structure of the wings, the remainder depict the genitalia of the species. We miss, however, the exquisite coloured plates that so beautifully illustrated the Crambidæ. We need not say more than that this is a full and entirely satisfactory work on the Pterophoridæ and that it maintains the high standard of excellence that we now expect in the author's scientific productions.

C. J. S. B.

Agriculture, by C. C. James, 200 pp., George N. Morang, publisher, Toronto, 1898.

It has been the lot of few authors to accomplish satisfactorily what in their preface they state to have been their object as Prof. James has in preparing the 200 page Manual of Agriculture which has lately been given to the farmers of Canada. The author has had special opportunities, which he has made the most of, of learning not only what was needed by the intelligent farmers of the Dominion, but what was the best way of presenting this information to them. Both as Professor of Chemistry at the Ontario Agricultural College and as Deputy Minister of Agriculture, Prof. James has been brought into close contact with the leading and rising farmers of Ontario. The new Manual will fill a decided want, which is none the less from the fact that this want may not have been noticed by some until their attention was drawn to it by seeing how well it has been filled.

The purpose of the book is "to aid the reader in acquiring a knowledge of the *science* of agriculture, as distinct from the *art* of agriculture, that is, a knowledge of the 'why,' rather than a knowledge of the 'how.' The science of agriculture may be said to consist of a mingling of chemistry, geology, botany, entomology, physiology, bacteriology, and other sciences, in as far as they have a bearing upon agriculture. The aim has been to include but the first principles of these various sciences and to show their application to the art of agriculture. . . . An intelligent understanding of the science underlying the art of agriculture will add much interest to what is otherwise hard work, and as a natural consequence, the pleasure of such work may be greatly increased."

Every day the fact is being recognized more and more that the elements of those sciences which underlie all progress in every branch of agriculture *must* be taught in the Public and High Schools of the country. Already simple nature studies and the first steps in chemistry and geology are taught in the schools of Manitoba and Ontario, and these studies have proved to be not only of use and attractive to the students, but a ready means of creating a bond of sympathy between the teacher and his pupils; more especially has this been the case with those energetic and restless souls too often now called "bad boys" more, perhaps, from lack of understanding or skill in management on the part of the teacher than from a superabundance of real badness on the part of the taught. Boys play truant because they find more to interest them outside the school than at their desks. If therefore the things which appertain to out-of-doors can be brought inside the schoolroom without robbing them of too much of their outside flavor, they will be a sure bait to catch the attention of all bright healthy boys and girls. Their study will arouse interest at once and the habits of concentration, power to observe and compare, and the necessary development of the faculties of exact thought and accurate description will be available for all other branches of study with which the pupil is engaged.

This book may be used as a text-book in High Schools and Public Schools. It would be well indeed for Canada if its use were made compulsory in every school in the land. The great truths laid before the reader are presented in a simple straightforward manner intelligible to all. The subjects are so skilfully arranged and concisely stated that a surprising amount of accurate information is given in this small octavo of 200 pages. The value of this simple knowledge to practical men is not, I believe, overstated when I aver that if all the farmers in Canada would read this little work, as they most certainly should, its appearance would mark an epoch in the history of the Dominion, which would be made manifest to all by an enormous increase in the crops and wealth of the whole country.

The scope of work is shown by the following brief epitome of subjects: Part I. treats of the Plant, its development, structure, food and functions; Part II, Soil, its nature and treatment; Part III., Crops of the Field; Part IV., The Garden, Orchard and Vineyard; Part V., Live Stock and Dairying; Part VI., Bees, Birds, Forests, Roads and the Home.

In these different sections the insect and fungous enemies of crops are treated at some length. This little volume is bound in cloth and well got up; although some of the illustrations are rather roughly executed, it is on the whole most excellent and for the price, 25 cents is a marvel of cheapness.—J. F.

THE WINTER FOOD OF THE CHICKADEE, Bulletin 54, New Hampshire College of Agriculture, by Clarence M. Weed—There is something particularly charming about those confiding little feathered denizens of the woods which brave our cold northern winters and stay to cheer us at a time of the year when there is so little animated life. The Chickadee or Black capped Tit-mouse *(Parus atricapillus)* is at once one of the most cheerful as well as one of the most useful of our common native winter birds. What a bright, busy, happy sight is presented by a flock of these little friends; for they are all friends these little balls of black satin and grey down, they are far too busy and well employed to waste time in fighting. Satan has a hard time of it in "some mischief finding" for these little fellows to do, for their hands are never idle, as they hurry through the woods, running up or around the trunks of trees or hanging head downwards from a slender twig, never still for more than an instant, as they peer into every tuft of moss, every crack or cranny in the bark, along the twigs, under the bud scales of deciduous trees or among the leaves of evergreens, talking cheerfully to themselves and each other all the time as they carry out their useful mission in clearing the trees and shrubs of countless insect enemies; woe to the luckless caterpillar, chrysalis, spider, or beetle which comes within the range of their sharp black eyes. Nothing comes amiss to these insatiable hunters, from the minute, shining black eggs of an aphis to the fat chrysalis of a Cecropia Emperor Moth; with deft blows the hard sharp beak soon penetrates the thick silken cocoon and in a very short time the marauder is away looking for another victim. Dr. Clarence Weed publishes in this interesting bulletin the results of some careful investigations which he has carried out as to the winter food of the chickadee. He shows that more than one half of the food of this bird during the winter months consists of insects, a large portion being in the form of eggs. Vegetation of various sorts made up a little less than a quarter of the food, and two-thirds of this quarter consisted of the buds or bud scales which were believed to have been accidentally eaten along with the eggs of plant-lice. These eggs made up more than one-fifth of the entire food and formed the most remarkable element of the bill of fare. This destruction of myriads of eggs of the plant-lice which infest fruit, shade and forest trees is probably the most important service which the chickadee renders during his winter residence. More than 450 of these eggs are sometimes eaten by one bird in a single day as well as the eggs of many other kinds of our most important insect enemies of the forest, garden and orchard. Dr. Weed figures in his bulletin some twigs of various trees upon which the eggs of insects have been deposited. Among these are represented the egg masses of the tent caterpillars and the Fall Canker-worm, both of which are favourite foods of these useful little birds. In addition to eggs or insects, many caterpillars and other stages in the development of insects are destroyed. One interesting figure shows the winter cases of a small caterpillar, closely hidden behind apple buds; these are, in all probability, those of the Eye-spotted Bud-moth, sometimes one of the most troublesome and destructive enemies of the fruit-grower. This bulletin shows much careful work in a field which has been, to a large extent, neglected by entomologists, and Dr. Weed should receive the thanks of all lovers of birds for the proofs which he furnishes of the real benefits we receive from these little favorites. It was pleasing for some people to know and most people to think that these birds were useful, but it is now possible to prove it to all who are willing to learn.—J. F.

Scudder's Revision of the Melanopli.

One of the most important works on Entomology which has been issued by an American author in recent years is that entitled a "Revision of the Orthopteran Group Melanopli (Acridiidæ) with Special Reference to North American Forms" by Samuel Hubbard Scudder.* It is more important because it deals with a representative North American group of insects whose members, between April and November, leap from our pathway in profusion whether we stroll through open woodland, sunny meadow, or along the roadside, and yet of whose classification and nomenclature the greatest confusion has heretofore existed. It was only another example showing the truth of the old saying: "that the common things around us are those of which we are most densely ignorant."

True, of one of the members of the group, the "Rocky Mountain Locust," *Melanoplus spretus* (Thos.), more has, perhaps, been written than of any other insect on earth, yet it is but one of 207 of its kind which are described at length by Mr. Scudder. The others are scattered far and wide over the continent of North America and the descriptions of the ninety-two species hitherto rightfully known to science were distributed through an almost equal range of literature. No better evidence of the need of the "Revision" is necessary than to know that after a careful examination of nearly 8,000 specimens, 7,000

*Proc. U.S. Nat. Mus., XX., 1897, No. 1124, pp. 1-421. Plates I.-XXVI.

of which belonged to the single genus Melanoplus, the author has in it reduced forty-seven supposed species to synonyms and has established eighteen new genera and described for the first time 115 species.

With a group whose members are so closely kin as those of the Melanopli it has heretofore been almost an impossibility for the specialist—let alone the tyro—to satisfy his conscience as to the status of a specimen which he might have in hand. The available literature was so scattered and the different authors had seized upon so many different characters as representing what appeared to them the most striking structural features, that the whole mess was worse than a Chinese puzzle. By seizing upon the variations of the abdominal appendages of the male as the most salient features showing specific rank, and by publishing actual drawings of two different views of the male abdomen of each of the 207 species, Mr. Scudder has done much to render possible the ready identification of each species—a task which otherwise would have been very difficult, owing to the size of the group and the close similarity of many of its members. Analytical keys to genera, and to species where the genus is not monotypic are also given, and add much to the value of the work; as does also the full list of localities from which each species has heretofore been taken.

Taking into consideration its size and importance, the defects of the "Revision" are very few. The one thing which the tyro will find most lacking is a glossary of the technical terms. In a work of the kind these are necessarily numerous, and though they may be plain to the author and to specialists, to the beginner they are often extremely confusing. Even a figure of a typical locust with all the parts named would have been a great aid. A tendency to multiply species can here and there be noted, as on p. 138, where *M. bivitattus* is separated from *M. femoratus* only by the color of the hind tibiae, which is an exceedingly variable character.

More might have been added along ecological lines, but this is a work for the future which the student of the group can now take up with renewed energy. For before one can write of a species he must have a name to handle it by; something which in the case of many of the members of this group has heretofore been lacking. Now, by using a little care and accustoming himself to the technical terms, the student can, by the aid of the "Revision," soon bring order out of chaos and label his Melanopli with correctness and despatch. In conclusien, it may be said that any one who will use the work will soon conclude that the aim of the author, "to enlarge and systematize our knowledge of this important group as a basis for future studies," has been well and successfully accomplished.

W. S. B.

A Text-Book of Entomology, including the Anatomy, Physiology, Embryology and Metamorphoses of Insects, for use in agricultural and technical schools and colleges, as well as by the working entomologist. By Alpheus S. Packard, M.D., Ph.D. New York: The Macmillan Company, 66 Fifth avenue. 1898. (Price $4.50.)

The book is primarily divided into three parts. Part I. being devoted to morphology and physiology, Part II. to embryology, and Part III. to metamorphoses. Under these divisions Dr. Packard treats his subject as follows: Position of insects in the animal kingdom. Relation of insects to other arthropoda. Insects (hexapoda). The head and its appendages. The thorax and its appendages The abdomen and its appendages. The armature of insects. The colors of insects. Muscular system, Nervous system. Sensory organs. Digestive canal and its appendages. Glandular and excretory appendages of the digestive canal. Defensive or repugnatorial scent glands. Alluring or scent glands. Organs of circulation. Blood tissue. Respiratory organs. Organs of reproduction. Development of the egg, larva, pupa and imago. Hypermetamorphism. Summary of the facts and suggestions as to the causes of metamorphism.

The volume contains 729 pages, including a carefully prepared index, 654 figures and numerous valuable bibliographical lists. We certainly have nothing in the way of entomological literature, in this country, that will cover the field of development of insects as will this last work of Dr. Packard. Not only the teacher and student, but the educated men and women of the world at large who may desire to know more of the anatomy, physiology and metamorphoses of insects, will find in this work the very aid that is most desired. With this work and some other like Comstock's Manual, any student of ordinary ability can begin at the very foundation of entomology and work his way upward, fully as easily as has heretofore been possible in zoology. The advent of this work certainly marks the trend of entomological studies in America. In future, except in some particular groups, we are to have less species-making and more studies of the development and transformations of those already well known in the adult stage, as well as of their inter-relations with each other and with other organisms about them. We shall not study dried corpses, alone, but life in connection therewith, and the possession of pinned specimens of the adults in our cabinets will only increase our desire to know more of the problems of their existence F. M. W.

Handbook of Insects Injurious to Orchard and Bush Fruit. By Eleanor A. Ormerod. London: Simpkin, Marshall & Co., Sept., 1898. 8 vo., 286 pp.

The excellent work which has been done for economic entomology by Miss Ormerod, particularly in England, but also in many other parts of the world, is well known to every one. Her valuable annual reports are eagerly looked for every year by all interested in the practical application of the study of insects for the prevention of their injuries to crops. We have just received from this talented authoress another evidence of her unselfish labours for the good of her countrymen. The above named volume is in reality a compendium of the original observations made during the last twenty-one years by Miss Ormerod and her correspondents, together with the latest results and the most approved remedies for the various pests of large and small fruits.

As in all former publications bearing Miss Ormerod's name, the arrangement of the subjects, for convenience of reference, the presswork and the general get-up of the volume, bear the stamp of a most careful and tasteful masterhand. The different fruit crops treated of are: Apple, cherry, currant, gooseberry, medlar, nut, pear, plum, quince, raspberry and strawberry. At the end is a list of the fruit crops infested by insects with the names of the insect infestations; the subjects are arranged alphabetically; and after the name of each tree or crop mentioned in the work the names of each of the infestations to which it is liable in England are classified under subordinate headings as Bark, Blossoms, Fruit, Leaves, Shoots, Wood according to the nature of the attack. The insects are given with their scientific and popular name and so far as possible are arranged together as to kinds, as Aphides, Beetles, Moths, etc., with the number of the page of the detailed observation in the volume. In four instances where the pests are causes of much mischief to several kinds of crops, the infestation appears under its own name. These exceptions are Earwig, Red Spider, Root-knot Eelworm and Wasps.

Particular mention must be made of the excellence of the illustrations which seem to be perfect types of what such illustrations should be in works on insects for the use of practical fruitgrowers. J. F.

The Butterfly Book, a popular guide to a knowledge of the Butterflies of North America, By W. J. Holland, D. D., Chancellor of the Western University of Pennsylvania, etc., Pittsburg, Pa. One vol. 4to., pp. 382. [Price $3.00 postage prepaid. Copies may be procured from the Author, or William Briggs, 29-33 Richmond Street, West, Toronto.]

It is with great pleasure that we announce the publication of this beautiful popular book on the Butterflies of North America Hitherto the vast number of young people who begin collecting insects have had their enthusiasm sorely chilled by their inability to find names for their specimens and have soon given up the pursuit in despair. Now, there need be no difficulty as far as the butterflies are concerned. In the handsome volumn before us there are no less than forty-eight beautiful colored plates, produced by a new process from photographic representations of specimens from the Author's cabinets and on them are depicted over a thousand butterflies, belonging to 527 species. The colors are remarkably true to nature and a child should have no difficulty in identifying any specimen that he may capture from the plates alone. In the letter press brief de scriptions are given first of the characteristics of the genus, in all its stages, with a wood cut shewing the neuration, and then of each species, setting forth the colours and markings, size, &c., of the butterfly, the early stages where known and the geographical distribution; references are also given to the works of Edwards, Scudder and other authors, where fuller information can be obtained. As an introduction to the work illustrated chapters describe in a popular and interesting manner, the life-history and anatomy of butterflies, how to capture, prepare and preserve specimens, their classification and the principal books that have been published upon them in North America. Interspersed through the volume are short papers for the most part of an amusing character in which the author varies the monotony of descriptive matter by telling some of his experiences or relating some interesting facts regarding these beautiful creatures. We heartily commend the work to our readers and earnestly hope that it may become widely distributed amongst all lovers of nature throughout North America. C. J. S. B.

WILLIAM HAGUE HARRINGTON, F.R.S.C.

One of the excellent portraits prefixed to this volume is that of Mr. William Hague Harrington, one of the ablest entomologists in Canada. He was born at Sydney, Cape Breton, on the 19th of April, 1852, and received his early education first at a private school and subsequently at the Sydney Academy, where he distinguished himself by close application in all the lines of study, and particularly in mathematics. In 1870 he removed to Ottawa and on the 30th of November of that year was appointed to a clerkship in the Post Office Department, where he has remained ever since, gradually rising until now he is chief clerk in the money order branch. Mr. Harrington has always been an enthusiastic naturalist and in 1879 he joined with his friend, Dr. James Fletcher, in the formation of the Ottawa Field Naturalists' Club, and has continued to take an active interest in it ever since. During the same year he was elected for the first time a member of the Council of the Entomological Society of Ontario, and has continued to hold some office in it ever since; in 1884, 5 and 6 and again in 1892 he was its delegate to the Royal Society of Canada; in 1891 Vice-President and from 1893 to 1895 President of the Society; for some years past he has also been one of the Editing Committee of the *Canadian Entomologist.*

Beginning with the year 1879, he has been a regular contributor to these Annual Reports. Among his more important and valuable papers may be mentioned those on Elateridæ (1879), Rhynchophora—Weevils (1880), Some Fungi-Eaters (1881), Long-stings, House-flies, Chrysomelidæ (1882), Insects affecting Hickory (1883), Saw-flies (1884), Ants, Wasps and Bees (1885), Insects infesting Maple trees (1886), The nuptials of Thalessa (1887), Insects affecting willows (1889), Hymenoptera Parasitica (1890), Notes on Japanese insects (1891), Uroceridæ (1893), Notes on Canadian Coleoptera (1894), Winter insects from Swamp-moss (1895) Beetles on Beech (1896), and his Presidential Addresses in 1893 and 4. During all these twenty years he has continually furnished papers of a more technical and scientific character to the pages of the *Canadian Entomologist*, and has described a considerable number of new species of Hymenoptera. His work is so thorough and accurate that it has been awarded the highest praise by those competent to judge.

In 1894 Mr. Harrington was elected a Fellow of the Royal Society of Canada. He is now in the full maturity of his powers, and, if his life be spared, we may feel sure that the coming years will continue to bear fruit and that Entomological Science will be enriched by the outpouring of his accumulated stores of learning, experience and observation.

JOHN DEARNESS.

The other portrait at the beginning of this volume is an excellent likeness of Mr. John Dearness, Inspector of Schools for East Middlesex, President of the Ontario Educational Association, member of the Educational Council for the Province, and from 1895 to 1897 President of the Entomological Society of Ontario. Mr. Dearness was born at Hamilton, Ontario, in 1852, his parents having come to Canada from the Orkney Islands. His early years were spent on a farm near St. Marys, where no doubt he imbibed in his youthful days the love of natural history which he has cherished ever since. His primary education was obtained at the local schools, from which he proceeded to the Provincial Normal School; there he greatly distinguished himself throughout the course and left with the highest honors and certificates. He at once began his professional work as the teacher of a cross-roads log schoolhouse in the country, but was soon promoted to be principal of a village school and then of a town school; after a brief period in a high school he was appointed to the important position of inspector in 1874, having gone through all these gradations of scholastic work in the marvellously short space of three years. He has now been performing the duties of an inspector for nearly quarter of a century, and is also Lecturer on Botany and Zoology in the Western University of Ontario at London. He was one of the editors of the series of "Royal Canadian Readers," and in 1896 was appointed a member of the first Educational Council of this Province.

Though his life has been so fully devoted to educational work, Mr. Dearness has yer found time for the practical study of natural science, especially of mycology, and has applied his leisure hours to the formation of a collection of fungi, which is unsurpassed in Canada, containing as it does a very large number of species new to science. For many years he has taken a warm interest in the Entomological Society of Ontario and since 1892 has held an official position upon its Council as Director, Vice-President and President. His addresses when filling the presidential chair have been published in these Annual Reports and must be familiar to our readers; they treat to a large extent, as might naturally be expected, of the educational value of natural history and the methods by which the study of insects can be successfully introduced into country schools. His scientific writings, however, have consisted for the most part of papers read before the Microscopical and Botanical Sections of the Society and have treated of toadstools and mushrooms rather than of bugs and butterflies. Being of the same age as Mr. Harrington and full of health and vigor, we may form similar expectations of his future work in his chosen fields of both science and education. C.J.S.B.

AN ACT TO FURTHER IMPROVE THE SAN JOSE SCALE ACT.

Assented to April 1st, 1899.

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

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

2 Section 7 of *The San Jose Scale Act, 1898*, is hereby amended by adding the following sub-section : 61 V. c. 33, s. 7 amended.

(*a*) If, in the case of an orchard or collection of plants, the inspector finds scale on plants located in several different parts of the orchard or collection, and decides that it is advisable in the public interest to destroy all the plants in such orchard or in any part or parts thereof and so reports to the Minister, the Minister may direct that an examination or inspection shall be made by an additional inspector, and upon their advice in writing he may direct that all the plants in such orchard or such collection of plants or in such part or parts thereof shall be destroyed without requiring that every plant in the said orchard or collection shall be first examined. Destruction of diseased plants.

3 The owner or proprietor of any nursery shall not send out or permit any plant to be removed from his nursery without the same being first fumigated by hydrocyanic acid gas in accordance with regulations prescribed by order of the Lieutenant-Governor-in-Council. Plants to be fumigated before leaving nursery.

4. No person shall sell or dispose of or offer for sale any plant obtained, taken, or sent out from a nursery unless the said plant has previously been fumigated in accordance with these regulations. Sale of plants before fumigation prohibited

5. In case the inspector finds scale in any nursery and so reports to the Minister, the Minister may thereupon inform, by writing, the owner or proprietor or manager of said nursery of the existence of scale in his nursery, and the owner or proprietor or manager of said nursery shall not thereafter permit any plant or plants to be removed from the said nursery until he is notified in writing from the Minister that the inspector has reported to the Minister that it is safe in the public interest to permit the said nursery stock to be removed after fumigation. Scale in a nursery—stock not to be removed without leave of Minister.

6. This Act and *The San Jose Scale Act, 1898*, shall be read and construed as one Act. Act incorporated with 61 V. c. 33

(For the San Jose Scale Act, 1898, see Report of 1897)

REGULATIONS FOR THE FUMIGATION OF NURSERY STOCK.

Toronto, April 7th, 1899.

The following regulations have been prescribed by Order of the Lieutenant-Governor in Council in accordance with the provisions of the *San Jose Scale Amendment Act*, passed April 1st, 1899 :

1. Fumigation must be carried on in a box, room, compartment, or house suitable for the purpose, which must be air-tight and capable of rapid ventilation. The owner or proprietor will notify the Minister as soon as preparation for fumigation is complete. The Minister will thereupon order an inspection of the fumigation appliances. No fumigation under the Act is to be carried on until such inspection has been made and a satisfactory report sent to the Minister.

2. The Inspector, after examining and measuring the box or house, or other compartment in which fumigation is to be carried on, will prescribe the amounts of material to be used for every fumigation, and the instructions as to the same must be carefully followed out. The Inspector may, if thought advisable, supply the material for each fumigation in weighed packages.

3. The fumigation house (which shall include all apparatus or appliances used in the fumigation, such as generators, etc.) is to be subject to the orders of the Minister on the recommendation of the Inspector. Subject to the approval of the Inspector the fumigation house may be on other lots than those on which the nursery stock are growing.

4. The fumigation is to be by hydrocyanic acid gas produced according to the instructions of the Inspector and from such formulas as he prescribes for the purpose.

5. The fumigation is to be continued for a period of not less than forty-five minutes. After the expiration of this time or longer, and when fumigation is complete, the house is to be thoroughly ventilated for fifteen minutes at least.

6. No person is to be allowed to enter the fumigating house until after the ventilation period has expired. Entering before may prove injurious, if not fatal, as the gas is a deadly poison.

7. The fumigation of buds and scions may be done in fumigation boxes of not less than thirty cubic feet capacity, the same to be subject to inspection and approval.

8. Immediately after inspection of the fumigation house, the Inspector will report to the Minister, and the Minister or the Inspector will thereupon give permission in writing for the owner or proprietor to begin fumigation.

9. The owner or proprietor of every nursery will attach to every box and to every package of nursery stock a certificate as follows, and he will furnish every purchaser who so desires a copy of the same.

CERTIFICATE OF FUMIGATION.

This is to certify that this package of nursery stock consisting of...............

....

....

was properly fumigated on the.........day of............, 1899, in accordance with the regulations laid down by the Ontario Minister of Agriculture. in accordance with 62nd Victoria, chapter 35.

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INDEX.

ANNUAL REPORT

OF THE

BEE-KEEPERS' ASSOCIATION

OF THE

PROVINCE OF ONTARIO

1898.

(*PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.*)

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1899.

ANNUAL REPORT

OF THE

ONTARIO BEE-KEEPERS' ASSOCIATION

1898.

To the Honorable, the Minister of Agriculture:

DEAR SIR,—I have the honor to submit herewith the nineteenth Annual Report of the Ontario Bee-Keepers' Association, in which will be found the papers read at the Annual Meeting held in the city of Guelph, and a full report of the discussions thereon. The report of the Inspector of Apiaries and also the audited statement of the finances of the Association are submitted.

Yours truly,

W. COUSE,
Secretary.

OFFICERS FOR 1899.

President,	W. J. Brown, Chard.
Vice-President,	C. W. Post, Trenton.
2nd Vice-President,	John Newton, Thamesford.
Secretary,	W. Couse, Streetsville.
Treasurer.	Martin Emigh, Holbrook.
Directors :	
District No. 1,	W. J. Brown, Chard.
District No. 2,	J. K. Darling, Almonte.
District No. 3,	M. B. Holmes, Athens.
District No. 4,	C. W. Post, Trenton.
District No. 5,	J. W. Sparling, Bowmanville.
District No. 6,	D. W. Heise, Bethesda.
District No. 7,	A. Pickett, Nassagaweya.
District No. 8,	James Armstrong, Cheapside.
District No. 9,	John Newton, Thamesford.
District No. 10,	F. A. Gemmell, Stratford.
District No. 11,	W. A. Chrysler, Chatham.
District No. 12,	H. N. Hughes, Barrie.
Ontario Agricultural College,	Dr. Jas. Mills, Guelph.
Auditors,	H. G. Sibbald, Cooksville. Geo. E. Saunders, Agerton.
Inspector of Apiaries,	Wm. McEvoy, Woodburn.
Assistant Inspector of Apiaries,	F. A. Gemmell, Stratford.
Representative to Industrial Exhibition, Toronto,	A. Pickett, Nassagaweya.
Representative to Western Fair, London,	R. H. Smith, St. Thomas.
Representative to Canada Central Exhibition, Ottawa,	J. K. Darling, Almonte.

Next place of meeting, Toronto.

LIST OF MEMBERS FOR 1899.

Name.	Address.	Name.	Address.
Armstrong, James	Cheapside.	Longfield, David	Crampton.
Alpaugh, J	Galt.	Livingston, W. D.	Frankville.
Atkinson, W.	Cheapside.	Lee, W. J	Addison.
Brenton, F	Corbyville.	McKnight, R	Owen Sound.
Boomer, A.	Linwood.	Munro, J.	Munro Mills.
Blais, Adolphe	Glen Sandfield.	Miller, F. J	223 Dundas St., London.
Bainard, E	St. Thomas.	McEvoy, Wm	Woodburn.
Brown, W. J	Chard.	Mansell, M	Athens.
Beaupree, M. C	Forestville.	McCarthur, —	Toronto.
Calder, J. W.	Lancaster.	Newton, Jno	Thamesford.
Comire, A. O., M.D.	St. Francois du Lac, Yamaska, Que.		
Cummer, D. N	Florence.	Overholt, Israel	South Cayuga.
Chrysler, W. A	Chatham.		
Craig, Will. J	Brantford.	Pierce, Moses	Brinsley.
Couse, W	Streetsville.	Pickett, A.	Nassagaweya.
		Pierie, John	Drumquin.
Davison, J. F	Unionville.	Post, C. W	Trenton.
Dickson, Alex.	Lancaster.	Parish, D.	Athens.
Darling, J. K	Almonte.	Potter, D. M	Elora.
Dickenson, Edw. E.	North Glanford.	Patterson, R. L	Lynden.
Davis, F. J	Brantford.		
Davidson, B	Uxbridge.	Ross, D. D	Martintown.
		Ross, Alex.	Williamstown.
Evans, J. D.	Islington.	Robinston, Geo. E.	Hatchley.
Emerson, Wm	Tansley.	Ramage, Thos.	Richview.
Edmonson, C	Brantford.	Reaman, Josiah	Carrville.
Emigh, Martin	Holbrook.		
		Shaw, James	Kemble.
Farmer, Thos. W.	Ancaster.	Switzer, J. F	Streetsville.
French, Augustine	North Glanford.	Strangways, Geo. W	Elora.
Fixter, J	Ottawa.	Salter, Jno. R	Wingham.
Frith, J. E	Princeton.	Sloan, W. H	Milford.
		Shultz, H. A.	Clontarf.
Gale, H. E	Ormstown, Que.	Smart, N. J	Collingwood.
Gemmell, F. A.	Stratford.	Shaver, J. H.	Cainsville.
Gemmell, John.	Lanark.	Shantz, Aaron	Haysville.
		Sibbald, H.	Cooksville.
Holmes, M. B	Athens.	Saunders, Geo. E.	Hornby.
Heise, D. W	Bethesda.	Smith, R. H	St. Thomas.
Holtermann, R. F.	Brantford.	Sparling, J. W.	Bowmanville.
Hall, J. B	Woodstock.	Smith, H. C	Athens.
Hoshal, A. E.	Beamsville.		
Hughes, H. N	Barrie.	Thomas, Joshua	Dracon.
Hurley, Jas. J	Brantford.	Taylor, Alex	Paris.
Johnston, Geo. E.	Bracebridge.	Vansickle, Lafayette.	Trinity.
Jeater, Wm. H.	Kincardine.		
Jackman, Sidney.	Bowmanville.	Wisner, Isaac G	South Cayuga.
Jackson, Ziba	Lyndhurst.	Wood, Geo	Erasmus.
		Wood, Samuel	Nottawa.
Kendrick, J	New Dublin.	Washburn, H	Soperton.
Kinder, Dr. Jos	Rockingham.	Whetstone, Josiah	St. Marys.
Lowey, R	Cherry Valley.	Young, Aaron	Murray.

FINANCIAL STATEMENT.

Abstract statement of receipts and expenditures of Ontario Bee-keepers' Association to December 7th, 1898 :—

RECEIPTS.

Balance from last year	$29 43
Membership fees	118 00
Affiliated Societies' fees	40 00
Legislative grant	500 00
Rebate on stenographic roport	15 00
From sale on books	3 00
	$705 43

EXPENDITURE.

Grant to affiliated societies	$160 00
" Industrial Exhibition	25 50
" Western Fair	10 00
" Central Canada Fair	10 00
Periodicals to members	76 70
Secretary's Salary	50 00
Treasurer's "	25 00
Stenographic report of last annual meeting	64 00
Directors' and officers' travelling expenses and allowance for board attending annual meeting	151 80
Executive, revising and other committee travelling expenses	37 75
Printing, postage and stationery	42 58
Auditors' expenses	4 00
Miscellaneous	2 00
	658 85
Balance on hand	46 60
	$705 43

We, the undersigned auditors, have examined the accounts and vouchers as per above account, and report all correct.

R. H. SMITH,
J. ALPAUGH.

Guelph, December 7th, 1898.

ONTARIO BEE-KEEPERS' ASSOCIATION.

ANNUAL MEETING.

The nineteenth annual meeting of the Ontario Bee-keepers' Association was held in the Council Chamber in the city of Guelph, on Tuesday, Wednesday and Thursday, December 6th, 7th and 8th, 1898.

The President, Mr. M. B. HOLMES, called the meeting to order at 2 p.m.

The Secretary, Mr. WILLIAM COUSE, read the minutes of the last annual meeting, which, on motion of Mr. W. J. Brown, seconded by Mr. A. Pickett, were adopted.

THE PRESIDENT'S ADDRESS.

BY M. B. HOLMES, ATHENS.

It gives me a very great amount of pleasure to meet the bee-keepers of this the banner province of the Dominion of Canada on this occasion. There is a pleasure in meeting because of the very favorable season through which we have just passed, the honey harvest generally throughout the Province having been a good one. Some localities, however, report only a very low average yield of honey. Again there is pleasure in meeting because of the very excellent programme which we are able to place before you. Masters in apiculture from the north and south, from the east and west, and from the republic to the south of us, are to give us the full benefit of the advantage gained by years of study and research. Honorable gentlemen in high positions of trust in the government of this fair country are expected to speak to us. Truly this is a bill of fare which cannot fail to satisfy and please the most fastidious, and I presume the question arises: How can we do justice to this "feast of reason and flow of soul" in the short space of three days, the time allotted for our convention in this city?

The location contributes largely towards making the present meeting a pleasurable one. Guelph, the "Royal City," with its beautiful surroundings and its agricultural college with its most competent staff of professors and teachers, where every branch of agriculture and domestic science and economy is so thoroughly conducted and the principles so well inculcated (each under its own separate and distinct head) that even those who might be disposed to criticise are unable to do so. These, and other considerations to which reference might be made, certainly go a long way toward making our visit to this city a pleasure.

Our Association is moving along nicely, and it is certainly most gratifying to know that the work of disseminating useful knowledge among our members, while at the same time their personal interests are being served, is being so well accomplished. However, as there is an ever widening field before us, the methods at present employed will doubtless be changed and improved as time and circumstances may require, and as "England expects every man to do his duty," so in like manner let every member of this Association stand by the colors, and speak well and only well of the organization which has done so much for the bee-keepers of this country, and in this way help to swell our present membership by the addition of the names of hundreds of bee-keepers who have not as yet realized the true import of a membership with us. In this connection the recommendation of a lecturer at Farmers' Institutes (the appointee of the Provincial Government) might be worthy of your consideration. In any event, first and last and all the time, let us be loyal to the organization which has for its object the promotion of the best interests of bee-keepers in general. The truest badge of membership, and the best show of sincerity, is a loyalty that manifests itself when there are no selfish interests to serve.

The Inspector of Apiaries has, so far as I have been able to learn, attended to the work in connection with his department in a manner which has been quite satisfactory to all concerned. His report will, however, be submitted for your consideration and approval.

The present prices of honey, with the slightly downward tendency incident to the harvesting of a good crop, will probably have a discouraging effect upon bee-keepers of this Province. The history of the butter and cheese industry of this country would certainly be an interesting and profitable study for all such. When the price of cheese commenced to decline, the dairymen did not for a moment entertain the thought of giving up the business. On the contrary, they decided to keep a larger number cows and to introduce new systems of feeding with a view to increasing the yield of milk per cow, and the result with the "up to date" dairyman is that the average yield of milk per cow has been doubled, and in many instances more than doubled. They did not give up because of low prices, and may we not profit by a study of their movements? Following their example we will keep a greater number of colonies of the very best bees that money can buy, sparing no pains or expense to improve and make the most of the bee pasturage in our various localities; and thus, keeping pace and co-operating with the dairymen, we will do our part in making this fair Canada what it was originally intended to be—"A land flowing with milk and honey."

SPRING MANAGEMENT.

By H. B. Sibbald, Cooksville.

The subject assigned to me is spring management. Perhaps the first consideration for those of us who winter our bees in the cellar is, when to set them out. I would say as early as possible after the middle of March. A few years ago, a month later was considered right. But, from experience, I believe better results follow earlier setting out. We save a few colonies that might not have stores to last until the middle of April—some that are affected with dysentery, and any that are restless—by giving them an earlier fly and earlier attention.

Next comes how to set them out. Each hive ought to be placed on the stand it occupied the previous summer, for the following reasons: They remember their old location, and will return to it if placed on any other stand, thus mixing up with other colonies, causing discontent, swarming out, queen-balling and general disorder and loss. For four seasons I have practiced placing them on their own stands, and have not had any of the above mentioned troubles. Nor have I lost a single queen in the spring. Four years ago I felt a curiosity to know how my bees had wintered, and also wished to have their company in the yard. It was a fine sunny day in March. So I accordingly entered the cellar and carried the first hive out, placing it on a nice dry stand in the centre of the yard. They soon commenced to fly out, and I watched them with interest and pleasure, as they flew so strong and healthy. But I soon noticed quite a cluster on the front of a corner stand, and I began to wonder what caused them to gather there. Then I remembered that this was the last hive carried in, and so belonged to this very stand. To further experiment I brought out the next hive and set it on the corner stand. When the bees had gathered they at once entered, but did not seem satisfied, but the bees that flew out surrounded the stand next to it where they belonged. I took the lesson, placed each on its original stand, and as I carried the remainder out followed down that row up the next, and so on until I had every hive where it was before, without the trouble of numbering hive and stand, as some advocate and practice.

The next important work in connection with setting the bees out is examining them. This I have reduced to a minimum, by having each hive contracted on five or six combs the previous fall by taking out four or five of the undesirable combs and placing a division board beside those remaining. Thus I have the bees snug and tight, clustering while in the cellar right down to the bottom board, and where they can be seen plainly by holding a candle close to the opening at the back, where the hive is blocked up $\frac{3}{8}$ or $\frac{1}{2}$ inch off the bottom board.

A few days before setting out time I go through the cellar with a candle and take a peep in at each hive. If they are clustering quietly, the bottom board clean and dry, I place a mark on the hive indicating that they are all right and need no examination. Thus I have to examine only the few that are uneasy, or those in which the dead bees have not been cleaned off the bottom board—perhaps only ten or fifteen out of say ninety or one hundred hives. This is a decided knock in the head to the robbers. They do not get any snap that day, and attend to legitimate business. I might just say that when carrying them out if I notice one unusually light I mark it to be examined also. Thus we have eighty to ninety per cent. with the propolised quilts undisturbed, air tight at the top, contracted, and, as I consider, in the best possible condition for future prosperity. After placing entrance blocks and sun-caps on each hive, I leave them alone for nearly a month until the young bees are hatching nicely and pollen is coming in freely, then I have a general examination, looking into each hive carefully, but quickly, noticing the brood, honey supply, and in fact the exact condition of each colony.

If the bees do not cover the combs, take one or two away, only leaving those that will be well covered by the bees. Crowd the combs very closely together, brood in the centre and put a well filled comb of honey on each side. Place a comb or two containing honey and pollen outside of the division board. (There ought to be a bee space underneath the division board so that the bees can come around and carry this food into the living apartment.) This stimulates brood rearing, keeps them at home contented on windy, rough days, and is a perfect assurance against starvation. It also aids in the more generous feeding of the larvæ, and keeps the bees healthy and strong. I believe they look upon these combs as not belonging especially to them, and the more eagerly and joyfully carry it around, placing it in cells just above the brood uncapped and ready for present needs. A constant supply is kept in this way until they occupy the entire hive, and there is no further room for it.

During the willow-bloom they may need more room. The brood should not be spread. The additional combs ought to be placed just outside of the comb containing the honey, and outside the brood nest, never adding more than one or two at the same time, and repeating the operation from time to time until the whole hive is full. I generally use combs that the honey has been taken from, and that has been cleaned up by the bees outside of the division board. They are more likely to be filled right up to the top bar with brood. Always keep them crowded, and if anything short of room, so that the brood is well covered and cared for, and the queen looking for more cells is compelled to lay in the very corner ones, thus giving solid combs of brood as we go along.

During the early part of fruit bloom hives ought to be cleaned, all burr-combs, barr-combs and propolis scraped off the frames and hive. All queens ought to be clipped; this is the most convenient time to find them. Choose a fine warm day when most of the bees are engaged in the trees and the hive is sparsely occupied. She can be detected readily, and the work of searching for her is greatly reduced.

At the close of fruit bloom I aim to have each hive contain eight solid combs of brood and two of honey during the week or ten days of dearth between fruit bloom and clover. Place the combs containing the honey in the centre of the brood nest, one first, followed four or five days later by the other, the cappings having been scratched, so that they at once move the honey, feeding their brood more generously. This will stimulate and encourage the queen so that she at once deposits eggs in the cells as they are thus emptied, making ten combs of solid brood and the hives ready for supers. By this plan the old honey and dark fruit-bloom honey is actually traded off for brood, and the first extracting is all new, white, marketable honey.

Of the work in the honey-house and work-shop I need not take your time any more than to say if one has a large number of colonies to manage, or other work to attend to through the busy season, have all the preparatory work done you can, such as new hives ready, supers cleaned up, barrels and tins washed, extractor, bee-smoker and all other appliances in readiness for the rush of the busy season.

Mr. R. F. HOLTERMANN, Brantford : I happen to have seen a good deal of the comb honey which Mr. Sibbald has produced; I have seen it time and again on the Toronto market, and I must confess that from that standpoint I received an exceedingly good impression of Mr. Sibbald's ability as a beekeeper. I have never seen anything, and I have seen it dozens of times on the Toronto market, which would not be a credit to any beekeeper. And I wish to say that particularly because I think, coming from this standpoint, that it always adds to the value of the paper. I know that Mr. Sibbald is modest, but I would like to emphasize that point. In his management there are many points which are valuable—but one in particular which I believe would bear discussion, and that is the converting the honey which comes in early in the spring, and is dark and inferior, into bees. That is a point in successful management. There are so many who will not do that, and the result is not alone that they do not get the bees for that honey, but that honey is taken up in the upper stories of the hive where, for comb or extracted honey, it deteriorates the value. I would like to ask Mr. Sibbald a question, whether under all circumstances, he advocates the clipping of queens' wings?

Mr. SIBBALD : I do ; before the swarming season.

Mr. F. A. GEMMELL, Stratford : Did I understand Mr. Sibbald to say that it was necessary to put them on five frames wintering in the cellar?

Mr. SIBBALD : That is what I try to do.

Mr. GEMMELL : Do you not think that for wintering in the cellar they would be just as good on eight or ten frames?

Mr. SIBBALD : No, I do not think so.

Mr. HOLTERMANN : For all men keeping bees, under different conditions, would you advocate the clipping of wings?

Mr. SIBBALD : I have not considered it from any other standpoint than my own.

Mr. HEISE : What injury would come from clipping under any conditions?

Mr. HOLTERMANN : Of course the clipping of queens' wings certainly comes under spring management. You know there is a diversity of opinion about the matter. I will tell you the conditions under which I do not like to see queens' wings clipped. If the beekeeper is not at hand always to catch the queen when she issues from the hive, then she is very likely to be lost, when many a swarm would not lose the queen if her wings were clipped and the beekeeper were there within a few minutes to get the swarm.

Mr. GEMMELL : I think in the matter of clipping queens' wings everybody has to use his own judgment. Mr. Sibbald advocates the clipping of queens' wings, so do I, and I guess if a majority of hands were shown here they would favor it. You have to use your own judgment. I would like to hear what Mr. Hall has to say about bees going into the cellar on five frames instead of ten.

Mr. J. B. HALL, Woodstock : If they are on five frames in the apiary I prefer to put them in the cellar on five frames ; if they are on sixteen frames in the apiary I prefer putting them there on sixteen frames. I prefer doing things with the least labor. As I told you before, I was born tired.

Mr. C. W. Post, Trenton : I like a temperature of about from 42 to 45°, but if there is a draft and much cool air coming into the cellar to keep the temperature down, I would rather have the temperature in the cellar a little higher rather than to go lower.

Mr. Hall : I would like to ask our friend who wrote the paper on spring management why he prefers all his queens clipped. Under all conditions I favor clipping queens.

Mr. William McEvoy, Woodburn : I am in favor of clipping queens under all circumstances.

Mr. A. Boomer, Linwood : I have read a good deal about setting bees out just exactly where they were before ; I have read of those who believed in it and those who did not believe in it. Last year I wintered very largely in the cellar. Previous to that I wintered largely outside ; and I put the bees in, not having any help. I put them in somewhat hurriedly, and then it was a consideration to me in the spring in putting them out whether I was going to have difficulty in mixing up. I took out about half of them one day to see what the effect would be, and spread them somewhat over the yard, and I have to say here now that I found no such difficulty as my fried has intimated in his paper. The bees kept very well to their own hives, and there was no scattering around that I could discover. On looking them over afterwards I found that they were in very much the same condition as they came out of the cellar. If some of them had strayed to other hives there were some had come the other way perhaps. At any rate I could not see that there was any difficulty in that respect whatever. On setting out the rest I found they kept very well to their own hives, and upon the whole I could not see that there was anything worth the trouble and bother of marking the locations and the hives. Not a single colony that I wintered in the cellar had died, and not a single one of those colonies was queenless in the spring, and every one of them came safely through the spring, whilst one or two that were wintered outside lost their queens. Now, as to the clipping of queens, I have had no experience further than in the purchase of queens, and so far as my experience with clipped queens goes it is not favorable. I have found that the bees superseded the clipped queens before they were two years old, almost as a rule. In those colonies into which I introduced clipped queens, and knew they had been safely introduced, they would swarm the second or third year at least, and the queen would be an unclipped one. I know that a queen I bought a year ago this spring, and was guaranteed to be one year old then, was superseded this summer, and it disturbs the hive considerably to have them supersede the queen. Then again, I have had no trouble whatever with absconding swarms. Having a considerable number of small trees around the yard I have not found any colony to swarm without first lighting, and it seemed to me to be less trouble to take care of these swarms than to watch the clipped queens. So that so far, from the experience I have had, I am not in favor of the clipping of queens. Otherwise the paper my friend here has read is certainly very interesting to me. There are many points that I think worthy of note, and I shall think of them, and read his paper again when it comes into print. There is just one thing he had no remarks about that I will touch upon, and that is the removal of drone comb from the hive in the spring. I presume he is careful to see that there is little drone comb left, but he made no remark as to that. On looking over the colonies I try to replace any drone comb there is with good comb, and in this way to keep down the drones as much as possible, because I fully believe that the raising of a lot of drones stimulates swarming. One season when I carefully removed drone comb I was not troubled with swarms at all, and yet my young friend here, I suppose, has had more experience and more instruction on bee-keeping than I have had myself, so I would not like to criticise his paper too closely. I appreciate it very much.

Mr. Hall : I can say in Mr. Sibbald's favor that I have kept bees for twenty-three years past, and I have been a clipper. I have never had but one imported queen live the second year. I attribute it to putting them in a shipping cage, and checking their laying qualities. Last year we had a queen in its fourth year, and it died. If you had offered in the spring ten dollars for that bee you could not have her. She was clipped at six weeks old. That is the only thing I differ in from that gentleman. Never open a hive of bees from the top until the fruit blossoms. You may do some good, but you will a great deal of harm. You will come into clipping. I was laughed at twenty years ago for clipping; I stood that laughing. Clipping their wings keeps them at home, and they cannot get off whenever they choose. My advice is keep on clipping.

Mr. GEMMELL: I do not think it is fair to say that clipped queens are superseded any sooner than any other. Take your young queens, and clip them and put them right back in the hive again, and then see. We all know that if you buy a queen from any part of the country, and introduce her into the hive, she does not live as one who is born in the hive. Queens should be caged in the hive a day or two before they are sent away.

Mr. HOLTERMANN: I would not like to be understood that I think the clipping of the queen would result in superseding. I believe a great many think that queens are not superseded when they are; when they clip them they know it, and when they do not clip them they do not know it. I would not like to lay down a universal rule for clipping. Where a person has four or five swarms they can keep their eye on those swarms to a certain extent, and nearly always will catch a swarm, when, if they are clipped, and the queen comes out and she is lost or goes back, they will destroy the queen; and then that bee-keeper rests under what is false security, for he thinks he will be able to get his swarm, when as a matter of fact the young queen is going to go out. I would like to ask Mr. Boomer, do you set out your swarms a few at a time or all at one time?

Mr. BOOMER: I set out some 30 one day and the same number the next day. I set them all out at one time, in the morning.

Mr. HOLTERMANN: I set out my bees not all at one time, and I try to set them out when they are not going to fly immediately, and I think that makes a great difference. If you set out your bees all at one time, the result is they do not locate themselves, and in this question of bee-keeping we want to get at the bottom of the business, and we will find our differences are not as great as we imagine.

Mr. J. D. EVANS, Islington: When bees swarm, and the bee-keeper is not there and the queen gets lost or destroyed, how does the keeper prevent the first hatched queen from going away with the swarm before she is old enough to be clipped?

Mr. A. PICKETT, Nassagaweya: I am listening to this matter of handling bees in the spring with some interest, and with profit. My method of setting out bees of late years has been to set them out towards evening, so that they are calmed down and quiet, and when they fly out the following day they go out as calmly as they would any other day, and there is no excitement, or not that excitement which prevails when they are set out in the early part of the day. Like many others we are anxious to see what they look like in the spring, and when a fine day comes are eager to set them out. Around one hive you will find there was quite a large number flying, and perhaps another one with quite an amount of disturbance was not flying scarcely at all. To my mind the bees were changing position in many cases and were flocking to the front of other hives, or in other words to the old stand whence they were carried. And I think if we note the matter carefully we will see at once that it is wise to put them on the stands from which they were removed in the fall, and all that mingling will be done away with, and we will have less bees lost, and the result will be that they will go forward with their work in harmony and with a will. I approve of the method of setting them out in the evening, as I said, because of the fact that this mingling is done away with. The question that Mr. Evans asked I am not prepared to answer just now.

Mr. JOHN NEWTON, Thamesford: I was very much pleased with the paper read, and I thought at the moment that I could not say a word on the clipping of queens. Of course I have been in favor always of clipping queens, and there was just this drew my attention to it last spring; I was not able, on going over my hives to find all my queens, and for that reason I think I have lost three swarms this season, the only time I have lost a swarm since I kept bees, and I know, had those queens been clipped, and I not been there, I would have had the bees. It is the bees we are after; we do not miss a queen at that season. It is the time we are looking forward to our honey crop, and we must try to save the bees.

Mr. EVANS: When a queen is gone the other queen is hatched, and that queen, I understand, will possibly swarm before it is mated. How would you guage the proper time to clip that queen's wings—before it goes away with the swarm and after it is mated? I am speaking, in this case, where you have an out apiary. I want a young queen that will stay in the hive in place of the old queen, and I want to know how you are to keep her there.

A MEMBER: Ten days from the time the queen emerges she will begin to lay; that is the rule.

Mr. EVANS: What are you going to do with that ten days if she wants to swarm before she lays?

Mr. HALL: We will suppose colony No. 1 swarms to-day, and it goes back; it will swarm again to-morrow. If the queen is lost they will go back and will not swarm again until the first queen hatches; that you are aware of. I go out once a week, and 99 times out of 100 there is not one queen hatched out in seven days and flying away. When I open that hive I know whether there is a queen hatched or not. If the old queen is there, there are eggs, and if she is not there are no eggs. Therefore, I know the queen is lost; and if she is lost I prevent any further increase from that stock of bees.

Mr. HOLTERMANN: That queen when she deposits eggs in the cell, and that colony has had the swarming impulse, she may fly out just as quickly as she had lodged one egg in the queen cell.

Mr. HALL: It has never been my experience to have a young queen swarm the year she is born. A young queen will not lay her egg and swarm. Some one has said they will swarm, and if they do not return you will then, of course, lose your queen. That is immaterial; as long as they have wherewithal to raise a queen they are quite at home. By having your queen clipped they come back. They may swarm in two days; again they come back; they will not swarm out again—mother won't go.

Mr. EVANS: Am I to understand that after the old queen is lost, and all the queens destroyed but one, and there is only one queen in the hive, there is no danger in their swarming?

Mr. HOLTERMANN: If she begins laying.

Mr. HALL: They have no swarming impulse then.

Mr. HOLTERMANN: You have practically nothing after clover, but where you have buckwheat that makes a difference.

At this point in the discussion Mayor Hewer and Alds. Howard, Nelson, Kennedy and Peterson came in and addressed the Association in warm words of welcome.

Mr. MCEVOY: There is another point I had forgotten. Where the garden is close at hand they do not want their queen in their neighbor's garden, and if they clip them they will not have to go after them. If they have wings you have to hive them within a reasonable time.

Mr. JAMES ARMSTRONG, Cheapside: If I understand the thing, if you clip the queens they will come back without any confusion at all.

Mr. HOLTERMANN: I think it is much better not to have any swarms in the yard at all. We have had seven and eight at one time this year, and I will tell you how you can prevent it. You have all seen a description of Taylor's Swarming Device. The moment you see your bees coming out, or before the queen issues, you put this at the front of the hive. It is practically a cage. The swarm issues into this, and perhaps in the next minute you have that adjusted, and another comes out. You put another at that, and you can have eight at one time. You can separate all your bees; you have not to look after your clipped queen at all. After a swarm issues you go to work and take off Taylor's Swarming Device (there is a cloth at the mouth of it) and close it up tightly.

Mr. MCEVOY: What would you do where a hive is raised from the floor an inch or an inch and a half?

Mr. HOLTERMANN : I would have some better system. A child who cannot catch a queen, who cannot see it, can adjust the catcher, and they can be left there all day if you like. Some have not made a success of Taylor's Swarming Device. If you attempt to hive your bees in the new hive, as soon as they are out of their hive they are going to take wing and leave it instead of going into the new hive; but if you allow them to stand there and cluster, and then put them in the new hive, you have not any of those difficulties.

Mr. GEMMELL : I have seven or eight of them in the yard, and I never mind the first swarm, but just as soon as I see the second coming, up goes the cage. I carry them into a little shop where it is shady, and after half an hour if I want to use a catcher I use it. I remember hiving eleven swarms from half-past ten to twelve o'clock, and not two of them were in the air at the same time. It saves trouble and saves mixing up. I have used those catchers for some time. I have them standing at different places through the apiary, and when I see a swarm coming I look for the first catcher, and it is clapped on.

Mr. J. K. DARLING, Almonte : The discussion started on clipping queens, and has wandered off to something else I think. As Mr. Hall says here, I am a clipper. I was not at first, but I have clipped the queens for a number of years. I was forced into it by a very disagreeable neighbor, and I do not know that he ever did me a greater favor in his life. He has saved swarms for me that I would have lost if I had not clipped. I lost those that issued with unclipped queens in several instances Friend Hall here says that if they come out the second time they will stop at home.

Mr. HALL : No, sir, after the third time. Three times and out.

Mr. DARLING : Well, I had them seven times, and out.

Mr. HALL : Did you put them back in the brood chamber?

Mr. DARLING : It was a new swarm, and they had been in for a time. It was a Jones' hive, and I had, I think, four supers on top, working on the principle that if we give them room enough they would not swarm. I have had them leave the hive after the young queen hatched out. I have had them leave the hive without a queen. I found the hives queenless, because the queen did not go back; but the bees came out all the same, and left the hive without a queen. I believe in clipping every time as soon as they begin to lay. I do not think they are superseded any sooner on that account, because one year I had one hive hatch out one queen after another; they were young queens and could not keep the colony up to its normal strength. With regard to their becoming dissatisfied with the queen coming out, I have had them where I captured the queen and put them back again, and the old bees drove them out. They will do the same thing with queens whether they have wings or not.

Mr. HALL : Our friend is talking about clipped queens in hivers or swarm catchers. In an apiary of 225 colonies of bees we had in three days eighteen swarms each day, and on fourth day twelve swarms, sixty-six in all. We had no swarm catchers, we had all clipped queens, and we had not hard work. We let the queens into the cage, the bees returned, and we let them stay there till we could attend to them. We had no means of catching them, only in clipping them. I have had as many as eight of these swarms hanging together. The queens were caged, they didn't all want to get into one hive, neither did they want to go into any hive, but they came back to their own stand. The chief object of clipping queens is to keep a record of their age, and to keep them from going to the woods. If you contract your brood nest they are very apt to be dissatisfied with it. If they try several times and cannot get off they will then go to work, and with clipped queens you can do that with them, but with other queens you cannot.

Mr. NEWTON : The question of clipping queens ought to be just about threshed out now. I heard a question asked Mr. Sibbald, if he cut the drone comb out in the spring. and the thought struck me how does that brother hive his bees. I think it is a point we ought to have some discussion upon. As far as mine is concerned I do not have any drone comb to come out in the spring. I very rarely look for it because in hiving a swarm I contract my hives to either five or six frames, and therefore have very little, if any, drone comb at all.

Mr. ATKINSON : There is one question I would like to ask concerning the clipping of queens' wings. Do the gentlemen who practice that put back the queen into the old hive? Say, for instance, there is an old swarm of bees with a clipped queen—do you take that swarm and return it back to the same hive without taking out the cells?

Mr. HALL : Never.

SUMMER MANAGEMENT.

By W. J. Brown, Chard.

Away down east, in the county of Prescott, my little apairy is situated, composed of about 100 colonies, sometimes more and sometimes less. It covers an area of about 120 feet square. I have a few of the Langstroth hives (eight-frame), but the majority of my hives are the "ten-frame gallop." I prefer the ten-frame hives, as they give me better results from year to year. They usually come out best in the spring from their winter quarters, and give a larger "first swarm," which is about all the swarms I have any use for, from each colony.

To make a successful summer's work requires that everything must be right the three preceding seasons, viz.: for autumn, plenty of stores of honey (as I have no use for the sugar barrel in my bee yard at any season of the year), and a good prolific queen; and for winter a proper repository, perfectly dark and quiet, with a temperature ranging from 40 to 45 degrees. In the spring see that each colony has its queen and enough stores to carry them through until the honey flow begins.

My hives are placed in rows of about 20 in each row, all facing the south. In the orchard the grass is kept down by the regular running of the lawn mower between the hives in every direction. At the commencement of the clover honey flow, when the combs begin to whiten along the top bar, and the bees begin to show signs of wanting more room, I then put on the extracting supers, as I work chiefly for extracted honey.

The supers are duplicates of the brood-chamber. When the supers are put on at this time I do not experience any difficulty in getting the bees to go up to work in them.

When the combs are about two-thirds sealed I commence to extract, and by the time I get over the whole yard the last combs are pretty nearly all sealed.

I start with a set of empty combs in the comb-basket, and open up the entrance (if not already done), contrary to the methods of some eminent beekeepers, puff in a little smoke, remove the cover and propolis quilt, puff in some more smoke, remove the frames that are sealed sufficiently for extracting, leave the rest and fill up the super with empty combs from the comb-basket. All this work is to be done as quickly and as quietly as possible, so as not to jar or annoy the bees. Then cover up the hive, and carry the combs to the extracting room, there uncap, extract, and then go to the next hive to be operated on, and repeat as with the first—this to continue all day long.

A stove is usually kept in the extracting room, and a temperature is kept up to 90 or 100 degrees. The honey is drawn from the extractor in sap cans, and emptied into the straining can, which is set on a bee-hive or other suitable box. It holds about 350 pounds, with a top to draw off the honey.

The honey is strained through common straining cloth, and when it is necessary to remove the honey from this can, it is either emptied into a large tank that holds 600 pounds or else filled into suitable packages for market, which, with me, are tins of the following sizes, viz.: 3 lbs., 5 lbs., 10 lbs. and 50 lbs.

I like the 3 lb. flint-glass sealers, but some customers find them a little high in price.

I endeavor to grade my honey. (The speaker then produced a sample.) At the close of the honey flow I remove the supers and stack them up about 50 yards from the apairy, after extracting (removing one frame from each super), so as to give the bees free access to the empty combs, to clean them up for the next season.

I might here say that for the last ten years, I put my bees into the cellar on the following dates: 1889, Nov. 4th; 1890, Nov. 6th; 1891, Oct. 28th; 1892, Oct. 11th; 1893, Nov. 8th; 1894, Nov. 8th: 1895, Nov. 4th; 1896, Nov. 13th; 1897, Nov. 11th, and 1898, Nov. 2nd.

In conclusion I would add that there is nothing that the old saying "cleanliness is next to godliness" applies more forcibly to than to beekeeping the whole year round.

Mr. ARMSTRONG: I think Mr. Brown has given us a very fine paper, but there are a few things I do not agree with him on. The first thing I notice is having his hives all in rows. That is something I used to do, but I have dropped that. Instead of putting them in rows, I put them in clusters, or I put them in pairs. I do not quite agree with him about the extracting. I do not generally extract till the season is all over. I generally have supers enough so that when one is full I take and raise the super up bodily and put another empty one in under it with full sheets of foundation; or, if not, I put full combs if not full sheets of foundation. If they need another one I do the same. I leave my whole crop of honey there until I am ready to extract it. I have my honey all there, and I think I get a good deal better honey, and I have no trouble in ripening my honey afterwards. Then I extract the whole crop. I very often use the Porter Bee Escape. I can take off maybe 20 or 30 supers to-morrow. I just take my wheelbarrow up alongside of my hives, and I have two hive boxes that hold eight frames each, and I just put my combs right in there, and I wheel them right alongside the extractor into the honey house without lifting them at all. That does away with all this lifting. I just take it right up alongside the uncapping can, and slide them off. If the season is over certainly, I leave them in the honey house until towards evening, and then I return the empty combs and have them clean them out, and leave them there until such time as I go to examine the bees to get them ready for winter, and my combs are all clean and dry. That is all I do with them. That is one thing in this paper I don't agree with.

Mr. McEVOY: You just take the top story right off?

Mr. ARMSTRONG: Yes. What I had reference to was not when I take them out comb by comb, but when I take them off as a whole with the Porter Bee Escapes. I take the full supers off—as many as I can get on the wheelbarrow.

Mr. NEWTON: I would just like to ask Mr. Armstrong if he uses a stove like Mr. Brown. In our locality if we were to leave our combs over night with the Porter Bee Escape on we would be unable to extract the honey. Mr. Brown says he uses his for a variety of purposes, because he says when he takes the honey to the house he keeps the temperature at 90°. Mr. Armstrong would have to use it for warming the honey up for the purpose of extracting it, because we could not do it if they stood over night with capped combs.

Mr. ARMSTRONG: I had no difficulty with leaving them over night. In some cases the honey would be toughish, and in that case I have a stove in my honey house.

Mr. GEMMELL: If you take your honey out in July or August have you to heat it before extracting it?

Mr. NEWTON: Certainly. I do not think any one can extract it without the honey stringing out, and I do not want it all over me.

Mr. BROWN: I think there would be no daubing if it was left until cold with me, particularly if it was clover or basswood honey. I find if that is left over night it will stick and become as sticky as mud; but at the last extracting, when the buckwheat honey is coming in, it is usually thin, and suppose it does stand over night or over a week, it makes very little difference—you can uncap it supposing it is cold—but with the clover honey it becomes too thick.

Mr. HOLTERMANN: Do I understand Mr. Brown to say the buckwheat honey is thin?

Mr. BROWN: Yes.

Mr. POST: I have had buckwheat honey as thick as any honey I ever saw.

Mr. BROWN: I am living in a buckwheat district, and I have harvested buckwheat honey for sixteen years, and I never could get it as thick.

Mr. DARLING: I have had buckwheat honey average fourteen pounds to the gallon.

Mr. MCEVOY: These men are all right.

The PRESIDENT: Do I understand you to say they are all right, and all wrong

Mr. MCEVOY: As a rule, I say, it is not as thick as clover.

Mr. HOLTERMANN: I do not think anyone has handled as many samples of buckwheat honey as we have from different dealers, and I was a little bit surprised at the statement of Mr. Brown. I believe if you get a sprinkling of buckwheat honey in with other honey then that holds good, but I believe the buckwheat honey is more difficult to remove from the comb.

A MEMBER: Mr. Brown and Mr. Holtermann live in two different districts of the country.

Mr. SPARLING: My experience is the same as Mr. Holtermann's.

Mr. DARLING: I have had buckwheat honey so thick that I could lift a pound and a half on a spoon.

Mr. NEWTON: I do not believe in that way of extracting, leaving it till it gets cold. The way the price of honey is to-day I do not think it pays Mr. Brown or anybody else to burn wood to warm it up. I just rose to say that I agreed with the discussion as to thick and thin buckwheat honey. I believe the season has a great deal to do with it. I know if the season is dry we always have a much thicker and much better quality of honey than we have in wet seasons, and it is the same with buckwheat honey as with other honey.

Mr. HOLTERMANN: What is the object in not extracting it after you take it off the hive?

Mr. MCEVOY: We cannot always get the time.

Mr. JACOB ALPAUGH (Galt): There is another point in Mr. Brown's paper. If we could all have plenty of top stories so as to keep adding as the bees want room, and never take in until the season is over, and then take the honey and set it in a warm room for a certain length of time, we would have a better class of honey.

Mr. ARMSTRONG: I may say here that the season with me is over by the 1st of August. When the thermometer is at 80° or about there you have no trouble in extracting.

Mr. HOLTERMANN: Even if we do make bee escapes, and do not mind how many we can sell of them, I want to say that I am a little surprised at the use that many find for them in extracting honey. You smoke your bees, and you know they rush down. If you will hurry and take out your comb and give them a little shake before they get back, and put back your combs, I do not understand how any man wants to be troubled with a bee escape after that. Then, if I could not take the honey all off at one time I would just take off part of it and extract it as we go along. It is true if you keep your combs in a warm room the honey will ripen. If you have a place where you can keep the temperature up, then it is all right, but if you have not, the quicker they are extracted the better.

Mr. FRITH: If the discussion on this part of the paper is over I would like to ask Mr. Brown a question. He hinted at the quantity of stores sufficient to carry the bees over until white clover. Why does he require that in his locality?

Mr. BROWN : I think that is a little oversight. I said "until clover bloom," but I said later until the "honey flow." I did not mean that they should have sufficient stores when set out in the spring to carry them through until the clover honey flow, but until there would be sufficient honey coming in to carry them through.

Mr. FRITH : The reason of asking the question is this : We find there is quite a difference in the spring flow south of this district and the latitude north. Mr. Brown being north of this we would suppose the spring flow would be somewhat different to the flow south of this. We sometimes get large quantities from fruit bloom in my locality before the white clover comes in. It was brought out at our Oxford convention that those north of us do not get the quantity of honey in the spring that we do, and it has quite a good deal to do with the efficiency of the bees at the time of the big honey flow, and I thought Mr. Brown had something of that in his mind when he made that statement.

Mr. BROWN : I would simply say that we have very little flow until the clover comes in. We generally have more or less, but nothing of a good flow.

Mr. HOLTERMANN : How about raspberries ?

Mr. BROWN : We have a small quantity of wild raspberries. I live in rather a sandy district, and we find some of our old farms growing sorrel in place of clover. I find that in a field of sorrel the bees work on that as strong as they would at a field of clover during the time it is in full bloom, and that carries them right up pretty well to clover bloom. We have some wild bloom and some fruit bloom, but the main-stay before fruit bloom is sorrel.

Mr. DARLING : In Mr. Brown's locality and mine we have very little fruit bloom. True, we have some wild blooms ; apples are not a success with us ; we cannot get peach trees to live, as is well known. Small fruits bloom well ; they are not much cultivated. Wild fruits in the rougher regions are somewhat plentiful—raspberries and the like of that. But I am not aware of the bees doing as well on any one thing as they do on the dandelion. I had honey stored from dandelion one year, so much so that I took some from the bees. It was not very bad honey, but it was not a white honey by any means. This year I discovered a lot of bees working on the white oak, but I do not know whether they got any honey.

Mr. HOLTERMANN : Have you not got a lot of wild cherries in your vicinity ?

Mr. DARLING : Not a large quantity.

Mr. HOLTERMANN : Do you find the bees work well on what there is ?

Mr. DARLING : I could not say. But about the time the hawthorn is in bloom there is a very disagreeable perfume arises from the hive, and I fancy it is from the honey gathered from the hawthorn. The honey is not offensive to the taste, but you would think there was something foul in the hive. A year ago last spring I set out my bees earlier than ever before. They were late getting into quarters last fall, and I thought about that when Mr. Brown read dates of putting his in during the last ten years. My bees were not put in last year until after our convention, and I never had my bees come out better. I do not think I ever had them in stronger condition, or better prepared for gathering white clover honey, but for some reason I did not get it though we had abundance of bloom. The two colonies I put out on the 11th of March seemed to do so nicely that I thought it was just the thing, but for some unaccountable reason they went back until almost without exception they were a failure as honey gatherers this summer. Those put out later on did far better. I had less difficulty with bees set out on the summer stands than in other years. I did not put them on their own stands either. They say one experiment does not confirm a fact. I tried experiments one way and another with the bees, and I could not find out that my bees remembered where they had been the year before ; and what mixing I had took place a week or ten days after I took them out of the cellar.

Mr. FRITH : Was there a strong wind blowing when this occurred ?

Mr. DARLING : No.

Mr. Frith: I find when there is one going that they seem to go with it.

Mr. Darling: They work against one and not with it. I do not know whetherit was this year or a year ago I noticed in one corner of the yard the bees were getting too strong altogether. I dispersed them with smoke, and they went right over to the opposite corner and gave me difficulty there. So it was not against the wind altogether. I think the first corner was the east corner and the other the west, but they seemed to have a desire to congregate and go into hives they did not belong to.

Mr. Frith: Mr. Darling said that his bees worked on white oak this spring. There is a good deal of spring honey dew, something new to this country, and it just struck me that perhaps instead of working on the bloom of the oak they were working on the deposits of the aphis. I have been given to understand that some people are anxious with regard to the wintering of bees on account of the honey dew. I could not find any spring honey dew in my section of the country, and very little fall honey dew this year.

Mr. Alpaugh: Living right alongside of an open woods I might say something about oak and honey. My bees work well on oak bloom, but I do not like the honey as well as the hawthorn. I have failed to notice any odor as mentioned by Mr. Darling, but from the oak it is not as nice; we get an odor there.

Mr. Darling: The oak is like the walnut and some others—the flowers are not perfect in themselves. The pistil flower is small and obscure. I think it is just a little green rosette. The flowers having pollen have a big stem similar to that on the butternut, but not as large. It was on the flowers containing the pollen the bees were working, and the reason I said I did not know whether they found any honey or not was that I did not watch close enough to find out, but I knew they nearly all had pollen.

Mr. Brown: A while ago the question came up about the buckwheat honey being heavier than clover. Here is a proof of it. Here is the clover honey in the bottom and buckwheat on the top, both in liquid form. So if the clover was lighter than the buckwheat it should rise to the top and bring the buckwheat down.

Mr. Holtermann: I said that could very readily be explained. The clover was gathered first; it was well ripened; the buckwheat later, and not so well ripened, and it came to the top.

Mr. Frith: Specific gravity and consistency are two different things.

Mr. C. Edmondson, Brantford: I think if Mr. Brown left the buckwheat honey in the hive as long as the clover they would be the same weight.

Mr. Holtermann: I was at Ottawa Exhibition, and noticed samples of honey separated in that way. Some of the local men had it there, and you could see, standing there a few days, clover in the bottom spreading and colorless. My explanation may not be correct, but that is the one that would suggest itself to me.

Mr. Alpaugh: It is quite natural for honey to form itself into strata or layers. One kind of honey's specific gravity is much greater than another's.

Mr. Holtermann: I may say that the Experimental Union have taken the specific gravity of some fifty samples of honey. They are being taken in hand at the O.A.C. and forwarded to Ottawa, so I expect you will know more a year from now than we do now. They have been collected from all over the Dominion with that object.

QUESTION DRAWER.

Question: Which is the best—a frame running across the hive or one running lengthwise? Explain the difference.

Mr. Post: I give the preference to the hive with frames running parallel. There is one reason in particular why I favor it. Late in the fall, say in my case, in buckwheat honey, I want the back end of my hive raised quite high, and the bees naturally place their stores in the back end of the frame, and when they go into winter quarters the frames are practically empty in the front end, and they will cluster in winter in the front end, and as they take the stores out they move slightly back. I find if they set perfectly level they do not do it so; they seem all to cluster promiscuously any wherein the hive. That is one reason. I give them just as much pitch forward as they will bear.

Mr. FRITH: This question was asked in the December number of *Gleanings*. This idea of our friend who has just spoken is new to me, at least I have never thought of it in that way. I had the idea that it was because we wanted the combs of honey parallel or plum, rather perpendicular; that as a general thing we want the hives to incline towards the front. Cross frames would not be parallel, and there would be brace combs at the top in the front end, and brace combs at the botcom at the back end of the hive. I found that difficulty. I have some hives with the cross frames and some with the frames tangent to the entrance. Those tangent to the entrance are preferable in my case.

Mr. HALL: I can confirm what Mr. Post says in reference to the frames running towards the entrance for various reasons. He gave you one in reference to the deposit of the honey for winter stores; that is very good. Another reason is this: I want the hive tipped slightly forward so that water will not go in it, and in spring so that the condensation will run out. We tilt up our hives at least four inches higher at the back than the front for various reasons. First, to assist the bees in taking out their defunct ones; secondly, to run the water out of the hive, and lastly, but most of all important, when you have the hive tipped up there is but little space in the hive at a level with the entrance of the hive, and therefore the cold air cannot enter the hive so readily as if it was flat During the winter when packed on summer stands, it is a very important fact that they should run from front to rear so that you can tip it up three or four inches.

Mr. GEMMELL: You cannot raise a hive at the back very well if combs run cross-ways of the hive, whereas if they run from front to rear you can raise it as much as you like.

Mr. HEISE: For three or four years I made quite a hobby of cutting bee trees, and I paid particular attention to it, and out of ten trees cut, not in one case were the combs built cross-ways with the entrance, but always parallel, which goes to show it is natural or them to do so.

Mr. FRITH: My experience is just this: the starting point of the comb decides the direction of the comb. You take a very thin piece of wood and put it into your frame, and the bees will build the comb right along on that as if it were a piece of foundation, and I find in bee trees the same thing. If you look at the top you will find a projection with a thin edge to it.

Mr. McEVOY: I winter my bees altogether out of doors, and I would not think of putting the frames cross-ways. It is much better to winter slightly slanted to the front.

Mr. ALPAUGH: This gentleman said it was natural for the combs to run to the entrance, and it seems to me that in almost every case the comb is started to the entrance in some way—maybe not exactly parallel. They have a direct road almost to the entrance. But I think one of the best things, where the frames run to the entrance, is that they get right on to the end of the frame and go just where they want to go without crawling over a lot of comb. I must say I did not have success with hives running cross-ways. I would say by all means have hives with frames running to the entrance.

Mr. BROWN: My experience has been a little different to Mr. Alpaugh's in that line. As I said in my paper a little while ago, I find that they give the best results, usually come out better in the spring, with the ten frame hive running cross-ways. I find them more convenient for manipulation. I like to be behind my work, not beside it.

Mr. ALPAUGH: When you get the latest system of keeping bees you can not work from the back, you must work from the side.

Mr. BOOMER: In producing comb-honey I find it necessary to have the hives level; and the objection Mr. Hall has raised to the wet running in does not apply with the hive I use—the Richardson hive. Set it as level as you can, and no rain will run in. There is space right at the entrance of the hive for any water that runs down the face of the hive to get through, and it does not get into the hive at all; and with these hives the frames run to the entrance.

The PRESIDENT: Those who favor the course of frame running lengthwise please stand up. A majority arose.

QUESTION: How shall we deal with compound honey like this? (Sample produced).

Mr. BROWN: This is a sample of what I would say is adulterated honey, probably no honey whatever in it. I brought it as I got it from the store. It is labelled "compound" very small letters, and "honey" very large letters. The name of the parties are on it, and their address.

Mr. HALL: The thing we have to decide in this case is, what is "compound."

Mr. HOLTERMANN: That is very simple. Write the Department of Inland Revenue and give them the man's address, and they will deal with it.

Mr. HALL: I may say, gentlemen, that one sample has been sent to the Inland Revenue Department, but I thought the Association would have more weight than one individual. My sample has the name of the seller on it; this has the name of the mixer. He says this vessel contains Clover Compound Honey, surrounded by the choicest honey syrup. It gives the name of the manufacturer. What is honey syrup? Glucose is not honey syrup; a mixture of cane sugar and water is not honey syrup.

Mr. FRITH: This Association went to a great deal of trouble and expense to get an Act passed by the Dominion Government a few years ago to cover this. There is a Dominion Act which covers this class of compounds, and I think it rests with the Inland Revenue Department to take this and find out whether it is a violation of that Act. I think if a sample of this is sent to the proper authorities they will take it in hand. Of course it will become a legal point, and they may have to resort to the courts to prove whether this Act covers this ground or not. That was one of the things we had to fight with at Ottawa on the start. The very first question asked was why not tack it on the Food Adulteration Act. We kicked against that from the beginning to the very end, so as to secure an Act similar to the Oleomargarine Act.

Mr. COUSE read a letter from the Inland Revenue Department, as follows:—

J. B. Hall, Woodstock,—

"I duly received yours of yesterday, informing me that you have seen exposed for sale in Woodstock, certain packages supposed to contain pure honey which are evidently adulterations, and I have given instructions to our officers to look into the matter at once."

Mr. HALL: I supposed that this Association would instruct its Secretary to write to the Minister of Inland Revenue in reference to this case. I think we as an Association have more power than one man. As an Association they gave us the law, and they also gave us their servants to punish these people. I propose: "That our secretary be instructed to write to the Minister of Inland Revenue asking him to look into this matter."

Mr. DARLING. I believe with Mr. Frith here that the law covers the ground now and the parties are liable to punishment. I have great pleasure in seconding Mr. Hall's motion.

Mr. HOLTERMANN: You had Mr. Macfarlane here, and if you had listened to what he said you would not have this difficulty at all. You all remember what Mr. Macfarlane told you. All you have to do is simply to do as Mr. Hall has done—notify him of these adulterations, and they attend to them at once. Last year after I left this Convention I went through to Muskoka, and I found in stores there 60 lb. cans, which had a look not at all as those bee-keepers use. I found out where these were sold there, and I sent the address of the people to the Department of Inland Revenue, and they dealt with it. It is not necessary at all for the Association to act. All you have to do is to do as Mr. Hall has done—send it in to them, and they will attend to it.

Mr. R. H. Smith, St. Thomas: That package I found in St. Thomas, and most of the grocers I have seen simply bought it because they thought it was pure honey; but the question arises, do they avoid the law by calling that the "finest honey syrup"? The question is, what is honey syrup? They simply trade on the good name of honey to sell their mixture, and I thought in bringing that here I was doing a little missionary work. There is nothing I know of that will injure the sale of pure honey more than such mixtures as that. They will not want a second dose of honey if they think that is honey.

Mr. Darling: I quite agree with Mr. Holtermann that Mr. Macfarlane told us distinctly last year that it was not necessary for the Society to move in the matter. He said the Department would act as readily for an individual as for the Association—in fact he seemed to think it better for the Society not to move in that way.

Mr. Holtermann: I think you will find that when the time comes that the Department will not act for the individual, that then it is time for the Association to take it up.

After considerable discussion, Mr. Holtermann moved that the Association suspend action in communicating with the Department of Inland Revenue in case of adulterated honey, until we find the individual is not heard, and then that the Association act. Mr. Darling accepted the amendment.

Mr. Holtermann's amendment was lost, and the motion was carried.

Mr. Alpaugh: I do not believe the public will take the right view of it. We have now got a law, and it has gone through the country at large that we have stopped adulteration. Now if we go there as a body and say we have found adulterated honey, like that on the table, it will just crush the law.

SUMMER MANAGEMENT.

By W. Z. Hutchinson, Flint, Mich.

My experience in the apiary for the production of honey, has been mostly in the line of comb honey production, and it is from that standpoint that I shall write. I prefer to have the bees make a start in the supers before swarming. If swarming is then delayed larger swarms are the result, and as I get nearly all of my surplus from the swarm, instead of from the old colonies that have swarmed, I get better results if the great mass of workers can thus be kept together where the sections are. For this reason I use every possible means to induce the bees to early turn their energies towards the supers. For this purpose I know of nothing better than the use of drawn comb in some of these sections—the more of these the better. I should be glad to give each colony a super of drawn comb in the spring. When the harvest opens with a rush, and the bees are at once forced into the sections before there is time made for preparation for swarming, the drawn combs may not be of much importance; but where the flow comes in gradually, and the bees are Italian, with their reluctance to store honey at a distance from the brood nest, drawn combs are nearly as valuable as combs of honey. When the flow is light, the bees will begin storing honey in drawn combs long before they draw out foundation for this purpose. Where the bees begin storing their surplus, there they are inclined to continue storing it. This early storing of honey in the super relieves the pressure upon the brood nest, and thus allows of the rearing of more brood, and at the same time retards swarming.

As soon as the sections in the first super are one-half or two-thirds completed, and the flow of honey remain good, I raise the super, and put under another super having sections furnished with full sheet of light foundation. Getting the bees started in the sections early in the season, giving them plenty of surplus room, and shading them so that the heat will not drive them out, will usually keep bees from swarming until they can swarm to advantage. Under this management I have known one-half of the colonies not to swarm at all; but in the majority of cases it eventually comes.

The management of swarms in a large apiary is really an important matter. I have tried leaving queens unclipped and allowing them to go with the swarm, until I am heartily sick of it. The climbing of trees, the chasing of runaway swarms, the straightening out of "mix-up" that result from the simultaneous issuing of several swarms, would, it seems to me, drive any man to control his bees by controlling their queens. I will admit that "mix-up" will often result when we have control of the queens, but, so long as we have our thumb on the queens, we are master of the situation. I have tried both the clipping of queens and the using of queen-traps, and my preference is for the latter. It saves the time and trouble of hunting up and clipping the queen, the time and trouble of hunting for and caging her when the swarm issues, and there is no danger of her being lost by the swarm coming out when no one is present to care for it Many of "mix ups" that occur in a large apiary may be avoided by the use of swarm catchers. A swarm catcher is simply a light frame work covered with cloth. The frame is about three feet in length, eighteen inches square at the outer end, and tapering to 3 x 10 inches at the other end. The outer, or larger end is covered with a removable door of wire cloth The smaller end nicely fits over the entrance of a hive. As soon as a swarm is seen issuing, the small end of the catcher is clapped over the entrance, and when the swarm has been caught the catcher is removed, a flap of cloth buttoned over the entrance, when the catcher and its contents may be set aside in the shade, and the bees hived at leisure. By having three or four catchers scattered about in different parts of the yard, nearly all of the swarms can be caught if desired.

My practice is to hive the swarm upon the old stand, in a contracted brood nest, with starters only in the brood frames, and to transfer the supers from the old hive to the swarm. By this plan the bees are back in the supers at work again within twenty minutes after they left them. As there are no combs in the brood nest in which to store honey, and the brood nest is of the capacity of only eight frames, the honey must of necessity go with the sections; I use a queen excluder, otherwise the queen too would go into the supers. The bees at once begin to build comb in the brood nest, and as fast as it is built the queen lays in it. The result is that the honey goes into the sections and the brood nest becomes a brood nest indeed. I prefer starters in the brood nest to foundation, and drawn comb I have found to be of no advantage—in fact a disadvantage. Drawn combs the bees quickly fill with honey, and are then very loth to begin work in the sections. When they begin storing their honey there they are inclined to keep on storing it. With foundation in the brood frames the foundation must first be drawn before it can be used, and this gives the bees time to begin storing in the sections. The greatest objection to the plan of having the bees build their own comb in the brood nest, is that, if the queen is old too much drone comb may be the result; but as this plan usually results in rather light colonies, unless there is a fall flow in which they can build up, and it is desirable to unite them at the close of the harvest, there is an opportunity of discarding the drone comb.

To go back just a little, at the time of hiving the old colony is set to one side of the newly-hived swarm. The entrance of the old hive is turned to one side. In a day or two the entrance of the old hive is turned towards the new hive. In a day or two more it is again turned still more. By the eighth day the two hives will be standing side by side. Take away one and all the field bees of both hives would return and enter the hive left upon the old stand; so in the early part of the eighth day, or the afternoon of the seventh day, the old hive is carried to a new stand. The result is that the hive having the sections receives a nice little addition to its working force, while the old colony loses this power just at the time when the young queens are ready to hatch, and is so weakened in numbers that further swarming is abandoned. The only condition under which this plan fails in preventing after-swarming is when the heat, or the swarming mania, drives out a swarm before queen cells are completed In this case it is so long after the old colony is given a new location, before the queens are ready to hatch, that sufficient bees hatch out to make a swarm. Unless a colony swarms early, or the flow continues late, I expect no surplus from a colony after it has swarmed, but it is always found in fine condition for winter. It will have a young queen, an abundance of excellent stores, and plenty of bees that have not worn themselves out with hard work

Some of my methods may not be desirable in all localities, but in my locality, they are the best I have tried.

Mr. ALPAUGH : Putting in the starters, for instance, in place of full combs, I have had some experience in both of these lines, and I found full combs containing no brood works very well provided you do not give them too many. If you give them just what starters they can cover nicely there will be but very little drone comb built. He says, if you do not want all your increase you can take the best combs from a certain number of hives and make a certain number of good hives.

Mr. SMITH : I endorse nearly everything Mr. Hutchison has said as to the management of swarms. It is practically our method. One thing I do not just agree with, is putting on a super too *early*. We found this season especially they were filled up with a very inferior grade of honey. In fact I know of one man who put on several thousand sections, and he found them half filled with this honey dew. Of course that may not occur again, but in this case he had to get that all out of the sections again, and get them filled up with good honey.

Mr. GEMMELL : I have very little to say; I agree so fully with Mr. Hutchison's paper. I would just like to ask him, in regard to the drone trap, if he really prefers the drone trap to cutting the queen's wings ?

Mr. HUTCHISON : The drones will, of course, go up and die in that trap unless you take them off.

Mr. GEMMELL : With a large quantity of drones I found it was necessary.

Mr. HUTCHISON : There is a division about half way up, and the drones come up in this upper apartment and the lower apartment is left free, I could not say that it interfered with the passage of the workers or the ventilation.

Mr. GEMMELL : There is the question of cost.

Mr. HUTCHISON : I was thinking of the time it took to look over the bees, and find the queen and clip her and cage her. This queen trap would practically last a man's lifetime, and they cost about twenty-five cents apiece.

Mr. HALL : I did not hear all the paper read, but I think it was favoring drone traps. If we should have one young queen with her wings not clipped we simply put it on and catch the queen on that occasion. But in putting them on to catch the queen we find it a very filthy practice. The drones, unless you empty them every day, will fill them half full. I do not think the bees like it. I simply lay them around in prominent places in the apiary, and as the queen never leads off a swarm there is generally half the bees out before the queen comes, and we, in nine cases out of ten, have the trap on and catch the queen in that way. We have them, but they are lying outside for that very reason. It is a filthy, nasty mass.

Mr NEWTON : I have tried the drone traps in different ways, but I have discarded them only in the case Mr. Hall mentions. I have them lying around, but only use them in the case of a queen that has wings. In leaving them on, of course, it does not matter whether you are there or not ; the drone trap would catch the queen. I notice that the bees do not seem to work with the same vigor when they have to go through that method ; it seems to stop their work. I would not like to advise any one to use drone traps and leave them on the hives continually.

Mr. GEMMELL : I have tried them, and couldn't make them a success for the same reason Mr. Hall gives.

Mr. EVANS : I was told that if the queen was killed and all the queens cells destroyed but one, and after five or six days the young queen was hatched that would stop the swarming impulse.

Mr. GEMMELL : I have lost old queens that were clipped ; by swarming when I was not present they were lost ; and in every case where a young queen took her place I never had a young queen lay a few eggs and swarm out. In every case I found she stayed there. She does not want to swarm.

Mr. HOLTERMANN : Doesn't that depend on your honey flow.

Mr. GEMMELL : It does ; but when the swarming comes you generally have a pretty good flow.

A MEMBER : Would you not have to cut out the queen cells in order to get that young queen to stay ?

A MEMBER : Yes ; but you would have to destroy them, the bees would not.

Mr. GEMMELL : If you go to the hive before the young queen is hatched, your plan is to get out all the cells but one. When she hatches she may swarm, that is, if there is larvæ to raise other queens from.

Mr. HOLTERMANN : Are there not any amount of people whom you cannot depend depend upon doing that work properly ?

Mr. HALL : That is not the fault of the system.

Mr. HOLTERMANN : I say universal clipping will not do for that reason.

Mr. ALPAUGH : This cutting out of queen cells and depending on one, I do not like. I find a much better plan is to cut out all the cells, but take a few of the best and stick them at the end of the hive. Some of them will hatch. The first queen that hatches will run into the hive, find no cells there, and that settles it. They stop swarming and you can have lots of cells.

Mr. GEMMELL : I do not object to that at all, but in my case I give them a cell I know is about ready to hatch. If you put a cell of that kind in you will not find any difficulty. Of course, if you put a cell in that you cannot tell whether there is going to be a live queen or not, you cannot be sure.

Mr. ALPAUGH : There is another instance come to my mind. If I can find the young queen I will kill her every time, and another cell will hatch. I would sooner have a later hatched cell than an earlier hatched.

Mr. GEMMELL : Is that where the old queen is lost when she goes out to swarm ?

Mr. ALPAUGH : Yes.

Mr. GEMMELL : But there are a lot of good cells in that hive.

Mr. ALPAUGH : If you kill her and allow another cell to hatch that will never happen.

Mr. GEMMELL : There is another point. A gentleman here spoke of giving drone sections and getting them filled with inferior honey. I know in our own locality sometimes if we put on drone sections we invariably get a poor quality of honey. I never like putting sections on my hive. I prefer giving them a half story of extracting combs —that is, if it is very early in the season—to giving them sections. Then by the time they have this pretty well filled up we have them out of the packing, and when they require more room I raise it up and put the sections underneath the half sections of comb.

Mr. HOLTERMANN : That is quite an important point. You will see so much comb honey on the market that has the centre of the section a little dark, and we can do a great deal of good by emphasizing the necessity of different management.

Mr. SMITH : I would ask Mr. Gemmell, does he ever allow the queen in these half storeys ?

Mr. GEMMELL : No, I do not want her there. I understood Mr. Alpaugh to say he gave a few drone combs ; I did not understand he said anything about foundation whatever. Why would you prefer the drone combs to foundation, or do you ? I do not think you do.

Mr. ALPAUGH : I would under certain circumstances. I am not prepared to say anything about that yet.

Mr. GEMMELL : Before Mr. Alpaugh went to California he was at my place. I had been using full sheets of foundation, and he recommended the starters. I had never practised much with starters. However, he recommended a wide starter instead of a shallow starter. He said that if you used a wide starter, and only five of them, that the bees had a better chance of clustering on the wide starter from one end to the other, and the comb would be more likely to be of worker comb, whereas on the narrow starter they had not so much scope, and you would probably have drone comb at the ends of two or three frames. I have practised that too, and some seasons you will get the thing pretty much without drone comb. Now he has another hive, and he is going to use sheets of foundation for hiving instead of starters.

Mr. ALPAUGH : I might say that I will simply use the wide starter yet.

Mr. HOLTERMANN : And that goes to the bottom of the frame.

Mr. GEMMELL : He has a shallow frame, and he uses the starter a little wider.

Mr. HOLTERMANN : Do you put that wide starter on all the frames?

Mr. ALPAUGH : No.

Mr. HOLTERMANN : I may say, I was not advocating drone traps, because we do not use them in the same way Mr. Hutchison does, and in this country I think they are very rarely used.

Mr. HOLTERMANN : May I make a suggestion ? It appears there was a subject down for to-night which cannot be taken up, and there is one which many of us would like to have light on, not in any personal way, but to make a general application of it, and that is, judging honey at fairs. If we could have a little discussion on that, I think it would be of educational value to all of us. I think there are others who would like to have that discussed in a general way, without any personalities whatever, so that when we leave this Convention we may know how to act as judges, and how to prepare ourselves to meet the judges. In speaking of men who judge in other classes, I know a good many of the men who are intimately connected with Live Stock Associations, and so on ; everywhere there is the difficulty of getting men who are thoroughly competent to do their work. It is, perhaps, less a matter of getting men who are willing to do what is right. Occasionally there is a complaint that men have not done according to their own judgment, and have not done justice, but that is not very often the case in our own country. It is more a matter of men not really being able to do the work in all its phases. For instance, we have a man who is a good judge of clover honey, we have another man who is a good judge of basswood honey, or another man who is a good judge of buckwheat honey, but rarely you come across a man who understands the three classes. Then, again, they may be good judges of honey and not of beeswax. Then, in our own classes at Ottawa, London, and perhaps some other exhibitions, we have a line to judge which a bee-keeper may not be competent to judge at all. What I am referring to is the award for the neatest and most attractive exhibit. Very often, I think, the majority of us may be good bee-keepers, and yet have not developed in us the artistic line, and we are really not competent to judge that particular line. I believe what we should try and do is to educate ourselves, the exhibitor as well as the judge, to do better in this line. I refer to basswood honey in particular. I can point to men in this room who are the best of bee-keepers, and yet the honey one man will pronounce as basswood the other will declare has not a drop of basswood in it. The same way with the exhibitor; one man supposes he has basswood honey and another man, who has an entirely different honey, thinks he has basswood. We should try in some way to overcome that difficulty. There are many other things to consider in judges. For instance in Toronto we have 500 lb. comb honey lot. I think no man should judge that comb honey without sampling it; not alone should he open the crates and examine the sections, but he should break at least one section. There is quite a diversity of opinion about that, and it appears to me there should be no diversity of opinion. There should be that feeling that whenever a man or woman puts up a lot of comb honey that he may have any crate inspected. It should not be only one crate, because that might be an injustice. One man may have a fair average, and just by accident a crate which is inferior to the average is taken out. I would like to see a resolution passed here, that wherever a prize is given on display an outside man, who has studied art, come in, as he is better able to tell than any bee-keeper which is the neatest exhibit.

Mr. Frith: Do you not think it would be a good plan to get an expert judge?

Mr. Holtermann: We want to be all experts.

Mr. Davison: I would differ from what Mr. Holtermann says for this reason: A man having artistic knowledge only would not know the good qualities of the exhibits before him if he did not know the qualities of honey. The exhibit of honey should embrace all the different qualities.

Mr. Holtermann: You know there are in the Toronto, and other lists, quite a few where quality counts most and display slightly, but there is another one where quality is not considered at all, simply the neatest exhibit.

Mr. McEvoy: Why not make that 100 pounds instead of 500 pounds, and then the man who handles it does not have to pull down the whole crate.

Mr. Holtermann: What the Toronto Industrial people pay for is one that will attract attention, and when you reduce that to 100 pounds your prize list is reduced in proportion. The trouble is if you reduce the quantity you reduce the effect of the exhibit, and the Directors would very soon knock out your prize list.

Mr. Smith: I fully endorse what Mr. Holtermann says with regard to getting a judge for display in particular. Of course we want experts with regard to quality. It is not a very easy thing to do; and as to reducing the quantity, the Toronto Exhibition is a feature apart from a local country fair. If you reduce the exhibit to small quantities, of course it would reduce the prize list too. The Toronto Exhibition is one by itself, and it is an example for the continent.

Mr. Martin Emigh (Holbrook): Fortunately or unfortunately I have been a judge for six years at London, and three years at Toronto. At Toronto I suppose a fellow could get along very well if he liked, for there are three judges there, but in London there is only one, and he has to take the bluff. I am very glad this thing has come up to-night, for there is no doubt we can learn something. It is rather a delicate thing to judge honey some seasons when it is all so nearly alike. This year at London it was a particular thing, and I am not just sure whether I did justice or not; but there is one thing certain if I did not it was my ignorance, for I never gave a *man* a prize; it is always what I consider the best honey that gets the prize. The same with wax; what would suit one man would not suit another. I suppose a man who works a good deal of wax would be a better judge than one who did not work much of it. I make a little foundation, and have for years. I know what suits me possibly might not suit others. As regards the neatest and most tasty display, I do not know about getting a town or city expert. I doubt if they could do much better than the judges we have. I know I have seen a good many very nice displays, and I am a little conceited on that. I do think I know a nice display about as well as any of them. There is a good deal of difference in putting up a nice display; and a man must have considerable taste about it to put it up. Some men who study putting up a display can put it up a great deal better than others. I should like to hear as much on this subject as possible, and learn as much as we can.

Mr. Boomer: While listening to the remarks that have been made I have just been wondering whether it was right at all to give prizes for honey. It may be right to give a prize for a fine display, but honey is not like a production of stock. If a man produces fine stock worthy of a prize he works for it, and it takes him some time to bring that about, but perhaps some bee-keeper who has no experience at all, and who has only kept bees a year or two, may produce the very finest article of honey. The locality has a great deal to do with fine honey. I think there are some localities in Ontario which will produce a great deal better honey than some other localities, and, therefore, is it fair to give to the man who has the best locality a prize for honey and favor in the market; and the other man who has not such a locality, no matter how much trouble he may go to to produce a good article of honey, cannot do it? One man may put up a very fine display of honey, and not have the best honey. Therefore to give a prize for the best honey I think is not just. While I think it is a very just thing to give a man a prize for producing a very fine animal because he must labor for that, he may produce a fine article of honey without any labor at all; he may get it by accident. I know a bee-keeper in the township where I reside who only kept two or three hives of bees, and he could take the first prize always. He would get some honey from the hive at a particular season of the year, and preserve it carefully, and get the prize, but he did not produce any better honey than anybody else in reality, taking it all the way through. And it seems to me this giving of prizes will help some bee-keepers, give them a name on the market, when they are really not entitled to it, and therefore I question the judiciousness of giving prizes for honey.

Mr. Holtermann: Do not some localities produce better potatoes than others?

Mr. Smith: I would like to ask Mr. Boomer if he could produce 1,000 pounds of honey without much trouble?

Mr. Frith: I think that giving no prize at the agricultural shows for honey would thwart the work of the Agricultural Department just along that line. Supposing we have no honey at any of the shows. Go away back to twenty years ago when we were first commencing bee-keeping on the present lines; it was by going to the local shows that we increased the interest in the present system of bee-keeping, and there were small prizes in some of the local shows. Take the district south and west, I showed bees there then, showed a few pounds of honey, and what was the result? It interested people in the show. There was a prize given for it, and they got interested for the first time in their life in some of the principles of keeping bees; and it also excited the appetites of those who have since become consumers. And I think it would be very unwise indeed to shut off the prizes for honey. I think the question of locality holds good in regard to stock, and in every department of agriculture. I know one neighbor of mine who can grow better potatoes than I can. I can produce better butter than the neighbor a few miles away, because I have better pasturage; I have better foundation on which to work. Another man can do better with his stock all round. It is really an exceedingly difficult matter to make nice fine distinctions between the different qualities of honey, and you find that perhaps a number of qualities are so near alike that it will take very acute senses to distinguish any, and it becomes very hard to judge impartially. The Toronto show is not in the public producers' interest. I have come to the conclusion that the Toronto show is just a little out of its legitimate place. It is booming Toronto. It is discouraging a large number of producers in a great many departments, especially in regard to displays.

Mr. Boomer: I just want to ask the question, how it is possible for one bee-keeper over another to produce a finer quality of honey? I can understand how one man or woman can make a better article of butter than another. I can understand that, or how better potatoes may be grown in one locality than in another; but what can be done to produce finer honey by one man than another with the same facilities I do not see.

Mr. Holtermann: I feel very strongly on this question that the sooner the general public know there is just as great a difference in the successful production of honey, as to quantity and quality, as there is of butter, the better it will be for the men who produce a good article of comb honey. We know that it requires the very closest application to produce good comb honey. In extracted honey there is a good deal that can be done. For instance, if you put your supers on a little too early, or put them on not too early but at some uncertain date, there is dark honey taken up. There are two men in a locality, side by side; the one man watches that super closely, and when the bees have taken up what appears to be a lot of dark honey, or brought it from mustard or some other source, he extracts that honey. The other man does not. They have both worked on the same field, but they put a different quality on the market. One allows his honey to ripen while the other does not, and that affects the quality. In the matter of judging honey, a man is judging perhaps a dozen samples of honey, and by the time he is through with a dozen samples he does not know what he is tasting. That difficulty can be overcome by not tasting the honey at all to begin with. You take the jar and unscrew the top, and the aroma will tell you whether that is clover or basswood honey.

Mr. FRITH : Do you not think you would meet the same difficulty you will in tasting ?

Mr. HOLTERMANN : I do not think you will.

Mr. NEWTON : I would like to say to Mr. Boomer that some three or four years ago when my crop of honey was gone, I went some miles north to buy some more, and after getting some comb honey, the gentleman said, "Don't you want to get some extracted honey ?" I told him I could handle a thousand pounds if it was good. It was so thin and watery, because it was not ripened, that I said : "I can't put that on the market ; it would kill my business." He said he could get rid of all he had at eight cents a pound. He was making more out of it than I could. We ought to see that our honey is fully ripened before we bring it to the market. I would be sorry to see the prizes taken away from the bee-keepers.

Mr. DARLING : With regard to the different qualities of honey produced by bee-keepers in the same section, I know that for a fact. I produce honey myself, and while the quality is generally pretty good the color is somewhat against it most of the time. I have never been able to tell exactly why. But even until this present season I take combs built by the bees and extract the honey from that in order to get a fine quality for exhibition purposes. I found it was a darker color than some other parties produced ; just why, I am not able to say. That honey will sell ahead of whiter colored honey. Some years ago I had a chance of buying 200 pounds of very nice white honey. I supplied one or two parties with it, and I think one brought it back, and the other said they did not want any more ; they preferred my dark honey. After I had it a little while it began to sour. I see no harm whatever in giving a prize for honey as well as for anything else, because it matters not how good our prospects are if we make a mistake in handling it we spoil the product.

Mr. FRITH : There is one thought that has presented itself to me that I think of importance to the bee-keeper, that is in regard to the marketing part. I was passing through one of the towns in Manitoba, and I heard my name called by a stranger to me. After getting introduced he said "I have just opened a barrel of honey, and have been told since you have been in town that you dabble in the honey business. Just come in and look at it ; it is one of the finest barrels of honey we ever received." That honey was fine clover honey, and so dense in its consistency that you could stick a spoon into it and lift up quite a bunch of it. It was fine in every respect, but the moment you tasted it. It was put up by a man who knew nothing about putting up and extracting honey. It was just as full of bee-bread as it could stick. Of course these people out there do not get much honey, and they could not detect it. The producers here this evening should have some encouragement to keep educating the people to produce honey free from that one single thing. We have got to compete with that very honey in Manitoba ; it goes out there by the barrel ; and if these men had been learning and getting prizes it would do away with that quality alone. We find it in every quality with regard to honey. I think Mr. Holtermann is trying to get at this, that we judge of honey along a line as a type. I stood by at the judging of some stock at the Brantford fair this year. The Holsteins and Ayrshires were being judged, and the judge came on the scene and a certain number of cattle. I said : "They will judge those according to type. Now, I am a practical producer of butter ; there is the practical cow for my purpose." But they had to be judged by type ; the practical cow got nothing ; the type cow I would not have in my possession as a practical cow. Now, of course I would like to see a better type, or grade, or whatever you may call it, of judging at the shows, but there might be difficulty.

Mr. HEISE : With regard to appointing experts, I admit it would a fine thing if they could be secured, but is it not practically out of the question ? It is possible to get an expert on clover honey, but when you mingle buckwheat, basswood, and clover honey how is he to be an expert on the whole? His fancy of taste may be in one direction. He may be a good judge of basswood honey, but he is no judge of clover.

Mr. HOLTERMANN : We want to get a man who is not so narrow.

Mr. SPARLING : I think it is very hard to get a man who is competent in all the departments. You can get a great many good men, but I think that when it comes to getting an expert for just one special prize it would hardly pay them.

Mr. HOLTERMANN : That is the sweepstake prize. I might say, I do not think there is a particle of trouble about that in Toronto. Just let us ask Mr. Hill to have a specialist put on to judge that class, and there will not be a bit of trouble about it.

Mr. BROWN : What do you mean by specialist?

Mr. HOLTERMANN : The very best man I can think of is the man who makes a business of window dressing in some prominent store in Toronto. He simply comes in and knows no man.

Mr. SPARLING : I presume there is not one present who has had more experience in showing than Mr. Hutchison.

Mr. HUTCHISON : I have had some experience in showing, but I have not had much experience in judging. At all the fairs I have exhibited I do not know that any has been more satisfactory than the Illinois fair. They have there a score card, the same as judging butter. We find the score card is away ahead of simply allowing a man to come in and say "This is the best." These score cards are preserved, and if there is any trouble we can see whether this man had the first price, and whether this the second. It is a guide to the exhibitor, he knows upon what points he must compete, and what will not count. I think it might be well, perhaps, to limit the quantity. They limited it this year in Illinois to 500 pounds. He could exhibit more if he saw fit, but the man who had 500 would receive the score.

Mr. NEWTON : I think we should have more judges than one on any article; I think we ought to have three, and then it would be more satisfactory than one.

Mr. GEMMELL : I am not a honey exhibitor; I produce and sell, but I do not exhibit. I think myself it would be a good idea to have more than one judge. I think it is hardly fair to ask one man to do the business. Another point, and that is in regard to exhibiting honey. Should any honey be exhibted by a man who does not produce it, that is, to get a prize for it?

Mr. HOLTERMANN : That is a question that comes up very often, and I claim that to be fair to every man the right way is to strike out that clause which says you are not to exhibit any but your own production. I went to the Toronto Industrial some eighteen years ago. I bought some comb honey from Mr. Emigh. I took it down to sell, but did not enter it. I thought it not being my honey I should not enter it. And those of us who have shown there year after year think that the man who is scrupulous, who does not want to show at any time any person else's product is apt to get left, because the majority of people if they cannot get their own will get someone else's. I am speaking advisedly when I say this. I have known a case where it was said the man was not showing his own product year after year, and another man came down from the same locality, and they said it was not his product but the product of the other man. To be fair to every one let them show the best that can be put there; put them all on an equal footing. The idea is really educational, and to that extent no injury can be done to any one.

Mr. DAVISON : I would like to take exception to what Mr. Holtermann says. I am a member of an agricultural society, and that matter comes frequently before the board, and our society have made a particular rule that an exhibit of all articles shall be the production of the exhibitor. Any exhibitor showing anything not his own production is barred from receiving a prize that may be awarded to him at that exhibiton. For my own part I would decidedly approve of that rule being carried out in all agricultural societies, because if a man can go all over the country and buy a better quality, and by spending considerable money can go to Toronto, or any other exhibition, and show a fine article it is very discouraging to those who produce honey. I think it should be laid down in all societies that only the production of the producer should receive a prize.

Mr. HOLTERMANN: Is it not the case that that rule is frequently broken? We know men trotting all over the country to get a collection of apples. Are you not handicapping the honest exhibitor?

Mr. DAVISON: That is done, but that is not to say it should be allowed. It has come up in our Society, and those who do it are deprived of receiving any prize. I believe if a man can produce a fine article of any kind, let him be the winner and entitled to all he can make thereby, and not, as I said before, the man who can buy an article from half a dozen producers.

Mr. HOLTERMANN: The principle is undoubtedly right, there is no doubt about that. At the Toronto Exhibition, for instance, we know men who come around and ask you for your nicest case of honey, and you stick the price up to $2 50, and they take it, and we think they have a pretty keen appetite for comb honey. I say the principle is right, at the same time we are handicapping the honest exhibitor. One of the objects in bringing this discussion up was to see what the feeling was in regard to appointing an outsider—an artist. I have heard it said that it is simply a matter of opinion which is the neatest and most tasty exhibit. That is not right. It is not a matter of opinion. For instance, here is a person dressed in five or six different colors, and one man says it is a matter of opinion. It is not a matter of opinion. We know there are certain lines laid down which is good taste, and which is not. I would like a show of hands to see how many would like to have, say, a window dresser, to judge that particular line.

Mr. FRITH: What particular advantage will it be to a honey producer?

Mr. HOLTERMANN: The advantage is this, a prize is given for a certain thing, and we want the prize given in accordance with the section. I will move "That we, the Ontario Bee-Keepers' Association, give a portion of our funds towards the prize list; that the management be asked to appoint a specialist to give the award on display of honey to the neatest and tastiest exhibit where such award is given."

Mr. PICKETT: In regard to this display, it seems to me that in it as in all other business the practical man is the man who is able to give the results, if any one. To bring in an artist who is fit to dress up a window as a milliner, or as a dry goods merchant, and set him in a honey room to judge bottles of honey and flowers, it strikes me he would be nearly as much out of his place as if I were placed in the show window of the dry goods man. His taste may be good in his line; in the business he follows he may excel to the highest point, but when he comes to touch that which he has no knowledge of, no experience, what may you expect? For my part I understand the source from which the discussion has arisen to-night, and I have not the slightest objection to it, or I would have been on my feet long before this. There has been an idea thrown out with regard to the number of judges. I have been fortunate or otherwise in being your representative, and I am not at all sorry this matter is up. I tried before the committee appointed to regulate these matters to get three judges; I couldn't get them, the dollars and cents were not there to pay them. The Fruit Growers' Association, the committee that was representing them, sat there on one side, and the butter and cheese men a little to their right again, waiting until we got through. The matter of judges came up. I have been on as most of you know for some years. If there were two of us you only get the judgment of one man after all. When we agreed it was only the judgment of one man as a rule, it could not be otherwise; when we disagreed in judgement one had to yield to the other, and hence you only had the judgment of one man when done with. If you can get three you have the judgment of two in the testing time. Perhaps they do not fully agree either, but it is the next best thing you can get.

Mr. HOLTERMANN: When you have three a man is open to conviction.

Mr. PICKETT: I found that means were scarce, and these gentlemen sitting on my right and left—the Fruit Growers and the Cheese and Butter men—they had each one judge. The discussion was taken up by them as well as us as to the number of judges, and they said right before us very plainly that from the time they adopted one judge they had better satisfaction than heretofore. Knowing whom I was likely to recommend as a judge, that he was a man who feared no man, I said to Mr. Hill, "Give us the $5 and we will take one judge for the year." I think there was an impression previously in some quarters that it would have been better if we had more on the committee. Mr. Hill told me plainly that even now when we have done the prize list will be taxed. The result was Mr. Hoshal had sickness in his home and he could not come; and the next on the list was asked and he came. The best was done, I presume, that could be done under the circumstances. I think the exhibitors under existing circumstances were very patient with what was done. I am sure if I were a judge I would prefer three rather than one. As to the matter of an artist, I think I have explained to you why I think these outside men would be a failure.

Mr. HOLTERMANN: I simply put that resolution because I wanted a show ot hands, and the President asked me to put it in the form of a motion. I am not at all anxious to press it, but I want to say this, that the very argument Mr. Pickets uses condemns him in that. He says it wants a practical man. Now, that clause read "the neatest and most attractive exhibit," and does not refer to the quality at all. That prize is given so as to make that exhibit attractive to visitors, and for that very reason a man who goes in just as a visitor would, and judges it, he is the man who can do it better than the bee-keeper.

Mr. GEMMELL: I second the motion for the sake of a show of hands.

Mr. DARLING: Before you put that I would like to ask Mr. Holtermann a question. Are we to understand that he infers that bee-keepers are as a rule void of any appreciation of art?

Mr. HOLTERMANN: Not at all. A man may be a good judge, but there are many men who think they are good judges of art and are not. That is what I mean to say.

The motion was lost.

Mr. GEMMELL: As I brought up the other matter I would like it understood I may some day be an exhibitor. Of course if I can get the best honey I can afford to buy I want to know, but I want it understood that it is an honest transaction. There is a great deal of talk about it. If it is understood it is right to do it, it is right enough, and if it is wrong let it be decided.

Mr. EVANS: I think that it is a question we should not waste time over here. A man exhibiting must exhibit under the rule of the Society offering the prize. If the Society lays down the rule that the party must produce the article exhibited there can be no question as to the right or wrong of following the regulation. I do not think we can make it right or wrong by any resolution we may come to here.

Mr. FRITH: If the Toronto Exhibition is soliciting our aid in making the displays, have we not a right to advise, or have something to say, in regard to the nature in which it is made?

Mr. EVANS: If you wish to pass a resolution advising any particular Society or all Societies to do away with that rule it is all right.

Mr. DAVISON: I think no Agricultural Society would take that out of their rules.

Mr. COUSE: If they did this with honey why would they not do it with anything else? You cannot borrow your neighbor's cow as a rule.

Mr. HOLTERMANN: But you can buy it.

Mr. COUSE: That is a different thing. I really believe there is no Agricultural Society that would knock that rule out.

Mr. HOLTERMANN: What I said was that it was hard on the perfectly scrupulous conscientious exhibitor, and I mean to stick to that statement. If any man knows a man is exhibiting what is not his, let him enter a protest, and if he does not let him shut up.

Mr. FRITH: If the originator of Agricultural Shows were to go to Toronto Show he would denounce it as a fraud, because the very object for which the Shows were instituted by the late Prince Consort was to encourage the producer along every line of agriculture. I think it is about time this Association shut down on it.

Mr. HEISE: I think Mr. Holtermann has admitted to-night that the principle is wrong. If the principle is wrong, then it is an evil; why open the door wide and encourage that evil?

Mr. HOLTERMANN: Who wants to do it? I do not think any man here can say that I said that. I simply said it was hard on the strictly conscientious man.

QUESTION: Which is the best for extracting, thick or thin combs—say $1\frac{7}{8}$ or $1\frac{3}{8}$ inch?

Mr. NEWTON: In my extracting supers I use one comb less than in my brood nest, and in that way they are spaced so as to have the combs project out at the side that they are handy for uncapping, but otherwise I do not know that I can answer the question.

Mr. W. A. CHRYSLER, Chatham: I find a thicker comb extracts much easier than a thin one.

Mr. POST: I prefer comb $1\frac{3}{8}$ inch for extracting to $1\frac{7}{8}$. In my frames the top bar is an inch square, and I like the honey built out slightly past the surface of the frame. There is a great advantage in uncapping; the frame is not in the way. You get more honey in the same number of combs, and it facilitates the work in extracting.

Mr. McEVOY: We can go sometimes a little too far in the thickness. I went so far as to make some of them $1\frac{3}{4}$ inch. I am turning them all into wax. I do better with the inch or $1\frac{3}{8}$ inch. As to projecting out past, that is right; it is handy to uncap. I would not use the Hoffman frame for extracting; it sticks out; it is in the road.

Mr. EVANS: I am with you there.

Mr. DARLING: There is just one other point in connection with the difference between thick and thin combs. It has been my experience that the thin combs do not uncap as easily as the thick combs. Outside of the fact that the frame is in the road, it is harder work to take the cappings off the thin combs. Some say they get more honey out of the comb; I do not care whether I get it out of one comb or two. There is another difficulty you have to guard against, and that is, a thick comb will bulge the screen in the extracting basket, and so it might get out of place.

The PRESIDENT: The answer to the question would then be in favor of thick comb.

Mr. ARMSTRONG: There are a few here who condemn the Hoffman frame. If you leave them far enough apart it will do away with the projection. The comb will stand out past the projection, will it not?

A MEMBER: Yes.

Mr. McEVOY: That is all right, but sometimes it stands out a little past it, and you come to it in a hurry with a knife and that shoulder sticks out there. I would a little sooner that was out of the road.

Mr. E. DICKENSON, North Granford: Do you not get the frames more of the same thickness when you use the Hoffman?

Mr. McEVOY: I use a better hive than the Hoffman altogether; that is a self-spacer without that shoulder. As far as the uniform thickness goes you are correct.

Mr. HALL: The idea is you can uncap seven thick combs in less time than you can uncap seven thin ones, and you can extract them just as quick, and you will get an eighth part more honey from them.

REPORT OF INSPECTOR OF APIARIES.

By Wm. McEvoy, Woodburn.

During 1898 I visited bee yards in the counties of Essex, Middlesex, Huron, Grey, Wellington, Simcoe, Dufferin Norfolk, Wentworth, Lincoln, Peel, York, Ontario and Victoria. I examined one hundred apiaries and found foul brood in thirty-two of them. Nearly every bee-keeper that had foul brood in his apiary wrote me private letters about it, and working on the rule of doing to others as I would like to be done by, I treated all such letters as if they were marked strictly private, and always will. By working along this line in a quiet way, and helping the owners of the diseased apiaries to cure their colonies, I have been able to find out more about who had foul brood in their bee yards than could or will ever be found out in any other way.

I am very much pleased with the way the owners took hold, and cured their apiaries, and particularly so with two that were cured by two ladies in the county of Simcoe. These two ladies did the best work in the shortest time that I ever had done, and with two of the worst foul broody apiaries that I ever handled.

Scarcely one week ever passes that I do not receive more or less letters asking questions about foul brood and dead brood of other kinds. I have also received very many samples of combs with dead brood in, and about seven out of every ten of these were genuine foul brood. The most of the letters and samples of comb with decayed brood in came from many parts of the United States and the others from bee-keepers in the Province of Ontario, Quebec and Nova Scotia.

About how long would foul brood be in a colony before it will become very bad with the disease? was one of the questions asked by several of the writers. I answered saying in some cases not more than one week, and in others over one year, but in the most of cases less than three months. Just how soon or how long it would be before any diseased colony would become very bad with foul brood, would depend entirely on how much or how little of the honey was diseased. The honey to become diseased must be stored first in cells where foul brood matter had dried down, and when any honey is removed from such diseased cells to cells partly filled with sound honey it will disease it also.

Foul brood is spread through a colony just in proportion to the amount of diseased honey that is fed to the larva.

I sent Mr. Gemmill out a part of the time, and he inspected fifteen apiaries and found the disease in three of them. I am very much pleased to say that neither Mr. Gemmill nor I had to burn one diseased colony. We found all parties very willing to cure, and gave them a chance to do so.

I believe that the Province of Ontario has less diseased apiaries for the numbers kept than any country in the world, judging by the number of letters I have received.

Mr. Atkinson: You visit a yard where they have foul brood, and the man says he will look after it. Do you take his word for it?

Mr. McEvoy: I do not wish to dispute any man's word, but I do not take any man's word. If I do not visit them in a reasonable time I come back another day.

Mr. Frith: You are satisfied that the foul brood is decreasing?

Mr. McEvoy: Yes, and I believe if we had not an Inspector people would come to the conclusion there was none. What I did get I got in a private way. In 1890 there were only three days from May to November I had not foul brood.

Mr. Hutchison: You examined how many?

Mr. McEvoy: About 160. It was like this, the whole Province was going to the dogs; it was the first break-in.

Mr. Davison: I very much approve of this gentleman receiving the letters in confidence of those who have the disease, and it would be a much better plan if it was known that that was the method adopted.

Mr. DARLING? Is there not a tendency wherever the inspector has gone and shown the proprietors of apiaries how to treat this decease, for those proprietors to help themselves out of the difficulty another time? He is an educator as well as inspector; the time may come that we will not need an inspector. The beekeeper will know how to get rid of the disease himself and help his neighbors do the same.

Mr. ARMSTRONG: I would like to ask Mr. McEvoy how he treats the hives with foul brood?

Mr. McEVOY: I do not do anything with them. If it is right to burn the hives, it is right to burn the bees; and if it is right to burn the bees I do not know but what it is right to burn the inspector.

Mr. HOLTERMANN: The bees can clean themselves, but the hives cannot clean themselves?

Mr. McEVOY: That is not the important question. This gentleman asked me what I did with the hive. I do not do anything with the hive; I go further than that. I have saved over $200 worth of combs in one case in the State of Vermont, and I will tell you how it can be done. If you have nice, bright, clean, new combs, that *never had any brood reared in them*, extract the honey out of them and then give them back to the *same diseased colony* until the bees lick them perfectly dry. Such combs can be used in safety on any colony of bees in the world, no matter how bad the colonies may have been with foul brood that they were taken off of. Combs that have had foul brood matter dried down in them will show the stain mark of the disease, and just as long as the comb lasts it will stay there. And such combs can never be made right or fit to use.

Mr. ATKINSON: What will be the mark?

Mr. McEVOY: The foul matter. A good many are careless, maybe have not queen excluders enough, and the queen has got above. If we go in for boiling hives you see to what an extent it would have to go.

Mr. FRITH: How are you going to detect whether the honey is diseased or not?

Mr. McEVOY: What is stored in the stain-marked cells.

Mr. HOLTERMANN: We know that during the spring of the year the honey is stored in the brood chamber, and it may be stain-marked. Now then, we put on the extracting super, and we know the bees will then carry honey into the upper stories. Suppose they carry it from a stain-marked cell into an upper colony, and you give that to another colony?

Mr. McEVOY: I said that stores that are moved from other cells would disease that also. It is the same thing. The hives do not need it. You can boil them and scald them all you like, but I look on it as folly. But all bright, clean, new combs, that are dry—I do not care how foul the hives are—if I can save you $50 or $100 worth of them I will do it. But if you have not been using queen excluders, and you have only two stain-marked cells, those have got to go. Those who have dead brood in their hive, I would ask, "What are you doing with dead brood anyway?" Make wax of them; take no chances.

Mr. DICKENSON: How do you clean it up?

Mr. McEVOY: I wash that out. I asked Mr. Gemmell here once to take some foul comb and crush it against the side of the hive, and let it stand for a few weeks. I think he was busy. He did not do it, and I tried it this summer on four in my own yard, and nobody gets any more of it. I have piles of it like that. I took some of this fancy mess, but it did not show up, and if it did I could treat it.

Mr. FRITH: Is there not a possibility of this bacteria getting into its proper medium in the future?

Mr. McEVOY: We both have had bitter experience. I had twenty-three years ago. I had it in fifty out of sixty

Mr. SPARLING: Did you leave those hives out in the air and sun?

Mr. McEVOY: Yes, they were out for a week. I did not believe that hive could give it, and I thought I would give it a pretty severe test.

Mr. FRITH: I would not like to take chances in trying it in my yard.

Mr. McEVOY: I did, in the honey flow.

Mr. FRITH. Is there not a time coming when this bacteria will get into the medium or the honey and distribute itself and come to life, and reproduce itself?

Mr. BOOMER: I would like to ask if there is not a difference in foul brood?

Mr. McEVOY: I suppose there is, and a great deal of difference too this far. Where larvæ have been reared in the same cell, and it gets down so fine that it is like a silk thread, I think that would be worse than the first one.

Mr. BOOMER: I want to give a case. What McEvoy said in his report just brought it to my mind. Early in the spring I was called to see some hives a man had in which he thought he had foul brood. I found one hive had died in the yard, and he had left it sitting there for the other bees to clean up. I fancied then that all the bees he had would be corrupted with it, but on examination I just found two that were affected, and there were only a few cells in each of them that appeared to have foul brood in. One of the colonies was weak, and I recommended him to double them up; and we there and then doubled those two colonies up, and he wanted to have the experience of curing the colony on Mr. McEvoy's plan. I said I would come back about the time of the honey flow, and we would put them through the process. I went back, and on shaking the bees off the comb then I could find no increase in the foul brood, although the hive had brought up well and become a strong colony. I could not then detect as much foul brood as I had detected nearly two months before. On shaking the bees off the combs, as I said, I could not detect any, and I feared I had been mistaken; but when we set that brood aside to hatch out, and I went back again in the course of a little over three weeks, then I found I had been correct in the spring, for there were just a few cells, and a few only, and I got the idea perhaps it might not be a very virulent type.

Mr. McEVOY: You are correct; that is the way very often. If the new honey coming in had been fed to the larvæ then it would spread. I get many letters wanting to know how long it will be before it will break out. As I said before that will all depend. Take where there are only two or three or half a dozen cells, that might linger for a year, it had such a small start. It comes in through the feeding of this honey to the larvæ.

Mr. HOLTERMANN: I would just like to say that it does appear so to me; as far as disinfecting the hive is concerned it can be done with so little trouble that we should use that precaution and disinfect it. At the present time science and practical experience do not agree. Mr. Harrison, the bacteriologist at the O.A.C., has been studying this question of foul brood for some years from a bacteriological standpoint. I know he has found the germ of the disease in the egg. I will candidly confess there are things about foul brood I do not understand. I speak rather from the practical standpoint than the scientific, but I believe this Association should not rest satified until we can reconcile science with practical experience. Is it not possible that when we attribute a disease to carelessness, it may not be transmitted in some of the channels we do not understand at the present moment?

Mr. McEVOY: When the scientists stand as far apart as the poles, what then?

Mr. HOLTERMANN: That doesn't make both wrong or both right.

Mr. BOOMER: How long should honey taken from a foul brood hive be boiled before it is fit to feed to bees?

Mr. McEVOY: I never recommend it from the first summer, because I could not trust the people. I have never had any trouble when they put half water with it and bring it to a sharp bubbling boil.

Mr. FRITH: I would like to refer to some experiments made recently by a chemist in regard to this bacteria. I cannot give the exact data, but it runs something like this.

If you bring your honey to a pasteurizing heat, from 145° to 180° or 185°, it destroys a large percentage of the bacteria and kills it, but traces of vital bacteria have been found in a medium in which it was heated up to 112°, and it has been super-heated up to 135°, I think it is, before they could absolutely say there was no vital bacteria in it, and to keep it at 112° for some hours lessened the vitality of the bacteria, It seems to me it had to be under the pressure of 112° for nearly twenty-four hours. Heating it to 112° would practically make it safe to feed.

Mr. HOLTERMANN: Would it not altogether depend on what kind of bacteria it was ?

Mr. FRITH: I cannot give the exact data, and I cannot vouch for the exactness. I am interested in foul brood. Ten years ago I lost more colonies in my own apiaries than have been destroyed this year. I am really afraid of the contagious part of the disease. This gentleman referred to "a few cells." Some seasons the bacteria propagates with greater rapidity than others. Formic acid is death to the bacteria, and formic acid is the poison in the sting of the bee. Some years that acid is much greater in the bee than other years, and it is possible where you have destroyed hives they will almost cure themselves through the formic acid in the honey.

Dr. JAMES MILLS, President of the Ontario Agricultural College, was introduced, and after welcoming the Association to the city, invited the members to attend any of the meetings of the Experimental Union now going on at the College, and particularly the open meeting to be held in the evening.

REPORT OF SAN JOSE SCALE COMMITTEE.

Mr. EVANS: At the last session of the Association Mr. Hall and myself were appointed a Committee with regard to the San Jose Scale. I communicated with Mr. Orr, and told him that if necessary we would attend at any time or place to help with the passage of the Bill; but I found it was unnecessary, that the Bill was going through without any opposition practically, and Mr. Orr did not think it necessary for us to attend, so we did not meet or attend the House, and consequently did not incur any expense whatever.

DIRECTORS' REPORT.

Your Directors are again pleased to be able to report that the Bee-keepers of Ontario have had a fairly prosperous season, there being a fair increase in bees and a good crop of honey.

The business of the Association has been transacted as faithfully as possible, and we are pleased to be able to report a fair share of success.

The finances of the Association are in a satisfactory condition, there being a balance in the hands of the treasurer.

As in the past each member of the Association has received a copy of the *Canadian Bee Journal* monthly during the year, and also a copy of the Annual Report.

The usual grants were made to the Toronto Industrial Exhibition Association, the Western Fair Association of London and the Canada Central Fair at Ottawa.

These grants were expended in compliance with the Agriculture and Arts Act of Ontario.

There was an appropriation of $200 to the affiliated societies to be be expended in accordance with the By-laws of this Association.

W. COUSE, Secretary.

AFFILIATED SOCIETIES' REPORT.

There have been eight societies in affiliation during the present year as follows: Russell, Haldimand, Brant, Glengarry, York, Halton District, Norfolk and Oxford.

Each society received a grant of twenty dollars and these grants have been expended as directed by the by-laws governing such expenditures.

The reports of the increase of bees and the production of honey are about as full as usually received.

The colonies reported in spring were 3,101, in fall, 3,362, or eight per cent. increase. Comb honey produced 26,672 lbs, on an average of 8½ lbs. per colony, and the extracted 148,865 lbs., or an average of 48 lbs. per colony.

These averages of honey show a very good yield per colony—a total of 56½ lbs., which is above the usual yield—and the quality of the honey has been excellent.

W. COUSE, Secretary.

HONEY EXHIBIT IN ENGLAND AND FRANCE.

A discussion arose regarding the advisability of making exhibits of honey at Earl's Court and at the Paris Exhibition.

Mr. HOLTERMANN moved, seconded by Mr. POST, that it is the desire of this convention that an exhibit of honey be made at the Paris Exhibition in 1900, and that if, upon investigation by the committee, we find Earl's Court is a suitable place, and one likely to benefit beekeepers, an individual effort be made to send honey there, and that a copy of this resolution be forwarded to the Provincial and Dominion Governments. Carried.

SPECIFIC GRAVITY OF HONEY.

A communication was received from Prof. Shutt, of the Central Experimental Farm, Ottawa, regarding the sending of samples of honey for examination as to percentage of water, etc.

Considerable discussion ensued as to whether samples should be sent to the Inland Revenue Department or the Central Experimental Farm, or to both. No definite action was taken by the meeting in connection with the matter.

HONEY FOR MARKET.

BY R. F. HOLTERMANN, BRANTFORD.

In selecting the above subject as a topic for the annual meeting of the Ontario Bee-Keepers' Association Convention, I chose it because it gave abundant ground to cover. It might almost embrace the entire subject of bee-keeping, but my intention is to confine myself to a very small portion of the field. I need not enlarge upon the importance of decreasing the cost of producing honey by having strong colonies for the honey flow, not only by bringing them well through the winter, but by giving them judicious care from that time until the honey flow begins. To many this alone is the battle ground for profit or loss in bee keeping. Beginning with the supers, a beginner should ask himself, if he shall produce comb or extracted honey, and what are the advantages and disadvantages of the two systems. Not counting the cost of the supers which can be used from year to year, and remain with the bee-keeper, a hundred pounds of extracted honey can be sold without disposing of any of the apiarian supplies. In one hundred pounds of good comb honey however, he has to give with the honey 120 sections at a cost of about 50 cents; enough thin super foundation to fill 120 sections, 73 cents; ten comb honey crates, $1 00, a total of $2.23 In large quantities this may be diminished somewhat, but with a beginner this is not far astray. The cost of material which has to go with the sections is then just about $2\frac{1}{4}$ cents per section. The moment a man places a value on comb and extracted honey, he runs the risk of having someone trample on him, but I believe that the interests of many demand that this subject should be taken in hand, and if any of the figures given are not satisfactory, you can do your figuring on a basis satisfactory to yourselves First-class comb honey in this Dominion of our is selling all the way from $1.00 per dozen sections to $2 50, the price varying according to season, locality, honey-crop, etc, or running from $8\frac{1}{3}$ to 21 cents per section; when you deduct $2\frac{1}{2}$ cents from that it leaves from $6\frac{1}{4}$ to $18\frac{3}{4}$ cents per section. In the tens of thousands of pounds of comb honey our company has handled, and many more transactions I know of, I have yet to hear of a case where the seller was paid for his comb honey crates. First-class extracted honey sells in Canada at 6 to 15 cents per pound, more frequently at 6 cents when purchased in large quantities, such as 1,000 to 5,000 pounds, and a comb honey at 11 cents. The difference thus far on first-class honey is $\frac{1}{4}$ to $2\frac{3}{4}$ cents per pound; but have we considered the entire difference of cost? I think not. Those who consider that in production 70 pounds of comb honey is equal to 100 pounds of extracted honey, are considered by the majority of bee-keepers as over estimating the ratio of comb honey; many more say that it is 50 to 100 pounds I am inclined to believe that with the best management the first is right, but with a bee-keeper not thoroughly experienced, or not having time to apply his knowledge, it may be even less than the latter; but taking the ratio of 70 to 100 pounds, 100 pounds of extracted would bring generally $6, while the 70 pounds of comb honey would generally bring $8.40 With $2\frac{1}{4}$ cents deducted, which is the cost of foundation, sections, and crates, this leaves $7.30, a difference of 30 cents. For the sections must be folded, the foundation put in supers, wedged up and put on These supers must not be put on too soon, lest the bees spoil the foundation and soil the sections. Increased care must be taken, and with every caution there will be a greater tendency to swarm, a snag against which beginners and other bee-keepers are so likely to run.

In extracting, we have the honey to take out and the empty combs to replace. To offset this in comb we have the bees to drive out of the sections, the comb to scrape, the grading, the nailing of the comb honey crates and the packing.

If the above figures are correct, it does not pay to produce comb honey with the present market difference. If the figures are not correct I trust the above will give some food for thought, and everyone can adjust prices to his own condition.

Thus far we have referred to first-class comb honey, but we know that the beginner and the man busy with other departments in life, cannot give his bees the close attention necessary to produce first-class honey. Consequently he produces comb, poorly filled, travel stained, light and dark mixed, with the result that it increases the cost per pound of sections and foundation with anything but a corresponding increase in the price of the product, and the producer becomes the loser. We might leave such a man to his fate, but our Association receives a Government grant, and we receive it to benefit bee-keepers generally. But this cull comb honey receives much greater attention than it merits. Market quotations appear to glory in giving the lowest prices, and if in Toronto, Montreal, or some other cities a few culls have been sold at $6\frac{1}{2}$ cents per pound, the public without explanations, see in the press that comb honey is selling at from $6\frac{1}{2}$ cents to —. The tendency of this is to depress prices; few men can resist a low offer when told that some one is selling at that price. I know individuals may be in a position to say they keep up prices, but the question is, are my statements in the main correct? And if they are is it not in everyone's interest to discourage the production of inferior comb honey?

Having made an effort to throw some light on the relative profit in the production of comb and extracted honey, let me say, in producing comb honey for the market it is desirable to keep colonies strong, to know when the supers should go on and when they should come off. In going through the country I have time and again seen sections on the hives, even freshly put on, when there was not the slightest hope that the bees would do anything with them. I have seen them on colonies so weak that they could not take care of a full brood chamber, to say nothing of these supers, and producing surplus honey suitable for market. While we find such frequently the case, these errors can be comparatively easily avoided. To prevent inferior honey from being stored in the sections is, however, more difficult. The bringing from the brood chamber into the super inferior honey, and the storing of early honey, can be avoided, first by shifting and uncapping honey, compelling the bees in strong colonies to convert dark honey into brood If the bees require more room than the brood chamber affords, the extracting supers should be put on, and if there is any spare energy let the bees pull out sheets of foundation Combs thus newly built offer an excellent opportunity for watching the color of the honey coming in from day to day, and at the opening of clover just as soon as the bees cease bringing in (or up) dark honey, the sections are put on. To avoid cull sections towards the close of the season, we then change to extracted honey. This system has been the most satisfactory to us. Although we depend upon buckwheat as a crop, we do not consider, if it can be avoided, that it pays to finish with dark honey sections having a considerable quantity of light honey.

In extracting honey a little too much does less harm than not enough. Two or even three supers on one hive can be used to great advantage, and this additional investment will do much to help the bee-keeper to decrease the cost of production. In running for extracted honey the danger of having dark honey carried up from the brood chamber is greater than with comb honey. To watch the extracting supers at the opening of the season would result in much less inferior honey being put upon the market. Better extract a little early honey then, than have a lot of well ripened dark honey. Even during mixed and unfavorable seasons a fairly good article can be secured by holding each extracting comb up to the light as it is taken in hand, and at the first extracting uncapping only such combs as show the light color through the capping. The practice of exposing a large surface of honey in so-called ripening cans placed in an ordinary temperature, is in ninety-nine cases out of a hundred altogether wrong. The honey becomes thinner rather than thicker. A simple test can be made of this by taking a plate, putting upon it a layer of honey one-sixteenth inch thick. The honey set out in the atmosphere generally becomes thinner. If it takes up moisture on the plate, it will be almost sure to do so in the open can. This is contrary to the opinions of those I have met thus far, but it can easily be tested. Seasons vary it is true, but after the close of the honey season there is generally a considerable quantity of moisture in the atmosphere.

Too much time has already been taken, but we must study our markets, and put our produce in the most acceptable and reliable shape. While catering to the demand for very small packages, we should do everything in our power to discourage them. There may be several reasons accounting for the fact, but when honey was at least not less in price, 5, 10, 20, pounds and even greater sized packages were generally used, and the very small packages were unknown. Neither the consumer nor the producer has gained anything by this. Comb honey not well attached to the wood should be sold at home, otherwise it may disappoint everyone connected with it.

There is at the present time talk of a European market for honey; should this develop, then, more than ever, will it be necessary to aim at a higher standard of perfection in the article. Such a course would result in a wonderful expansion in our home market.

I have of necessity had to leave much unsaid, but the sooner the idea is exploded that honey is simply honey and all of the same quality, the sooner the public know that it varies in quality just as much as butter, the better for everyone.

In closing let me say, a larger return for capital and labor expended means greater profit; to secure the larger returns we want a greater quantity of produce, or a better article, or both; and upon this the question of producing at a profit, or loss, hinges to a greater extent.

Mr. Gemmell: There is only one point I would like to touch on now, and that is with regard to the quantity of comb and quantity of extracted honey. I think Mr. Holtermann says there is 70 per cent. of comb to 100 per cent of extracted honey. Some years that may be right, and some years wrong. I would like to hear the experience of some of those who have been a little more in that line.

Mr. Holtermann: In the paper I say that no one says that you can produce more than 70 pounds to 100 of extracted, and of course giving the benefit of the argument in that direction. Granting that you can get 70 pounds of comb, that puts it in the most favorable light for comparing comb and extracted. But even if you can get 70 pounds of comb to 100 of extracted, it shows that there is not the profit in comb honey there is in extracted.

Mr. Darling: I do not think he places the price low enough. In a town a little north of where I come from first-class comb honey is sold for 5 cents.

Mr. Davison: I think there is even more difference than he says in the amount of comb honey to extracted.

Mr. Holtermann: Your idea is that there is less profit in the production of comb honey than I have stated?

Mr. Davison: Yes.

Mr. A. E. Hoshal (Beamsville): Do I understand that is by weight or by section?

Mr. Holtermann: I am figuring by weight. My idea is to discourage every beginner who thinks he wants to go into comb honey.

Mr. Chrysler: The young bee-keeper will find more difficulty in disposing of his extracted honey on the start, at least, than he would of comb honey. It would probably discourage him in that way.

Mr. Frith: Mr. Holtermann's comparisons and ratios are pretty nearly correct according to past experience of producers of honey. There was another point with regard to the local markets for honey. Mostly every bee-keeper will find he can sell in his locality more comb honey than extracted, and this would have something to do with the profits of the honey in his locality.

EXTRACTING WAX.

By F. A. Gemmell, Stratford.

In regard to the rendering of wax, I have nothing new to offer. Anything I have is a combination of what others have been carrying out for some years past. Several years ago I had quite a number of combs to melt, and I had made up my mind that all the wax had not been secured out of the rendering of combs by any process I then knew. I had been practising the plan generally followed by most people; that is, crushing the old combs in cold water, and allowing them to remain for 24 or 48 hours in order that the cocoons and pollen contained in them would be saturated with cold water and not so apt to take up any of the wax when the combs were put into hot water. Bruising the combs as I have told you, they were placed in an ordinary gunny sack, and put in a boiler of hot water and sunk to the bottom of it by placing a frame work on top; underneath there was a framework also. After boiling for a certain time the wax would rise to the top, and it was skimmed off; and I have thought that I did not get all the wax by that process I should get, because I always found some refuse in the comb remains. Having a few more combs to melt a year or two ago, I thought I would try some other process. I found that the solar wax extractor was no use for old combs, for the simple reason that as soon as the wax melted the cocoons would absorb a certain amount of the wax as well as the pollen. That refuse was put to one side and kept for experiment later on. Then I tried the experiment of using a steam wax extractor. I had spoken to Mr. Hall about it, and he had used the same extractor, that is, one such as you will find illustrated in the

A.B.C. Book, and in fact it was once called the Jones Steam Extractor. Mr. Hall thought he could get all of the wax out of the combs he considered worth taking out. I was not quite sure of that, and I got one of the steam extractors made and tried it. I was not satisfied with it, so I resolved I would bring some pressure to bear. I tried the three different ways. I first got the press made. It is a simple thing. First of all there is just a wooden frame, and two iron uprights; and across the top of the apparatus there is a wooden bar, and an ordinary jackscrew put in at the top, so that by turning this screw it would go down and bring pressure to bear on whatever was under it. We had to have an ordinary scouring tin pan about 14 inches square and 4 inches deep, and there was a lid to it; that was set down on the wooden platform. On top of that was set a wooden mat. This mat was made of slats, such as you have seen in these ordinary window blinds. The slats were $\frac{7}{8}$-inch high and about $\frac{1}{2}$-inch wide, and a quarter of an inch apart. This mat sat right down on the bottom of this tin pan. On top of the mat we used a frame that was made of $\frac{7}{8}$-inch stuff, and just set inside of this tin tray. After that was put on top of the wooden mat a piece of gunny sacking was spread over all, and a quantity of combs that had been melted on the stove was poured in on the gunny sacking, not in a bag but just a plain piece of sacking. Then the gunny sacking was folded on top again and tucked along the edges of the wooden frame. There was a follower of 2-inch plank having a piece of iron on top. There was another small mat laid on top of the gunny sacking similar to the one underneath, and then this wooden follower, this 2-inch plank, was laid on top of that again. Then pressure was brought to bear, and as we pressed we found we could force both wax and water out into the tin pan underneath. But of course we did not get all the wax out that way. We still pressed and found we could get nearly every particle forced down in between these spaces in the wooden mat and the mat up above. After it was kept there 15 or 20 minutes we would sometimes pour in cold water, in order to get it cool quicker. After that we would take the screw out and lift off the follower and take out our top mat, and we would find this wax seemed to be forced through into this place. Sometimes the wax was a little colored with pollen, and underneath we would find the same thing, and we would roll the mat up and scrape long strips of wax out from the mats. We found by trying that process we could get a great deal more wax. We would get about an average of one-third more wax from the combs melted in the solar extractor or from the combs melted by the steam extractor, but we would not get as much from the combs that were boiled in the water. It seems to me that in using the steam extractor for a time the wax would come out very freely, but as it got near the bottom the cocoons and the pollen seemed to prevent all the wax coming out. There would be more wax come out than if you boiled it. It seemed when the wax was boiled, that the wax being so much lighter than the water would come to the top more freely, and there seemed to be less contained in it, so that I did not really lose as much by the old process as I thought. We found that we could by the boiling and using the press afterwards get about three pounds of wax out of eight combs, that is old combs that were may be five or six years of age. That is a great deal more, I think, from what I can learn, than usual.

Mr. Chrysler: Have these tests you have been making been on old refuse or have they been from old combs?

Mr. Gemmell: Old combs. I took no refuse that had been boiled, but one or two parties that had refuse that had been through the steam extractor seemed quite satisfied they had gotten all the wax out. Mr. Hall was one. He said he got very fine wax, and believed he got mostly all the wax out of the combs. He asked me how I had gone about it, and he said I differed very little from him in that he melted the combs in a pan of water on the stove before he put them in the steam wax extractor at all. Mr. Newton followed the same process. After I had concluded my experiments I asked Mr. Newton if he would give me a little of his refuse to see what I could do with it. I got 20 pounds, and we put it on the stove and heated it, and poured it into the press, and got out of it 7 pounds 2 ounces of wax. My boy went down there to learn to make comb foundation, and he took this press of mine down there to convince Mr. Hall that there was something in it, and Mr. Hall said he was more eager to find out about that press than to make the foundation.

Mr. ATKINSON: Did I understand you to say you could get 3 pounds of beeswax out of 8 frames?

Mr. GEMMELL: Eight combs.

Mr. ATKINSON: Would these combs be made from starters?

Mr. GEMMELL: Full sheets of foundation. You might not get that from all, but out of 96 combs there was an average of three pounds per hive of wax.

Mr. HUTCHISON: Before you put this refuse in the press is it run through the steam extractor or boiled?

Mr. GEMMELL: Steam extractor. I tried the ordinary way of boiling it, and I got less wax than out of the other.

Mr. EDMUNDSON: Do you think it is necessary in your process to break your combs and soak them in cold water for 24 hours?

Mr. GEMMELL: It is not necessary if you use the press. I wanted to find out how much wax I had been losing by the old plan. If you melt the combs and put them through the press what you do not get by the steam extractor you get by the press.

Mr. HALL: I simply get up to state a fact. I told Mr. Gemmell that I thought he could not get any wax out of my refuse. We put it in a Jones extractor and stirred it until we thought we got the wax out. We tipped it out, and he was so sanguine I had not got it out, and I was pretty positive I had, that he wanted me to send up some refuse to see how much he could get out. I thought he was too sanguine to be trusted in the transaction, and I said, "No; you send the press down to me, and if I like it I will get one, too" As he says, his boy came down with the machine, and we tested it, and we got a lot of very nice wax out of that stuff that had been lying around for four or five months on the ground. We then tested some from the combs, and we got very nearly a third more after we took out all we could by the boiling process. We got one-third more wax than what we got out in the common way. I sent that wax extractor home, and we sent down to the wagon shop and got the iron made and the cross-pieces and the follower, and it laid aside until last week, when I commenced to build it up. It will be done when I go home ready for operation. In the past I did not like to melt our old combs because we got so little wax for so much trouble that I let them be. I have only one improvement to Mr. Gemmell's. His sits on the floor or box, and if you pull it to one side it slips. I put four iron pieces on to that to screw it to the floor; that is the only improvement I have made, and all I think is necessary. It will cost you $1 60, besides your labor to make it.

Mr. GEMMELL: Mine cost about $2.

Mr. SMITH: I would just like to ask Mr. Gemmell, I understood he got three pounds of wax from eight frames?

Mr. GEMMELL: Yes.

Mr. SMITH: How much wax would be in the foundation?

Mr. GEMMELL: About a pound and a half.

Mr. HOLTERMANN: Wouldn't you be inclined to think it was fairly heavy foundation to begin with?

Mr. GEMMELL: It might; I wouldn't like to say. That is what we got. We did not take one hive. We took 96 combs, and that was the result. We kept count of the wax we boiled out and the amount we pressed out.

Mr. HALL: It is very soft wax.

Mr. SMITH: I did not think there would be so much added. There must be more or less absorbed in the cocoons.

Mr. GEMMELL: This pressure seems to press everything out through the gunny sacking.

Mr. NEWTON: I am glad Mr. Gemmell has brought out the point he has I think it was two years ago we had a long discussion on the same line, and it did not seem as though we could get much light on the subject. I have done a good bit of melting of old combs, and I thought I could get a pretty good percentage, though I never was certain I I got it all. After Mr. Gemmell was up to see me the refuse was out in the garden, and he asked if I would give it to him. He sent for it, and the return he told me was seven pounds two ounces out of the 21 pounds of refuse. In making up some of Mr. Gemmell's wax this year into foundation, I might say, it was nice wax that was taken out by that process, and although a little bit soft it worked very nice. I am sure as bee-keepers we have to thank Mr. Gemmell for what he has brought before us. Although probably not new in a way, yet it is new to the bee-keepers of the Ontario Bee-keepers' Association.

Mr. Hoshal: I have been satisfied this long while that there was a very large proportion of wax in the best cleaned refuse we could get. Take ordinary refuse and look at it with the naked eye, and it has every appearance of being rubbish. If you will take that rubbish and put it under a glass and magnify it, you will see that it takes on an altogether different appearance—that instead of being a lot of refuse with a little wax in it, it is a great big lot of wax with just a little refuse in it to color it and deceive the naked eye.

Mr. Dickenson: My experience along that line is something like Mr. Hoshal's I have always had considerable doubt that after extracting combs I got all the wax out. I was quite positive I had not, and to prove that I was quite positive I have got now a stock of this refuse stored away. I did not know whether I have been waiting for some man like Mr. Gemmell to discover something new, but I must say that, according to the explanation he has given us with regard to the pressure he brings to bear on that hot refuse, I have no doubt I can get considerable wax out of this stock of refuse. So I shall be very glad to try that process.

Mr. Darling: I have tried two or three ways of taking out wax I used the Jones extractor for a while, and was dissatisfied with it. Through Mr. McEvoy's influence I was furnished with the pattern of Mr. Alpaugh's invention of the solar extractor. I made one, and was very pleased with that. In starting the fire one day with refuse it burned so freely that I made up my mind there was too much wax there to waste. So I gathered the refuse up in a box. I had no press to press it out, but I put it in some of this coarse sacking, and took two sticks and pressed it as well as I could with the sticks, and got about ten pounds of wax out of what had been thrown away. Still I was not satisfied. My friend Gemmell told me about his process, and I made up my mind my refuse could lay there until I got a press.

Mr. Brown: It appears very plain to me that the paper before us is one of the most interesting we have had for some time. It goes to show that we are as a rule losing quite a quantity of what should be turned into hard cash; that is, a large quantity of wax. I am using solar extractor, and from the discussion going on I must be losing at least one-third of the wax. I think this paper is worth a good deal to the convention, and for my own part I mean to profit by it if possible and have a press.

Mr. Alpaugh: I have never used the solar wax extractor for melting old combs except where the combs were in a whole state, and getting them just to fit the basket, and setting them on edge so that as they melted it ran down through the base, and was not caught in any of the seams. I know I could get about all the wax out of the combs that way, but whether it came out from between the cocoons and the wall of the cell or not, I do not know. I would never recommend it for old comb, because the wax will collect in those cocoons and stay there unless it is got out by force. Even by the boiling process, Mr. Smith was telling me he got about all out; he was sure the wax would rise to the top I told him it would not. You put so much wax in, and so much will come to the top, and so much will stay there.

Mr. Smith: What weight did you get from eight combs?

Mr. Alpaugh: I only got a pound and a half from the combs—old black combs.

Mr. Gemmell: You would get more wax by using the press out of those. The thicker the cocoons, the more power required.

Mr. ALPAUGH: After going through the combs I could see that the wax had gone out through the base, but I could not see why there could be as much wax retained in the wall as what went out, unless it was taken up by the cocoons in some way, soaked into it, instead of running where it ought to go. I cannot see yet how you can get three pounds.

Mr. EVANS: In case of this process of squeezing out the wax becoming general, and bee-keepers were to extract wax from foul broody hives, would there be any danger that parties would not boil it sufficiently?

Mr. GEMMELL: You boil it first and squeeze it afterwards. If you use a steam extractor the steam would destroy it, but in using a solar extractor I do not think it is a very safe thing to do. After you get all the wax out you would have to boil the refuse.

HOW CAN WE MAKE OUR ASSOCIATION MORE USEFUL?

BY J. K. DARLING, ALMONTE.

The above question is one that should interest us very deeply. Receiving as we do a grant from the public funds, and being assisted in other ways as we have been by the Government of Ontario, it is but fair that we should endeavor to render as great returns as possible for that which has been given us. It would not be possible in one brief paper to mention half of what might be done, and I propose to just glance at a few of the many ways in which we might hope to attain to greater usefulness. I shall divide these ways into two classes, the positive and the negative, the doing and the refraining from doing, and I shall treat of the latter or negative side first.

We are not to consider our work done because we have succeeded fairly well in the past. It is true that some of the tasks have been fairly completed and some others well under way, but what we have accomplished only opens the way for other and in some cases better work. If we are to conduct the business of this Association for the benefit of the beekeeping industry at large, we must not come to these conventions as isolated individuals, and endeavor to make all things work together for our personal benefit; neither should we try to place personal friends in official positions unless they possess some other qualifications besides a desire to please. We must not allow ourselves to monopolize the precious time of these conventions in discussing abstract theories which are of no practical value to any person except those of a scientific turn of mind, and of little use to them only as side lights on some other subject. Above all we must not permit personal matters and private bickerings to be discussed during business hours, neither must we permit personal spleen—if you will allow the term—to influence our work for the public. A true soldier knows no enemies on the battlefield except the enemies of his country. We should all remember when we get here that individually we are only a part of this Association, one piece in a machine, and we are expected to do our part to the best of our ability and with the least possible friction.

Do you ask what shall we do? As individuals we should come here prepared to take part in all matters relating to advancement which may come before the Association, if we have any facts in our possession that would aid in the work, doing so as briefly as possible, and then giving others an opportunity to do as we have done.

When we disperse let each of us carry home with us a feeling of responsibility which will prompt us to do the best we can for the industry and for the Association as opportunity may offer. Let us remember that in our own locality the work of the Association in that particular locality rests entirely upon us as individual members, and call to mind the watchword, "England expects every man to do his duty."

As an Association we have work enough to tax all our energies. If we would rise to the greatest heights attainable there are some things in our management that will have to be conducted on different lines. In fact one or two should be almost revolutionized, notably the *manner of selecting* our officers—not the mode of electing them, with that I find no fault. To quote phrases that have been repeated at these meetings, there appears to be a desire to "get new blood," to "pass the honors around," and if one may judge by some of the selections it matters little where the "blood" comes from or who may get the "honors," provided there is a change. This is utterly wrong, and will keep us down if it does not lead to ruin. Railway companies, banking institutions, agricultural societies, insurance companies, and all successful business corporations do just the reverse. When they succeed in securing a competent man for a responsible position they keep him there as long as possible, no matter how many others would be willing to show what they could do if given a chance. We should do likewise. If we have men who have made our meetings a greater success, and have given the country more for their money than others have done, put them back for as many terms as possible unless we are sure we have a better. To the winds with sentiment; business is business; the greatest good to the greatest number. One other thing just here. There have been members of this Association who have admitted that they have opposed a good man and set up an inferior individual simply to gratify a bit of personal spite. How can we expect to prosper if such principles influence us in the selection of our officers? If we wish to make our Association more useful we must have no more of this.

But what is the Association to do? That is the question. I answer, much in different ways. The Government has done much, and has spent money freely in the past, and I think it might be induced to do a little more, especially as it would add little or nothing to the expenses. We are trying to gauge the honey crop from year to year. Efforts have been made to obtain an estimate of the number of colonies of bees in the country and the results have been very unsatisfactory. Could we not induce the Government to have a column in the assessment roll for "colonies of bees," and have every individual on the roll give the number of colonies of bees in his possession? In that way I believe we could succeed far better than at present. One other duty we have to face and that is the dissemination of knowledge—educating the public, if you like the term any better. There should be five or ten times as much honey consumed in the country as at present, and there is only one way to bring that about: Educate the public. When honey producers put a better article on the market, and consumers learn that honey is a food and not a luxury—that it is cheaper than good butter for a poor man's table—there will not be quite so much trouble in disposing of our crops. This can be accomplished only by education. How shall we do this? That is a question for this Association to decide; also each individual member has his duty in this matter. I shall mention only one of the various ways which have presented themselves to me. Let us use the Farmers' Institutes We have been asked to recommend men as lecturers. Here is a grand chance to reach both producers and consumers, as many farmers and laborers are consumers now, and it is hard to say how great an increase there might be in the home demand. In the list of speakers for institute work for the present season there are about eight prepared to speak on poultry, some three or four having no other theme prepared. There is just one prepared to speak on beekeeping, and I believe he has other subjects as well; and, more, he is available for only about two weeks, while the Institute work covers a period of about three months.

As this paper is too long already I will drop a word of caution and have done. Do not send men out who have "axes to grind" if you can avoid it. There has been trouble already in Institute work mainly caused by such persons. Any suspicion on the part of an audience that a man is trying to talk money out of their pockets into his destroys that man's influence for good, and directors of Institutes will not have him on the delegation if they can avoid it.

Mr. Frith: This excellent paper touched the very vitals of the beekeepers' institution. We are here as an Association. Perhaps a great number of us come with the expectation of getting a good deal of individual knowledge. There is another feature of it which becomes somewhat important. We are representatives of a vast number of beekeepers, according to the statistics which have been given here to-day. Each member sitting here to day is the representative of about 2,000 beekeepers in the Province of Ontario. We are here to guard the interests as far as we possibly can of beekeeping in general, and when we become members of this Association we assume this responsibility; and in proportion to the ideas which we fix and the methods and modes that we propose to beekeepers to follow, in that proportion the industry will rise and become useful, and we will be able to help our fellow men in securing or gathering from nature her stores. It is a well known and acknowledged fact that every man who can recover a dollar from nature adds not only to his own personal prosperity but adds to the common wealth of the people. The paper to my mind divides itself into three divisions, the past, the present and the future. When we look over the work this Association has done in the past, we miss, one after another, those who have brought this institution into existence, and who have left legacies in the way of methods and plans, and legislation, and who have initiated a great many useful things for the advancement of beekeeping in general. They are passing away, and it is becoming a fact very noticeable. In regard to the present, we must ask ourselves what we can do, and the very best things we possibly can do to advance the industry of beekeeping in general. Take up the experience of the past, benefit by our failures in the past, and lay a good foundation for our institution. Young men are coming upon the scene; there are quite a number here who have never been here before, and they come here with very little knowledge of what has been done. We can see that manifest in many propositions that are made, and it becomes us as an Association to look well to the present. In regard to the future, we should lay foundations that those who are coming up after us can build upon; foundations that will be sure, that will help to raise this industry up to its place with other industries. There are many points brought out which it would be out of place for me to touch upon. I have very much pleasure indeed in introducing the discussion to the Association.

Mr. Evans: I agree with nearly all that Mr. Darling has said, especially as to the government of this Association, and the advisability of keeping the officers in who are good officers I have always preached that doctrine at home in municipal elections. I was rather out of harmony with him when he spoke of putting better honey in the market. I think we do satisfactory work there. I am altogether at issue with Mr. Darling as to the advisability of having lecturers on the honey business, of having speakers go out to the Farmers' Institutes. I do not think you will get many customers by it. The fact of having lectures delivered, or having beekeeping alluded to, at Farmers' Institutes in particular, where you meet a particular class of people who are going into it, is inviting competition. It is not selling at such enormous prices that we should encourage people to go into the business, and I think it would be injurious to have men speak at Farmers' Institutes. If people will go into it all right, let them go, but we should not induce competition. I pay my dollar and am here. I do not know that I am bound in any way to help those fellows who won't give a dollar in the interest of beekeepers. I think we who are engaged in the business, and making a profession of it, should keep strictly in view our own interest. It is the most patriotic thing we can do, to look after ourselves

Mr. Darling: I think Mr. Evans misunderstood the sentence in the paper. It is my firm conviction that if we had intelligent men go out as lecturers there would be fewer men lose money in beekeeping; there would be less competition among those who are already engaged in the industry. There are too many in it who do not put a good article on the market.

THE PREMIUM.

After discussion it was decided that the Association take the *Canadian Bee Journal* again as a premium to members.

ADDRESS.

By Hon. John Dryden, Minister of Agriculture for Ontario.

We have proven in this country that this is a land flowing with milk, and I think I read in somebody's address that you proposed to make it also a land flowing with honey; so that we will be able to say that this is a land flowing with milk and honey. Our dairymen have not only given us good products, but they have advanced now to such a stage as to the quantity of the product as well as the quality, that our country is known for this product all the world over. Now, I shall be very glad if the bee-keepers are able to add to the other in a similar way. I would like to say that in my judgment this country is admirably suited for the very best quality of honey; and what I have felt all along, and perhaps you understand better than I do, that all we needed as a sort of stimulus to advance production in this country was a better market. I think now you will probably soon see an open door for better markets for this product, as we have for all our products. I understand that some Canadian honey has gone into Great Britain; I understand also it is very much appreciated there, and I would expect in the near future that you would have this market increasing very rapidly. I think now is the chance, because more than ever in the history of our country do we find Canada appreciated in every respect in the Old Land. I remember years ago being in that country, and I used to be, to put it mildly, disgusted to find that the people there new so little of Canada. They knew of America, but they did not seem to have heard distinctly of Canada; and when you talked to them about coming to this country, they would say to their neighbor "This is an American," and when we went to purchase sheep or cattle they would say "The Americans are here," and when we spoke of the ports in this country they would tell you of New York and Boston. I remember on one occasion being seated at a dinner table where a number of prominent gentlemen were present, and we had been talking of Canada, one of the gentlemen turned to me and said, "By the by, I did not hear you say which of these gentlemen you voted for as president at last election." You see after all our talk the man reverted in his mind to American institutions; he referred not once to Canada, but to the Republic. I did not like to rebuke him and tell him how little he had studied the history of the world, I merely said, "But you forget that I am from Canada, and that our institutions are similar to what yours are here." I venture to say that in the near future you could not have such ignorance as that. All the people are studying our country—are studying how trade can be increased between the motherland and this land—and to-day, I am told, what you need to do to have your products receive attention is to mark them "Canada," and Canada will be preferred rather than America to-day. We understand that they are friendly to America because of what has been done by some of our politicians; it has had that effect all over the country. Now, in order to catch this market, of course I need not tell you that there are two or three things absolutely essential. You must have superior products. You meet there the whole world in competition, and you cannot expect to gain the front rank in the market with that which is inferior, but that which is superior. You must put it up in some attractive form, so that it will present to the eye some attraction as well as to the taste when they open into the parcel. I think our people in the past have made a mistake in this regard, and have not paid enough attention to British peculiarities. So that they will know at once "That is Canadian; I have had some of that before; that is what I want you to give me." The Englishman does not like to be deceived; you cannot try any wooden-nutmeg business on him. It must be honest dealing. Those who handle this product must be careful that they do not impose upon the Englishman; he won't stand much of that. If he makes up his mind that American cheese is filled, and therefore inferior, he says, "I do not want any more," and you will have to work a long time to get it out of his head. Everybody ought to unite their efforts to this end. So far as I am personally concerned you all know I am your friend, and am prepared to render any assistance to any of these Associations we have in this country, provided we work along the line of progress and development and improvement to our country. I have often difficulty because some organizations say, "The country—let the country take care of itself; I am looking after this gentleman." Do not let us have too much of that. We must understand we do the best for this gentleman and for ourselves when we are doing that which is best for the country. I would like to suggest that the bee-keepers of Ontario have a part to play in working out our national interests in this country, just as certainly as any other branch of agriculture. The little bee may be considered a very small thing, and to some persons it is a very inferior thing, and does not deserve as much notice and attention as we give it. They say, "You give this and that. Look at what you give to the bee-keepers; it amounts to nothing. Look how you are encouraging the poultry men; what does that amount to?" But when you come to add up the product you find that there are millions of dollars in it, and every time the little bee goes out and settles on some flower, and brings the honey out of the flower and stores it for you, every bee that does that is adding to the wealth of this country. There is no doubt of it. A little drop of water is not much; but the ocean is a great deal, and yet it is made up of drops. So it is. The wealth of our country is made up of these little industries, some of them greater and some of them smaller. But as a Canadian I desire that all our industries should be encouraged, and that every man in this country should understand that he has a part to play in the working out of the great nationality we expect to see here in the future. And as you work with your bees at home, the thought I have to give you as you properly take care of them, as you look after what you call your own, is that you are but adding to the wealth and prosperity of our country.

MANAGEMENT OF COMB HONEY.

By R. H. Smith, St. Thomas.

If I understand aright what is meant by the management of comb honey, it includes the management of bees to produce a crop of comb honey in sections that will command the highest market price, and the care of the same until it is sold.

I would not advise the novice in bee culture to go very deeply into comb honey production until he has had some experience with bees, especially if he has a market for extracted honey. He will find it a comparatively simple matter to give surplus room and to extract the honey at the close of the season. For the production of section honey it is necessary to know the nature of the pasturage within reach of the bees, and the probable length of the honey flow, so that no more sections will be given than are likely to be finished, or the result will be a lot of partly filled, almost unsaleable sections.

My plan of procedure is: First, to prepare during the winter all supplies that are likely to be needed for the coming season, such as hives, supers and sections, the latter to be filled with thin comb foundation made from the finest wax procurable. Next, in the spring, to set out the colonies wintered in the cellar and see that each has plenty of stores and a good laying queen with plenty of room to deposit egg. Then, during fruit bloom, those wintered outside are unpacked and all queens reared during the previous season are clipped. More room is also given to those that are crowded; some may require another story to keep down the swarming fever till we want them to swarm, or just before the clover honey harvest. When swarming commences, we usually hive the swarms on the returning plan, by removing the old colony to one side and placing the new hive on the old stand. This hive contains five frames with foundation starters two inches deep; the rest of the hive is filled with dummies. If the swarm is only an average one, we give a super filled with sections next day; or, in the case of two or more swarms going together, we give one or two supers at the time of hiving. If the honey flow should be good they will require close attention to see that they do not get crowded, or the result will be re-swarming and loss of time from the bees loafing.

As soon as the supers of sections are finished we remove them from the hive, first driving the bees out with the smoker, or by using the bee escape. The finished honey should be stored in a very warm room and it will improve in quality. The sections are then cleaned by scraping off all propolis, graded and put up in neat, white basswood shipping crates holding twelve or twenty-four sections, with a paper tray in the bottom to catch any honey that may leak, the sections resting on strips one-eighth inch thick. These crates are all marked with the grade, and gross and nett weight, then they are ready for market.

There are many phases of the subject that I might go into, such as size and width of sections, plain or no bee way sections, separators or no separators, style and size of hives and supers, etc., etc., but I think this paper is long enough. We use a $4\frac{1}{4}$x$4\frac{1}{4}$x$1\frac{5}{8}$ section with a perforated cleated separator that gives a plump section weighing fourteen to sixteen ounces that finds ready sale at good prices.

Mr. SPARLING: I think Mr. Smith's plan, so far as he has outlined it, is much in accord with that of most comb honey producers He would recommend the novices to take extracted honey. Well, that is a question, whether it is advisable to tell the novices to take extracted honey. If he does there is great danger of his putting poor honey on the market. If he takes sections, the sections may not be perfection, but the honey stored in them will be as good as that produced by an expert. He advocates light foundation. I presume he means what is known as extra thin. Well, I am not sure about that. To produce the best results, as far as a large profit is concerned, I think that medium weight foundation serves the bee-keeper's interest best. He talked about the bees swarming out. It is only, I find, at certain seasons that bees are inclined to swarm out—during very hot weather. I have obviated that in a great measure by, in very hot weather or very heavy swarming, where I have a couple of swarms together, putting an empty chamber below the brood chamber.

Mr. SMITH: I might say that I would not advocate extra thin foundation—I guess about twelve foot to the pound.

Mr. NEWTON: There is one point that came out in Mr. Darling's paper that I thought was brought out yesterday. and I think it well that we stand to the point we arrived at yesterday. Mr. Sparling said he thought the novices could produce the quality as well as the expert bee-keeper. That is just why I want to mention it. We said yesterday that so much of the honey this year when held to the light had a reddish cast in it, that it was carried from the brood nest, and if the novice does not guard against such he will have that honey in his sections; and that, I say, is not in it with the best of honey.

Mr. POST: In reference to that thought of Mr. Sparling's, I would say that novices in producing extracted honey are almost sure to starve their bees to death the first winter. It is very discouraging for them; they have to buy over again.

Mr. GEMMELL: Would they not be just as apt to starve if they were held in a contracted brood chamber for extracted honey?

Mr. HOLTERMANN: The novice never does that.

Mr. EMIGH: I would like to hear from the gentleman who had the comb honey at London.

Mr. J. H. SHAVER, Cainsville: I take it on Mr. Pettit's plan; I do not want drones running over my honey, and I do not allow an old colony to do any capping if I can help it.

Mr. GEMMELL: Do you put sections in your old colonies at all?

Mr. SHAVER: I do.

Mr. GEMMELL: Because they are apt to use the old cappings?

Mr. SHAVER: I do not know what they do, but they dirty it anyway.

Mr. GEMMELL: I think it is pretty generally conceded that if the sections are capped over an old brood chamber and allowed to remain any time at all they will become dark.

Mr. SHAVER: I use the Pettit way on all my hives. There is one question I would like to ask you: When is the proper time to put the wedges under the hive? I have had a little argument with a few this summer and we do not agree.

Mr. SMITH: Do the wedges make any difference in the way the sections are filled?

Mr. SHAVER: I claim it helps to fill them. I have done far better with the wedges than without them.

Mr. SMITH: If you had a small colony of bees in that hive would you get the outside sections filled just the same as if you had a large swarm?

Mr. SHAVER: I do not use small swarms.

Mr. SMITH: If the super was not full of bees would they fill the outside?

Mr SHAVER; I have had them fill the super before they touched the outside. I have had them start in the middle, but I have had them start on the outside too. What I want to know is the proper time to put the wedges in.

Mr. POST: What race of bees do you produce that honey with?

Mr. SHAVER: As near as I can tell they are hybrids.

Mr. POST: Is the foundation stock Italian?

Mr SHAVER: I do not think so. There were some neighbors of mine had better bees than mine, and mine have improved.

Mr. HOLTERMANN: I might say, as far as those wedges are concerned, we tried in the same yard wedges and no wedges, and we certainly think we got better comb honey and more evenly filled with the wedges. It seems to me it would be reasonable. Of course, anything that will produce the same effect will answer, but by doing that the bees are compelled to go along the outer sides and fill the outer sections.

Mr. GEMMELL: Last year I used the wedges, and this year I did not. Of course it depends a good deal on the honey flow. I think a perforated separator has more to do with getting the outsides filled than the wedges. There was one other point asked: when it was best to put the wedges under—that is before swarming or after swarming?

Mr. SHAVER: Any time. After swarming I put them under.

Mr. HOLTERMANN: Mr. Pettit puts them in before.

Mr. SHAVER: But does he put them in when he puts the super on?

Mr. HOLTERMANN: He puts them in a little after the super is put on so as to force the bees into the super.

Mr. ALPAUGH: I would like to ask any others who use the wedges if they examined under the hive to see whether the bees are not clustered on the bottom board?

Mr. SHAVER: I have. If the wedges are put in at the right time they will not cluster around the bottom board.

Mr. Sparling: I have tried the wedges to a small extent, but I could see no difference.

Mr. ARMSTRONG: I would like to ask Mr. Shaver if he uses perforated separators.

Mr. SHAVER: I used a few, but mine were not spaced right. I made them myself, and I got the spaces too big.

Mr. GEMMELL: I thought Mr. Post's were a little large. He made his, and I thought if his were a trifle less they would be better, just barely wide enough for the bees only to go through. With the use of wedges you get the outside sections better filled than without them?

Mr. SHAVER: By all means.

Mr. GEMMELL: That is opposed to my experience. I would sooner do away with the wedges than the follower, that is for getting the outside sections filled.

Mr. POST: That is my experience. In fact I never use wedges.

Mr. SIBBALD: I never tried the wedges, but I block the hive up in front, and there is a space left then from the front to the back. The bees can get out near the front; by the back they cannot. They store their honey up from the outside comb; they do not leave their honey down so near the light. Before that I had the outside combs pretty well filled with honey. Then, as to the followers, or the wedges, I have used them for a good many years. I had to use them to fill up my super in the first place, and after just followed the separator with the wedge, and it gave a space at that side; on the other side I had not one. The one near the space was the best filled. Now I have one of those at each side.

Mr. GEMMELL: Mr. Alpaugh, as I understand him, does not want any space at the side of the super at all. Mr. Post prefers the space, and so do I, and you prefer the wedges to the space at the side?

Mr. SHAVER: I have not tried it enough to know. I have had good results from the wedges.

Mr. SMITH: Have you found that the slatted separator has any advantage over the plain separator?

Mr. HOLTERMANN: You know as soon as you begin to make perforated dividers; the expense is so great in boring those holes that it makes it an expensive contrivance.

Mr. SHAVER: Why not punch the holes the same as in the chairs?

Mr. HOLTERMANN: Yes, but you would sell more seats for chairs than of the other. I have great doubt that either the slatted separator or the perforated separator has any advantage in the interior of the hive.

QUESTION: When is the right time to remove outer cases from hives wintered outdoors?

Mr. McEVOY: When the warm weather has come to stay.

Mr. ATKINSON: When do you calculate that is?

Mr. McEVOY: Well, with me, about the 20th of May; I am in South Wentworth.

Mr. ATKINSON: Do you think it would hurt to leave them there till the 1st of June?

Mr. McEVOY: I do not think it would. I do not remove the cases, I just simply remove the packing and raise the case, because I want to shade them from the great heat of summer.

Mr. I. OVERHOLT, S. Cayuga: I like to have my bees out of the packing by the 24th or 25th of May.

Mr. SHAVER: Does not that depend a good deal on the season?

Mr. McEVOY: Certainly, I said as a rule about that time.

Mr. GEMMELL: Between the 20th of May and 1st of June. I have left them in till the 1st of June some seasons and some seasons taken them out earlier.

Mr. ARMSTRONG: My experience is about the same as these other gentlemen have been saying. It depends a great deal on the weather; I go a good deal by that. If it is a cold backward spring I do not take them out so early; if it is a warm spring I get them out a little earlier. I do not take them out till the colony is good and strong, and there is no danger of them getting the brood chamber cool—cooler than what it has been for weeks before that—but I am never in any great hurry. I used to be. When I first got my hives I wanted them out pretty early, but now I have gone the other way and want to be a little late instead of too early.

Mr. McEVOY: I agree with Mr. Armstrong. Of the two I would rather be a little late than a little early. Mr. Hoshal, what time do you take the packing out in the spring?

Mr. HOSHAL: When the bees get so strong they won't stand it any more. It is along, usually, about 20th or 24th of May. Of course, the colonies vary.

Mr. McEVOY: How many take the cases away altogether? If you unpack you can either leave the case on or take it away altogether.

Mr. ARMSTRONG: I take it away altogether.

Mr. GEMMELL: I take them away altogether. I remember one season taking the packing out and leaving the cases there, and I found it very unhandy to put on and take off supers.

Mr. McEVOY: I do not know as my experience would suit all cases. I am in a pretty favored locality, in a way. I am in a hollow, in an orchard, and in the summer where it is surrounded by woods it is very hot, and in the hot days the bees sometimes cluster outside. They do better with the cases as a sort of shade. I dare say in many cases it would be better with the case out of the road.

Mr. HOLTERMANN: With us it is rather a matter of when the hive needs an upper story. When they need upper stories we find them inconvenient to have them in packing, but until that time I never see any harm in leaving them in.

Mr. McEVOY: How soon do most of you find that the colonies are ready for the top storey?

Mr. NEWTON: As regards Woodstock, Mr. Hall was taking off comb honey in the apple bloom. My bees were not doing that. I suppose his should have been off, according to what Mr. Holtermann has said. As far as I am concerned I am glad this has come out. We had a short discussion on it at our Oxford convention. In late years they are trying to get their bees out early in March, they will, probably, get them out in February soon and then, probably, they will not put them in at all. I used to take the packing off much earlier than I do now. We are leaving them on until nearer the 1st of June than the 1st of May as we used to do at one time. I think they do no harm there until they are so crowded that we have to give them room, as Mr. Holtermann said, but we want them out of the way then altogether; we do not want to see them again until the next fall.

Mr. POST: We sometimes have a failure of honey entirely in Ontario in sections. If the packing protects them from the cold why will it not protect them from the heat? And if we do not get a honey flow let them remain in packing all summer. My hives are permanent, that is the reason I state it in that way. I do not unpack at all.

Mr. ALPAUGH: We generally get a little flow of some kind whether it be late or early in the section I am living in. We generally get an early flow. I want to give them room, anyway, so as to keep them together.

Mr. McEVOY: It makes quite a difference to some of us in different locations. Mr. Post is down on the north-east part of Lake Ontario and it is colder, and it is just right in his case. With Mr. Alpaugh and me and others it is just the reverse; we are a little better with the packing off.

QUESTION: Which kind of packing is the best?

Mr. GEMMELL: There is a diversity of opinion as to packing. It would depend on what kind of packing case you have. If you have a packing case that won't leak there is nothing better than sawdust. If you have a packing case that will leak I find nothing better than forest leaves or chaff. I might say I got the idea from Mr. McEvoy of using the leaves.

Mr. McEVOY: I have tried sawdust and chaff, but I like the leaves the best of anything.

Mr. SHAVER: Are not soft maple leaves bad for smashing up fine if you get them perfectly dry?

Mr. McEVOY: I packed with some of them, but mostly the hard maple. In our village you can rake them up in great heaps.

Mr. ATKINSON: I would like to ask Mr. Shaver what difference it makes if they do break?

Mr. SHAVER: The gentlemen here always recommend leaves, and I followed their example. They break up so fine and are so dirty and nasty. I took clean wheat chaff and ran it through the cutting box, and it is not so dirty with me.

Mr. GEMMELL: I have never found any objection to their breaking up, and I never found them break as fine as you speak of in one season.

Mr. SHAVER: I had a lumber wagon, and, not knowing any difference, we trod them in, and I thought maybe we spoiled them.

Mr NEWTON: I have had considerable experience along the line of different packings, and would recommend by all means the leaves. I have tried sawdust and shavings, and also the waste from the flax mill, but I think leaves are ahead of them all. I remember the flax mill man asked me why I did not go to the mill and get flax seed and I said I did not want them, I would rather have leaves.

Mr. ATKINSON: I do not agree with those other fellows. With regard to leaves, I have had experience with them, and I have had experience with chaff, and I have had some experience with old rags, and several other things, and I tell you the worst luck I ever had was with leaves. I packed my bees the first year with leaves, and just had a cloth on top, and I packed them with chaff and had a cloth on top. They wintered far better with the chaff than with the leaves. The next winter I tried it a little different with leaves; I left the top on the hive instead of the cloth, and they came through all right. I would just as soon have the leaves fine as coarse as long as they are perfectly dry. If the packing is thoroughly dry I don't think it makes such a great difference, providing the tops are on.

Mr. McEVOY: When I put the packing on of leaves I press it down pretty firmly, and leaves, four or five inches between, and then put more leaves on, and then the top.

Mr. ALPAUGH: I would like to ask Mr. Atkinson if he renewed his top quilt with a fresh one?

Mr. ATKINSON: Yes.

Mr. ALPAUGH: That is where you made your mistake.

PRESIDENT: Do you put on your packing loose or do you put it into a sack?

Mr. ATKINSON: I put it on loose, under and above and on the sides.

PRESIDENT: I think it was in the yard of the late Mr. Gardiner, the packing he had was sacking, similar to common salt bags, filled with forest leaves, and he claimed these to be good for years without getting broken up. Then he set his hive cover on top of these and held them down in place. I think it would be a much cleaner way than to have them put on loose.

Mr. ALPAUGH: I would like to ask Mr. Atkinson another question. You say you just renewed the propolis quilt with a fresh clean cover, and you just put the leaves on top of that loosely. You didn't pack them down?

Mr. ATKINSON: I put the covers on top of the leaves again.

Mr. GEMMELL: How many inches had you on top?

Mr. ATKINSON: Four or five inches.

Mr. GEMMELL: That wasn't half enough.

Mr. ARMSTRONG: How much packing do you use?

Mr. ALPAUGH: You really do not need much more on the top than on the sides. Anywhere from three to four inches; you must weight it down to that many inches until it is fairly solid, with some kind of boards. Of course you can put in a foot of loose leaves; if you leave it in that state I do not consider it would be good packing.

Mr. ARMSTRONG: Has any one used packing right over the covers without removing the covers at all?

Mr. ALPAUGH: Do you use a cloth underneath your cover?

Mr. ARMSTRONG: No; I do not put on any cover at all

Mr. ALPAUGH: It is all right to leave the cover there if you put a little of something underneath.

Mr. ARMSTRONG: I have tried it both ways. I have tried removing it the same as that photograph, and used the same case, and am using the same case now. I also tried leaving the cover on just as it was through the season after the honey flow was over, and I found that they wintered just as successfully with that wooden cover with the packing over the top.

Mr. GEMMELL: How big is the entrance?

Mr. ARMSTRONG: My entrance is about five inches by $\frac{3}{8}$ inch.

Mr. GEMMELL: Some three or four years ago when I went to California I had no time to loosen the covers, I simply lifted the hive into the outside packing case. My intention was to go around and loosen the covers. With some I did it, and with others

I did not do it at all, and I must say I could see no difference in the hives as far as that was concerned Those with the solid covers were no worse than those that had the covers pried loose. The entrance would be four or five inches, some of them a little more. This winter two-thirds of my bees have no quilts on them at all, just the ordinary wooden cover. Whether I shall loosen some of them or leave all that way or not I have not made up my mind.

Mr ATKINSON : How much packing do you use on the top?

Mr. GEMMELL : A good foot, that is on top of the hive proper. I press it down pretty well with my hands

Mr. ATKINSON : You think they winter better with a foot than five or six inches?

Mr. GEMMELL : I think so.

Mr. DARLING : I winter inside, and I have been in the habit of taking my propolis sheets off and putting in sawdust. Last year my bees were late getting in, and a grea many went in with the propolis sheets on and the cushion over that. It has been many years since I had the bees come out better than they did last spring.

Mr. SMITH : I would just like to ask you if you winter in the cellar, and what was the thermometer?

Mr DARLING : I try to keep it at forty-five degrees. It is just in a solid clay bank about six feet deep, and so warm that it is only necessary to put on a little sawdust.

Mr. SMITH : Under those conditions they would winter all right, but if you had a lower temperature you would find it just the opposite.

QUESTION : Which bees are the most subject to spring dwindling; the bees wintered in the cellar or those wintered outdoors?

Mr. EMIGH : I do not winter outdoors, so I do not know anything about how much they dwindle when they are wintered outdoors, but if they are wintered properly in the cellar, and taken out at the proper time, I have never had great trouble in spring dwindling. I do not think any person can winter outdoors with very much less spring dwindling than I have had by wintering inside.

Mr. PICKETT : I have wintered two seasons out of doors, but it is practically indoor wintering. I have been packing them with sawdust. For my own part I would hold up my hand for indoor wintering. As for dwindling, I see but little difference if necessary care is taken.

Mr. ATKINSON : How soon do you take them out?

Mr. PICKETT : As soon as we feel confident we are going to have warm weather. If I get them all out in April I do very well.

Mr. SMITH : I think in the future we will put more out in March. The last two seasons I have put them out on the 8th of March. As far as I can see I think I shall winter more in the cellar. We have a good deep cellar, with high temperature. Some say 45°, but I would say from 45° to 50°, because I notice those on the top always come out in the best condition. I always raise them about eighteen inches from the floor, and the cellar is perfectly dry.

Mr. PICKETT : My experience has been much the same as his. The top rows always winter best.

Mr. SIBBALD : I recommended putting them out in March in my paper. If they are contracted, if they fill the hive, it does not matter whether they are put out in March or not; if they occupy ten frames, half of it empty space where cold and frost can get in, they will spring dwindle.

Mr. HOLTERMANN : There is much diversity of opinion through the country as to spring dwindling. In five cases out of a hundred there is spring dwindling as a result of the season. Where you have these catchy springs, the sun comes out warm, and the bees get out, and then cold weather comes and spring dwindling is the result. But generally it is the result of poor wintering. If you have a good cellar, that you can keep an even temperature, and I must confess I do not like one between 45° and 50°, I would sooner have it between 42° and 45°. If you can do that I believe you will not have much trouble with dwindling; but if you are wintering so that the bees are getting restless put your bees out early, because the longer you leave them there the more restless they will become. I wintered my bees last year—a good many of them—according to the Alpaugh plan. I like it, and I believe you can get every condition inside or out, and you want to select what is best for yourself. Unless you have a good cellar, and any temperature you like, I would say winter outside and you will have less danger of spring dwindling.

UNFINISHED BUSINESS.

Moved by Mr. McEvoy, seconded by Mr. Sibbald, that Mr. Evans and Mr. Heise be the revising committee. Carried.

Moved by Mr. Holtermann, seconded by Mr. Armstrong, "That the executive of the Ontario Bee-Keepers' Association make out a list of men they think suitable to lecture at Farmers' Institutes, and forward it to the Superintendent of Farmers' Institutes. the Association feeling that it is desirable to have a number of speakers." Carried.

Moved by Mr. Darling, seconded by Mr. Overholt, "That in case the executive committee deem it advisable to make an exhibit in England and Paris, that the matter be arranged by correspondence with the board of directors." Carried.

After the usual votes of thanks the meeting adjourned.

ANNUAL REPORTS

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OF THE

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1899

ONTARIO POULTRY ASSOCIATION.

ANNUAL MEETING.

The 25th annual meeting of the Ontario Poultry Association was held in the Pavilion, Toronto, on Thursday afternoon, January 12th, the President, Dr. A. W. BELL, taking the chair, and calling the meeting to order shortly after one o'clock. Upwards of two hundred members, representing all parts of the Province, were present, the greatest interest being manifested in the proceedings. A number of American poultry fanciers' who were in the city attending the annual meeting of the American Poultry Association, were also in the room and expressed both pleasure and surprise at the large attendance and the lively interest displayed in the proceedings. "Such enthusiasm augurs well for the future of poultry in Canada," Mr. Arthur Felch, the retiring secretary of the American Poultry Association, said at the close of the meeting.

PRESIDENT'S ADDRESS.

President BELL, in calling the meeting to order, expressed the great pleasure it gave him to welcome the visiting fanciers to Toronto, on the 25th Annual Exhibition of the Ontario Poultry Association. He knew he was voicing the opinion of all the exhibitors and breeders when he said the present show was the most successful ever held under the Association's auspices. The entries were far in advance of any ever made before. The extra large number was mainly due to the meeting of the American Association being held jointly with the Ontario, but not altogether, for the American entries were not equal to the total increase compared with last year.

There were one or two matters which he wished to bring before the Association's attention. One was, the more equal distribution of prizes. In some classes there were more entries in one section than in the whole variety of other classes. In Barred Plymouth Rocks, for instance, there were 171 entries, while in other varieties there were but twelve, but the prizes given in each were equal in number and amount. This did not seem fair or equitable. (Applause.)

Another question which would come before the gathering was, the next place of meeting. He asked the members to give this matter careful consideration, and hoped that wherever the show went next year it would excel in all points the present one.

SECRETARY'S REPORT.

We all agree with the sentiments which have been expressed by the President in relation to our large increase of entries and the overwhelming success of the present show. I have taken from my books a comparative statement of entries between London, last year (which was then the largest held up to that time), and that of Toronto, now going on in this building.

In the first place, let me say that the building which we occupy to-day is far in advance of anything we have had during my term of office, and, I have no doubt, any ever occupied by the Ontario Association before. We feel grateful to the workers of the local Association for the manner in which they have conducted the preparation of the coops for this exhibition. Although not having been able to get the building until Monday at noon, every bird in the building was cooped before they retired for the night, and everything would have been in excellent order throughout had we not been compelled to break off the judging in honor of the visit of the American fanciers to the Agricultural College at Guelph yesterday.

To return to numbers of exhibits, the records show that in London the total amounted to 1,809, to-day we have 2,422, which means an advance of one-third over that of last year, and also means an increase of three hundred dollars in cash, entry fees. The increase is not confined to a few varieties, but exceeds previous years in every department. The membership has also increased from 127 up to 222.

I might call your attention to the essays which have been printed and mailed to each member of the Association, so that at this meeting we will be able to take them up and discuss them intelligently. I might say in addition, that there were a number of others who promised essays but were unable to get them ready in time for this meeting. They will, I trust, be received in time for publication.

Allow me, while touching on this subject, to express my opinion as to the importance that should be placed on the preparation and discussion of the essays. They should receive our earnest attention and consideration first, for so soon as we reach that point where we appear to regard the holding of these exhibitions and the distribution of prize money to be the principal object for which we exist, then have we arrived at that stage in our history when we will be called upon by the Department of Agriculture, which is so liberally assisting us, to look elsewhere for the necessary funds. Spreading abroad good, first-class, practical information, acquired by experience, among the farmers and poultry breeders of Canada, through the aid of Government reports and poultry journals, as well as the ocular demonstrations afforded by exhibiting these large collections of nearly perfect fowls, etc., in different sections of the Province each year, should, and must be our primary object.

There are several matters of importance in the conducting and management of the Association's exhibitions which should be considered by the newly elected directors at their first opportunity, and I would suggest that any of the members who have ideas which they consider would be for the betterment of the Association correspond with me, that I may be in a position to bring their suggestions before the Board. When I have a little leisure time I propose formulating a number of them myself, and hope to have not a few of the members manifest their interest in the progress of the Association in this way. "Always room for improvement."

In looking over the membership roll, the usual occurrence has taken place again this year—some of the older members who we expected to meet are absent and others have taken their places.

As an Association and as members we have every reason to thank God for the many mercies He has extended us. As far as known to me, not a single member has been called home by death nor suffered from financial trouble during the past year.

I wish to thank most heartily the officers and members of the Association for the kindly manner in which I have been treated by them during the past years, and again assure them that I shall do all in my power to merit a further continuation of your kindness.

THOS. A. BROWNE, Secretary.

THE NEXT PLACE OF MEETING.

The members present from the Brantford Association asked for the show of 1901, and asked that their application be placed on record.

Mr. COLLINS, of Peterboro, moved that the show of 1900 be held in Peterboro', and set forth the town's many advantages, such as hotel accommodation, hall, etc.

Mr. ALLAN BOGUE, London, seconded, and argued that in all fairness the show should go east next year, as it was in the west last year and central this year.

Mr TREW, Lindsay, said Peterboro' had an excellent hall for a poultry show.

Mr. BROWN, Owen Sound, spoke strongly in favor of his town, the show had been held repeatedly in the east, but had never yet been held in the north.

Mr. JAMES ANDERSON, of Guelph, spoke along the same lines as Mr. BROWN. The show had been held in Port Hope three or four years ago, while the northern portion of the Province had never been recognized by the Association.

The vote was then taken. As each member's name was called he came forward and deposited his ballot. The result was a close vote, sixty-four to fifty-five, with the majority in favor of Peterboro'.

Mr. A. G. GILBERT, of the Experimental Farm, Ottawa, congratulated the Association on the great success of the Show, the largest and best in its history. Speaking of the poultry industry, he said it had developed within the last twelve months by leaps and bounds. Agricultural development in all departments had been very great. There were no more ready or better money-makers than the cow, the hen, and the pig. As regards poultry keeping, there was a difference between the Canadian and English farmer; the latter had his poultry with a view principally for table use, but the Canadian farmer had actually two strings to his bow, for he had a winter market of high prices for his eggs, and when eggs were becoming cheap he could convert the fowl into poultry for home consumption or export to the English market, the latter being almost without limit for a superior quality. In consequence the thoroughbred was the best for our farmers, being good winter layers, and rapid flesh makers. Experimental shipments of specially fattened poultry to the British market had been very successful. The birds shipped were first or second crosses, and sold at a handsome margin of profit. With pure-bred Plymouth Rocks, or Wyandottes, he believed a still better margin of profit than seventy cents could be realized. (Applause).

Messrs. ESSEX and HILL moved that in future the judging be done by scoring. This method was formerly in vogue at the Associations shows, but was abandoned a couple of years ago for the comparison method. The proposers of the resolution spoke strongly in favor of their motion, but the meeting voted it down by a large majority.

The question of a more equitable distribution of prizes, mentioned in the President's address, was taken up, and Dr. Bell submitted a plan for grading the prizes according to the number of entries in each section. It was decided to send the question to the Board of Directors.

On motion of Messrs MCNEIL and BURN, a hearty vote of thanks was tendered the Toronto Association, for the handsome manner in which the visiting fanciers had been entertained.

DIRECTORS' MEETING.

The newly elected Board of Directors met in the Secretary's office, Pavilion, on January 13th, and owing to the absence of President Stratton, Mr. Allan Bogue, 1st Vice-President, was in the chair. Present—Messrs. M. T. Burn, William McNeil, G. F. Hutton, Dr. A. W. Bell, D. C. Trew, T. H. Scott, T. Brown, and J. W. Kedwell.

A protest was read from Mr. R. H. Essex, against the judgment of Judge Felch on his Buff Plymouth Rock Cockerel, disqualifying it for having wry tail.

The Directors decided that the judge had made a mistake, and the bird was entitled to a place in the awards, and ordered that the four prize winning birds be brought in and examined. After a careful inspection they decided to amend the award of the judge in this section, as follows: T. H. Scott, 1st ; James Forsythe, 2nd ; R. H. Essex, 3rd ; Chas. Bonnick, 4th.

The Secretary also explained that he had in error stated that Mr. Richard Oke had not entered for the the Pheasant Special, as he found on turning up Mr. Oke's entry paper, that he had made the entry with the clerk in the office in London.

The Secretary also explained that he had a protest from Judge Felch, wherein he stated that he would not award the prize cup, donated by the A. P. A., in the American class, owing to a motion passed at a meeting of the American Poultry Association the night before. It was moved by Mr. McNeil, and carried, that Mr. Felch's objections be filed, and that the awards be made for best two cocks, two hens, two cockerels, and two pullets, allowing the selecting of one or more birds from each, or all from one of the varieties included in the American, Asiatic, Polish, and Game Classes, for which their cups were donated, being open to the members of the A. P. A. only.

It was moved and carried that the next meeting of the Directors be held at Toronto Exhibition, on Thursday of the second week, which would be September 7th, at 2. p;m.

THE AMERICAN POULTRY ASSOCIATION.

The American Association held its annual meeting on Wednesday morning, January 11th. This was the first meeting of this Association in Canada, and the Americans made it memorable by electing Mr. Allan Bogue, of London, its President. Mr. Bogue has been for more than twenty-five years a member of this Association, and has the honor to be the first Canadian to be elected to its Presidency.

The principal business transacted by the Association was the revision of the Standard.

Mr. I. K. Felch had had prepared the omissions, corrections, etc., that he had noticed, giving the legal sixty days' notice. Each member was supplied with a printed copy of the notices.

1. The handicap between solid and parti-colored birds was reduced to 1 point instead of 1½ points as was also done in the case with breeds having a weight clause.

2. Vulture hock to disqualify light and dark Brahmas.

3. White in face of Leghorns, both cockerels and pullets, to disqalify with the exception of buffs.

4 Messrs. Bridge, Butterfield and Pierce were appointed a committee to correct any errors in scales of points in Houdans, Polish and Bantams other than game.

5. In Pekin Ducks black in head to be a disqualification.

6. Breeding pens. To win a first prize the pen shall score not less than 180 ; with no specimen in the pen scoring less than 88 ; second do., 178 and 87 ; third do., 175 and 86.

7. In P. Rocks males and females it is to be definitely stated that wattles be of equal length. Color of beak in females to read yellow with slight dark stripings. Eyes to read medium in size.

8. Brown Leghorns. Tail coverts to read same color as in back.

9. In Black Sumatras comb of male to read same as that in female.

10. Color of Silver Spangled Hamburg eye to read—male and female—" dark hazel."

11. In Golden Duckwing Game, female, beak to read "horn color" (light or dark erased.)

These changes to go into immediate effect and copies to be sent to all poultry papers.

BARRED ROCK MEN MEET.

The annual meeting of the American Barred Plymouth Rock Club was held on Thursday morning, January 12th, and was one of the most enthusiastic meetings held in connection with the Show.

This Association is international in its scope, and has done a great deal to develop and make popular the Barred Plymouth Rock.

The annual meeting this year, however, was the largest ever held in its history, and with a new and energetic set of officers it promises to soon exert its old potency amongst the breeders of this popular variety. At present a good deal of difference of opinion exists as to the proper shade of color, and other details, and an effort is now to be made to overcome this, as well as to increase its general utility.

Mr. Schwab, of Rochester, N.Y., is the new Secretary, and the membership now for the first time, includes a large number of Canadian fanciers.

THE ANNUAL BANQUET.

The banquet tendered to the visiting fanciers by the Toronto Poultry, Pigeon and Pet Stock Association, on Thursday evening, was a grand affair, and the guests comfortably filled St. George's Hall.

Mr. Chas. Bonnick, President of the Local Association, presided, and among those in the seats of honor, were Prof. Robertson, of Ottawa Experimental Farm ; Mr. C. C. James, Deputy Minister of Agriculture for Ontario, Toronto ; Mr. Allan Bogue, President American Poultry Association, London ; Senator Pierce, of New Hampshire ; Judge I. K. Felch, of Massachusetts ; Mrs. Comyns Lewer, editor "Feathered World," London, Eng., and Dr. Bell, retiring President of the Ontario Association.

Judge Felch, after the good things had been disposed of, made the first address, and it was full of practical suggestions.

Twenty-five years ago, he said, few believed that poultry was the greatest money making business in connection with agriculture. To-day none doubted it. Twenty years ago he warned the Association in fixing their standards not to lose sight of utility in breeding to the standard, and he believed they had heeded his advice. One of the benefits of such a show as the one just held in this city, was to draw attention to the various breeds. The favorite breed was one that was a good egg producer, a good broiler, and a good boiler. He strongly advocated the selling of eggs by weight, and went into details as to the weights of the eggs laid by the respective breeds. The Brahma eggs averaged 27 to 32 ounces to the dozen. The Plymouth Rock, 24 to 26, and Wyandottes and Leghorns, 22 to 23. Was it fair, he asked, for breeders to be expected to sell the heavy Brahma eggs for the same price per dozen as the Leghorns?

FATTENING POULTRY FOR MARKET.

Professor Robertson, among other things referred to the increased interest paid by Parliament to the agricultural interests of the country, and dealing with the poultry particularly, he gave the following method of fattening, as one practiced by English poultry men : The crates in which the fattening is carried on, are six and a half feet long by sixteen inches square, inside measurement Each crate is divided into three compartments, and each compartment holds four or five chickens, according to their size. The crates are made of slats running lengthwise on three sides and up and down in front. The slats may be from one inch, to an inch and a half wide by five-eighths of an inch thick. The space between the slats in front should be two inches wide, to permit the chickens to get their heads through for feeding.

The slats on the bottom should be put on three-quarters of an inch apart. Each compartment has a small sliding door in front. The crates are placed on stands about two and a half or three feet from the ground. The droppings from the chickens in the crates are received in sand, or some absorbent material below. A light "V" trough two and one-half inches inside, is placed in front of each, running the whole length of it. The bottom of the trough is about level with the floor slats of the crate. The birds of larger breeds are best suited for fattening. Dorkings or Plymouth Rocks are good sorts, also light Brahmas and Buff Cochins, or crosses of these. The age may be anywhere from three to four, or even five months, and the condition of the bird should be such as to indicate healthfulness, and a tendency to fatten. The feed may be oats, barley, or wheat, preferably oats, ground very fine—as fine as they can be pulverized—the seeds or hulls being kept in, and also thoroughly pulverized. The ground grain should be mixed with skim milk only. The skim milk may be sweet or sour; preferably sour. The mixture should have about the consistency of thin porridge, so thick that it will not run readily, and so thin that if a large spoonful of it were put on a plate it would spread. The chickens should be fed from the trough in front of the crates, three times a day. During the first three or four days they should be fed quite sparingly, after the first week they should be fed as much as they will eat up clean twice a day.

When the chickens are first put in, it is a good plan to rub a little sulphur close under both wings, over a spot of about one and one-half inches in size, and over a similar surface of the skin under the tail. This treatment will kill lice.

It is desirable to have the chickens fed in the crates from the troughs for about two weeks. Then they may be fed by the cramming machine. When it is used they should be fed twice a day only, and the feeding period with the cramming machine, should not be longer than two weeks.

During the last ten days of the fattening period, a small portion of tallow should be put with the food. To begin with, the tallow should be used at the rate of one pound per day, for about seventy, or one hundred chickens, according to size. That should be gradually increased, until one pound per day is being fed to from fifty to seventy chickens. The best way to mix the tallow is to melt a portion of it, thicken it while still hot with ground meal, and then mix the right quantity of that paste with the other feed for the day.

POULTRY AS A REVENUE MAKER.

Mr. C. C. James, Deputy Minister of Agriculture, made a speech that was full of interesting information. While the Dominion Parliament had been concerning itself with the development of the trade in poultry, it devolved upon the Province to see that the supply at home was kept up properly, and he believed the great means to this end was education. The Ontario Legislature was attending to that work. Mr. James pointed out that in Ontario an effort was made to develop the resources of the Province along all the different lines of agriculture, and not to overdevelop along any one line, the aim being to build up a diversified agricultural industry. He said that he was surprised in reading an estimate made in 1896, of the value of different products in the United States, to see the position of the poultry industry. Gold and silver together, totalled $120,000,000, the lowest figure on the list. Poultry and eggs combined headed the list with $290,000,000. Mr. James estimated that in Ontario, there were at least 200,000 homes where poultry could be raised, and taking an average of fifty fowls for each home, and a profit of two dollars on each fowl, this would easily produce $20,000,000 a year.

He pointed out that as the dairying industry was now taken away from the homes of the farmers, relieving the women of the farm of the heavy work of milking, and handling the milk, the raising of poultry was a pleasant and profitable branch of agriculture for them to turn their attention to. An industry that would bring in $100 a year to each household was worthy of attention, and the question was now, to a small extent at least, engaging the attention of the Provincial Government.

POULTRY CULTURE, A WEALTH PRODUCING INDUSTRY, SHOULD BE PROTECTED BY THE STATE.

By I. K Felch, Natick, Mass , President of the American Poultry Association

None will deny that poultry culture, when intelligently controlled, pays a profit as large, and I assert, a larger per cent. of profit for money and labor expended, than does any other live stock of our farms.

Our boards of agriculture have been slow to recognize this truth, but are now giving the industry support; but are they doing it to secure the greatest benefit to the greatest number of those who are making poultry culture a calling? We see that some of the States are giving from $600 to even $2,000 as prizes to encourage the exhibitions, hoping thereby to increase the industry; but they are giving the whole lump sum to some one society, and it raises the question, "Is it best for all interested, or does it work to the advantage of a very few and to the discouragement of many." Let us take Massachusetts for instance. The State gives to one society a lump sum, say $2,000, and this secures a very large exhibit, so large that its judging is done by comparison. This gives the emolument of winning to a very few of its exhibitors, while it gives no record of merit to the individual specimens, beyond the fact that a few of each class are the best shown. Take a class of 300 birds, two or three of the fifty competitors secure the prizes; the balance go to their homes their birds not recognized. But suppose the State should give to each of her counties $200, which would insure such counties in making an exhibit without the risks or loss to the few who give their time to making the exhibitions, the exhibits probably being a congregation of 500 to 1,500 specimens, would enable the management to have every specimen scored, each bird getting a score card record in points, and showing the relative difference between the competing specimens, and showing oftentimes twenty birds in our large classes, scoring within one point of the winner, while it shows the real merit of the winner. If a specimen that scores 94 points is worth $25, then if it can be shown there are twenty scoring 93 and 93½, it shows them to be worth a corresponding price, and it shows also what the possibility of such specimens is to beget progeny of like merit. But do comparison-judged exhibitions do this?

Now, what would be the influence in and for the wealth of the State to force a system which these exhibitions shall be held under, that will show to the world the true merit of an entire exhibition, or to leave it to a system that merely discloses the fact that a few have won, and not give even the winner's individual value in point of merit?

We ask the question, "Which system would advertise the whole number of specimens and enable the entire exhibit to sell for several thousand dollars more?"

Now, what does the State offer this bounty for if not in the belief that it is to be an incentive to a greater productive wealth that shall pay for the distribution she has offered. If this be the motive, then such a distribution as will reach the largest number in each of its counties will cause in the combined exhibitions several times as many birds to be shown, ard try to secure this influence from one exhibition in a State, no matter how large it may be.

Such large exhibits are generally made in our big cities, where the exhibition generally results in an entertainment for city people, and does not reach the element that become interested as breeders and producers.

Should each county be encouraged to that extent as to enable them to hold a show in each county, and secure a record for their specimens exhibited, the influence and benefit would be ten times greater to the State and much fairer for her in true citizens. I am a firm believer in these bounties to agricultural industries, for agriculture is productive and pays all the bills of the nation, and each laborer in the field should have the same impartial consideration.

What is true of Massachusetts is true of every other State, or Dominion or territory. Both our country and Canada are of magnificent distances—to centre any one industry makes it a burden for those living at the remote portions to attend. For this reason I favor the distribution of those helps. Concentration gives control to the few. Politics generally find their way to control where the sum is large enough to attract. But when the sum is large enough to secure workers to take hold, then is it from such sums the State derives the greatest good and extends the greater good.

Foster and create county exhibits—demand that each exhibit shall receive a record of its merit; then the entire exhibit will sell for the most money, a larger number receive a help thereby, and a larger aggregation of wealth produced for the State.

THE POULTRY ISSUE OF TO-DAY.

By George Seeger, Jr., Late Superintendent Poultry, Pigeon and Pet Stock Department, World's Columbian Exposition, Chicago.

Handicapped as it has been for a number of years by the simple word "fancy," nevertheless the poultry industry has been steadily gaining ground, and to-day stands second to none as a business.

In explanation of the above, the word "fancy" is and always has been a misnomer, so far as poultry is concerned. Those who are not acquainted with the issue have heretofore been of the opinion that the breeding of what is termed "fancy" poultry is only a legitimate way of spending money to satisfy the taste or hobby of the individual. This impression is wrong to a great extent. True, there are some who breed for this purpose, but the per cent. is very small—no larger than in any other transaction.

Poultry raising is a business pure and simple. It has its ups and downs, and its good and bad seasons, the same as everything else.

It would be folly to say that one hundred per cent. of the people who take up the poultry business will make a success of it. The per cent. of failures is necessarily as great as in the pursuit of manufacturing, mercantile or agricultural pursuits, but need not be greater. An adaptibility to this, as to other affairs, is an essential to success. To make a success of poultry raising good judgment is needed. When this is applied, one then can see on the right side. If it is not applied, the result is readily foreseen.

"Breeders of Fancy Poultry" is a common term and applies to one's business, and the sooner the public at large comes to understand that it is a business and not a fad, the sooner the importance of that business will be understood.

The farmers, the past few years, have realized that in poultry raising the largest kind of profit is gained. They no longer term it a "side issue," but place it at the top of the list as the best revenue-getter of all. Until late years the poultry on a farm had not been given the credit it deserved. The output, or profit, such as young stock, eggs and increase in flock, is consumed without the slightest mention of a saving in living or a credit of gain to the poultry yard. Has a farmer ever stopped to think what he owes to the poultry end of the farm at the close of the year, when he should still have at least the original number left? This is a matter that seems of small importance, but if he would take the pencil and figure for a few minutes he would find that there is nothing raised on a farm that pay so much interest on the investment as does his poultry. There is one thing to which the farmer has become very much alive, and that is the breeding of a good grade of stock. It is with pleasure that I mention this. The average farmer has found it is much cheaper to feed good stock than poor; besides, the chances for good results are much better.

The show room has done more to encourage the breeders to produce good stock than anything else. They realize that competition is the life of trade, and the show-room the best teacher of all. It is here that the many breeders must meet in friendly competition and exchange their ideas It is here that the public at large sees the results of many years of study and breeding, and it is here that the new and enthusiastic fanciers are produced.

Advertising is another great factor, but the art is much abused. By this I mean that a large per cent. of the fanciers and breeders who want to present their names or stock to the public do no realize the importance of a continuous advertisement. Those placed at irregular intervals present nothing more than a chance of attracting the attention which they seek. It is a sort of hit and miss arrangement. Advertising pays when properly done, and the value of printers' ink is best learned by the continuous use of it.

I cannot refrain from expressing my personal gratification at the growth of fellowship among poultry fanciers, as so splendidly evidenced in your international meeting. In it I recognize the advancement of the business and the improvement of methods, to say nothing of the growing sentiment for higher devolopment of friendships and a promotion of that competition which must lead to a healthier and better competition.

THE REARING AND MANAGEMENT OF POULTRY ON THE FARM.

By J. E. Meyer, Kossuth, Ont.

The proper time to begin making preparations for rearing your chickens is early in February. At this time the farmer or his wife—and it is the wife on many farms who takes the greatest interest in the poultry—should carefully select about ten of the choicest hens or pullets, yearling hens preferred, and place them together with a pure bred male in a pen containing seventy (or over) square feet of floor space. You cannot very well have this pen too large, but it will not do to have it smaller than this because the birds would be too crowded. The floor of your poultry-house should be covered with five or six inches of dry sand or clay, and over this again place five or six inches of wheat straw. The purpose of this earth and straw is to enable you to cover all the grain scattered in it, so as to make the fowls scratch. It is the nature of a hen to scratch for her living, and we must follow nature as closely as possible, while our hens are confined to their houses in cold weather. A flock of hens that have a trough full of wheat before them all the time will stand round all day, likely begin feather-eating, and certainly will not lay. A lazy hen is a very indifferent layer.

You have no doubt noticed in the spring and autumn that some of the hens remain outside hunting and scratching long after the majority have gone to roost. Such hens are always the best layers. The roosts are important, more important than most people think. When roosting out of doors hens will generally go to a high place. They do this for security. In the morning they fly down obliquely and so light easily. Not so with your high perches in the hen-house. The fowls cannot fly down obliquely from them, as there is not room, and so they come down heavily, especially if one of the larger breeds. This is certain to bruise their feet, causing bumble-foot. Many farmers have what may be termed ladder-roosts placed against a side of their houses. On these the fowls all crowd for the highest perch, and many are knocked down, falling heavily to the ground and hurting themselves. Under both these styles of roosts the droppings are allowed to accumulate in large quantities, and through it the fowls walk, causing many of them to contract a disease of the legs and feet called "scaly-leg"—a very unsightly disease. This filthy place is the cause of at least one other disease, vermin, that is bound to trouble your fowls if they are not kept clean. Myriads of lice will harbor and multiply in such a place. It is a regular hot-bed for them. Your hens cannot be healthy and thrive in such a place, You know that it does not pay to keep an unhealthy cow or horse about, and neither does it pay to keep an unhealthy fowl. Let us then consider how we are going to keep our fowls from feather eating, egg-eating, scaly-leg and lice. Later on in their proper place we shall speak of the other common diseases. First, the roosts. Build a tight, warm platform $2\frac{1}{2}$ inches from the floor, and 10 inches above it place the perches in such a manner that they can easily be removed. The droppings will be caught by this platform, which should be cleaned off every morning. On the perches pour coal oil once every two weeks in winter and every week in summer. Besides this the whole house should be whitewashed, fumigated with sulphur or sprinkled carefully with a coal oil emulsion with the spraying pump at least every fall. Clean out the nests often, pour coal oil about them, put tobacco, sulphur or insect powder in them. To keep them from feather-eating and egg eating make them work, give them a little meat, and give plenty of fine gravel or broken crockery for grit.

Your poultry house should be warmly built and supplied with plenty of windows to admit sunlight, which is very necessary. It need not be more suitable to the needs of your fowls than your horse and cow stables are to the needs of your horses and cows. As you do know that it is a terrible waste of food, time and money to try to make beef and milk when your cattle are almost frozen, supplied with dirty water, covered with vermin and irregularly fed, so you can easily understand that fowls treated in a like manner cannot be any more profitable. For illustration, we shall suppose that a farmer has ten hogs in a pen that he wishes to turn into pork. Does he keep them where they are almost frozen and go to them once a day and throw them a bushel of peas, perhaps into the filth, at the same time giving them a drink of water? He knows better than to do this, because these are pigs and pay to feed properly; but those hens that are only a nuisance anyway and never pay, when he goes to feed them in their filthy cold stable he will throw down a lot of wheat in the filth once a day and let them eat snow for water. No wonder these hens don't pay. Now, which hen will cost the most to winter, the one fed all the wheat she can eat and kept in a cold filthy place, or the one kept in a warm clean place, supplied with clean water, and fed somewhat as follows: At daylight, cut clover and crushed oats mixed, steamed, and fed in troughs, just enough for them to eat up greedily and leave them so that they want more. In an hour or so after put up the troughs and scatter a very little wheat over the pen, covering it deeply in the straw and sand. Do this three or four times during the day so that they may be kept scratching continually from morning till night. At night, just before they go to roost, put all the wheat that they will eat into the troughs, and after they have gone to roost empty the troughs. Keep a turnip, cabbage or mangel before them all the time. There is no cheaper or better food for fowls than cut green bones. If you have cut green bones and vegetables very little grain will be needed. Now, which hen costs the most to winter? I am going to let you answer. The first hen never laid an egg until April, when all the hens in the country were laying and they were cheap, the other laid all winter when they were dear. I know that the second hen cost more trouble and work than the first, but did you ever accomplish anything without trouble and work? I never did.

The breeding-pen that you mated early in February should be laying well by the beginning of March, so that by that time you will have eggs ready to set. If your fowls are a large variety all your chickens should be hatched during March and April, and if a small variety as late as the end of May will do.

Never set a hen in the poultry-house if you can avoid it. Put her where she will not be disturbed. Place food, water and a dust-bath near her. Always set several hens at the same time, and after they have set six or seven days test out infertile or clear eggs and put fresh eggs under as many of the hens as you can. The nest should be so solid that the eggs cannot sink down into it. Take a shallow box, fill it to within three or four inches of the top with earth, on which place hay-chaff. The earth should be smoothed nicely and slope slightly to the centre. Put tobacco in the nest—I use cigar stumps when I can get them. Dust the hen thoroughly with insect powder when you set her and again a few days before the chickens come out. Before taking the chickens from the nest dust them carefully. If you take these precautions your chickens are not likely to be troubled with lice. Lice cause more trouble and loss amongst chickens than anything else, and you must keep them down if your chickens are going to thrive.

As soon as the chickens are at least twenty-four hours old remove them with the hen to a coop placed in a shady place, where there is grass and where no other fowls can get to it. I run wire netting about the coops, which keeps all large fowls out while it gives the chickens liberty. A hen can take care of fifteen chickens in early spring and twenty in warmer weather. Feed the chickens on a clean board out of the hen's reach, and keep clean water where both the hen and chickens can get it, but so arranged that the chickens cannot get into it.

I feed stale bread soaked in sweet milk and pressed dry, granulated oatmeal and a cake made somewhat as follows: Half-crushed oats, equal quantities of ground wheat and barley, a little salt and flax seed meal, some baking soda—all mixed together and moistened with milk placed in a shallow pan, and bake in a moderate oven. You will find the chickens very fond of this. As soon as they can eat wheat keep it before them all the time After the chickens are three weeks old you will not need to bake this food, but moisten it only. Never feed sloppy food either to chickens or older fowls at any time.

As the chickens are taken from the hens at from four to six weeks of age, place them in separate flocks of from twenty-five to thirty of the same age and size. If the coop in which you had the hen is made large enough, and is perfectly tight all round, excepting the front, so that there will be no draughts on the chickens while in it at night, this will be the best place for them, and they can remain there until quite late in the fall if you put a front to the coop. Be extremely careful that the chickens do not get into any draughts during the chilly nights of August and September. As sure as they do they will get distemper or cold, and once that gets into your flock you will be a long time before you will get rid of it. They immediately lose flesh when they have distemper and your nice plump pullets almost ready to lay will, in a very short time, be little but skin, bone and feathers. As the cockerels become large enough you market them, so that there will always be room in your coop for each flock. Keep clean fresh water and wheat before them all the time and feed mornings on soft feed. Never allow them to get anything sour.

I have here discussed raising chickens in what is now termed the old way, which is fast being superseded by machinery, where chickens are raised in large numbers. The artificial hatching of poultry was practised centuries ago in Egypt and China, and in China to-day there are not a few who make their living by hatching chickens for the poultry-raisers of the surrounding district. The methods they use, however, are very crude compared to those used in America, England, France and a few other countries—especially in the United States are incubators and brooders used to a very great extent. The demand for really first-class dressed poultry and eggs has always exceeded the supply, and no sooner had the incubator and brooder been brought to a comparative state of perfection than a new impetus was given to poultry-raising, until to-day it is no uncommon thing in the Eastern States especially, to hear of poultry establishments running from six to thirty incubators of from 300 to 600 eggs capacity each, and turning out annually hundreds of thousands of chickens and ducklings for the markets of such cities as New York and Boston. These men make this a business.

There are many advantages in favor of machines over hens for raising and hatching chickens, and they will answer as well for the farmer as for the exclusive poultry raiser. The good incubator and brooder of to-day is as simple, as easily managed, and will do its work as perfectly as the ordinary machines of the farm. The earlier you can hatch your chickens the better they will pay you. You can seldom get hens to hatch all the chickens that you would like to raise in March or April, but the incubator is ready to go to work at all times and will hatch 200 or 300 at once, with far less trouble than the dozen or two hens that it would take. If you have an incubator to do this work your hens can go on laying and lose no time. Incubator-hatched chicks are not troubled with lice. A brooder will take care of from fifty to two hundred with far less trouble to you than the hens would be. Any farmer who wishes to raise from 200 to 500 chicks each year will find it an advantage to do it with machines. The farmer who wishes to raise only from 50 to 100 does not need machines.

A farmer who has quite a large farm adjoining the village of Preston has been for a number of years paying careful attention to a large flock of Leghorn hens that he keeps for furnishing eggs for market. He also keeps quite a large herd of cows which are not neglected. This farmer told me only a few weeks ago that his hens were paying him better than his cows. There is not a farmer who cannot make his hens pay just as well as this flock, if he will only make up his mind to do it. The time has come whon you are each and every one of you compelled to look to every available source for your incomes. I know a hen is a small thing—perhaps beneath the attention of some men, but she is either a profit or a loss to you. Which are you going to make it? It depends entirely upon yourself.

THE FANCY IN AQUATIC FOWLS.

By H. S. Babcock, Providence, R.I.

Fancy fowls are practical fowls. Despite the popular error to the contrary, the breeder, who strives to produce perfection of form and feather, does not, necessarily, lose sight of other qualities. Indeed, the very skill which is exercised in the attempt to perfect fowls in configuration and coloration, gives an earnest that improvements in other directions will be made. Fancy fowls are simply well bred fowls, fowls upon whose breeding thought and skill have been employed. And it is a fact, capable of easy demonstration, that the fowls which have been brought to the highest perfection in utilitarian qualities, have been produced, either as distinct new breeds and varieties or as improved strains of old breeds and varieties, by the skill of fanciers. In the direct work of improving the quality of the feathered stock of a nation, we need, therefore, fanciers and a fancy.

But in aquatic fowls we have almost lost sight of these fundamental facts. We have left their breeding largely to men who are interested only in the production of meat, for these fowls are seldom kept for the production of eggs. And what has been the result? Outside of the Pekin duck water fowls have been largely neglected. The exhibits at our poultry shows are strangely lacking in water fowls. When ten men should be breeding ducks or geese there is hardly one man. And the perfection of these fowls has lingered. Mr. George M. Austin, of Mansfield, Mass., the veteran dealer in fattened geese, who markets from 10,000 to 25,000 geese annually, recently told me that, while he could purchase a few thousand of very good green geese in Nova Scotia, the product of Canada was so inferior in quality that it did not pay him to attempt to handle it. If the breeders of geese in Canada would imbibe something of the fancier spirit, and improve the quality of their geese, there would be a large demand at highly profitable prices for them. Better geese and more of them are demanded, and the breeders of Canada have here an unworked field capable of yielding them rich returns.

It is true that, owing to the lack of plasticity—the quality which renders them easily moulded to the will of the fancier—there is not likely to be a highly cultivated fancy in geese. The fancy, too, will be more or less limited by the requirements of these large fowls, for one who has not abundant pasturage can not hope to make geese raising a profitable industry. Yet plasticity is not wholly lacking in the goose, and there are thousands who have the necessary pasturage, and the goose fancy is capable of considerable expansion.

To ducks these objections do not apply. The duck possesses a plastic nature, as is proven by the breeds we now possess. The beautiful white Aylesbury, the large white Pekin, the black Cayuga, the lovely Rouen with its parti-colored plumage—one of the most beautiful of domestic fowls,—the crested white, the prolific Indian Runner, the gray and white Calls, and the irridescent black East Indian, are all certainly descendants of a common ancestor, and the great variation shown in these breeds, in size and color, proves the possession of great plasticity. The recent production of a buff duck and the probability of the production of a blue duck in the near future, give further proof of this quality.

Ducks, too, can be reared successfully in narrow quarters and without access to ponds or streams. The writer kept a trio of East Indians in a run about 20 x 4 feet, and raised thirty-three young from them in a single season, the young having a yard only about twenty five feet square. And what one can do, another can do also.

Ducks are such rapid growers that they prove highly profitable to raise for the flesh. They enable one to possess the nimble sixpence which always and everywhere beats the slow shilling. And more than that, they are much easier to rear than the young of the ordinary domestic fowl. In 1897 out of thirty-six ducklings hatched, the writer reared thirty-three. The other three were killed by a hen when a day or two old. In 1898 the writer rearer every duckling hatched. With chickens there is always more or less loss, and then there is the "irrepressible conflict" with lice. A duck hatched is almost a duck raised, and there is no fighting with lice to be undergone.

The food for ducklings may be coarser in quality than is used for chickens. The writer, however, has found the following method of feeding satisfactory for his purposes: equal parts by measure of corn meal and wheat bran, and from one-half to two-thirds as much ground beef scraps as there is of meal. That is, if one mixed two quarts of corn meal, and two quarts of wheat bran together, he should add one quart or three pints of beef scraps to the mixture. To this is added about a half pint of fine grit, and the whole mixed with cold water and fed rather moist. With plenty of water to drink and the above mixture fed thrice daily, his ducklings have thriven remarkably.

When one considers the beauty of aquatic fowls, the ease with which they can be reared, and their value as profitable poultry, he sees the need of a fancy in them, that they may become more generally cultivated and that they may improve as rapidly as other feathered stock. No branch of poultry keeping is more neglected, none is capable of more improvement, and none offers for the fancier more generous or more certain rewards for intelligent skill directed to the improvement of either beauty or utility, or rather, let it be said, to both beauty and utility.

BREEDING AND MARKETING EGGS AND POULTRY.

By Robert H. Essex, Toronto.

Every fowl and every egg that is disposed of for less than the highest market price is sold at a loss; and a very large percentage of poultry and eggs is so disposed of.

1st. There is a loss when the produce is marketed at the wrong season of the year.

2nd. There is a loss when it is marketed in poor condition.

3. There is a loss when it is the product of unsuitable stock.

Under these three headings I will endeavor to give reasons for the above and point out the remedy.

1. Marketing at Improper Season of the Year. Take the egg trade. The market is flooded with eggs from April to July; the price is correspondingly low. In August and September the supply from producers is not great, but the middlemen have been laying in large quantities during the four earlier months, and these are placed upon the market, so that prices do not revive to any great extent. From October to March is the season of high prices. Prices vary each year and so does the supply. Much depends upon the weather. During October of one year eggs may be fairly plentiful, while in the corresponding month of next year they may be scarce, as was the case last October. Similarly with regard to the other months. The endeavor, therefore, should be to enforce laying from October to March, inclusive. This necessitates comfortable poultry houses, built to admit lots of sunshine and to exclude the frost, continual attention and observation, egg-producing food in proper quantities (not

patent medicines), and most important of all a flock of birds that were hatched early. Breeds which mature rapidly should be hatched the latter part of April or early in May. The larger breeds which mature slowly, should be hatched in March or early in April. This gives ample time for the pullets to be full feathered and in good laying trim before the cold weather puts a seal on the prospect of egg production. Remember that where the market price in spring and summer is fifteen cents, it will in winter be about double

Do you market your surplus stock in October, November and December? If so, you lose money. How old were those cockerels you sold in October? Six months. Just so, and after feeding them for six months they sold for about fifty cents a pair, and lucky to get that. Suppose you had sent them to market in June or July, after feeding them only ten to fourteen weeks, you would have received somewhere around seventy-five cents a pair and saved three months' feed. "That's funny, but it is so." Your cockerels of the larger breeds hatched in April or early in May should be marketed in June or July to secure greater profits. After that they are kept at a loss. The hens should not be kept over two years. If they bring out an early clutch of chicks, they may be sold at a good figure just before the time the chicks aro old enough to look after themselves. The hen will then be in good condition and the prices will be right.

2. Marketing in Poor Condition. A fowl marketed when young (and, as I have said, that is the time to sell it) must have been well fed and intelligently reared, or there will be nothing but skin and bone to dispose of, and the price paid for such a combination is not high A well fed, healthy bird, will have a nicely rounded breast and plump thighs, and will command a high price. Add to this the enhanced appearance if it should be well dressed, and it commands a still higher figure. In the case of old fowls, it is of still greater importance that they be neatly prepared for sale. Leave in the pin-feathers and stubs and twenty-five per cent. is clipped off the value. Scald your fowls so as to make easy the removal of the feathers, and you will lose nearly an equal proportion. Everything should be done systematically. Kill your fowl by bleeding; immediately pluck it, taking care not to tear the skin; then plunge it into cold water to plump it, and see that it is skewered so as to give it a still more plump appearance. I need hardly say the legs and feet should be washed before killing.

If the birds are to be marketed unplucked, it is simply necessary to have them in good condition, and free from soiled legs or feathers. Fowls should be fattened before marketing, and should fast a day before killing.

Harking back again to eggs, I need only repeat what a prominent commission merchant informed me, as appears in the *Reliable Poultry Journal* for June, 1898. "In the first place," he said, "the farmers will not convey their eggs to us in a proper manner. The great majority of eggs are received in baskets rattled over a country road, for many miles, and naturally many are broken, and more are injured by the jolting and shaking. To illustrate this, come along and see our men candling the eggs. Here is a consignment of eighteen dozen eggs from which three dozen have been taken as defective. These are called checked eggs, and result from the severe handling they have experienced. The shells are not necessarily cracked, but (holding one before the light) you will observe the yolk has a muddled appearance; it is distributed through a larger portion of the albumen than is the case with this egg, which is nearly perfect. Here is another defective egg, wherein the yolk is so dark that we have simply to discard it altogether." "Why there is a chicken of about ten days growth in that egg," I exclaimed, and sure enough upon breaking it there were the eyes and blood vessels of the mongrel (I guess). Several other eggs were broken, some containing chicks, others showing the growth of four or five days, but most numerous was the badly shaken yolks." . . . "The farmer has not yet learned that eggs of one color, or assorted sizes, will fetch a bigger price than those of all descriptions.

3. Marketing the Product of Unsuitable Stock. Milkmen and farmers who breed cows for supplying milk are careful to select the breed which will give the largest quantity. Then again, suppose the object is butter making, the quality of the milk at once becomes of importance, in which case another breed is chosen.

Similarly with intelligent breeders of fowls. If the fowls are raised with the intention of marketing them, they should be selected with that object in view. The shape of the fowl denotes more or less breast meat, more or less bone, and more or less waste. Many breeders have until lately considered the Brahma and Cochin too coarse to be esteemed a high class table fowl, and yet at the largest shows on this continent they have carried off the prizes for dressed poultry. The size, the deep and lengthy breast, is evidence of an abundance of flesh even if the bones are large. The Dorking and Langshan represent the type of fowl required in the British market, and without doubt the low-set long body of the Dorking is the ideal for a table fowl. The Indian Game is also a favorite there, notwithstanding its yellow flesh, for that market prefers the white-skinned breeds.

Now, suppose the chief wish is to secure good layers. In such case it will be wise to select from a breed having that reputation. I claim that any breed can be made to lay satisfactorily if bred year after year for that sole purpose; but it is of course best to commence with a ready-made egg producer, then continually select the best layers and breed from them. Such breeds are grouped and come under the heading of the Mediterranean class and include Minorcas, Leghorns, Andalusians and black Spanish. The farmer, however, needs a general purpose fowl, one that will dress well, meaty and plump, also one that will give a fair supply of eggs, so that returns may be secured from both sources; then the surplus cockerels may be sold at a good figure, and the pullets retained for laying.

Now, it stands to reason that the best market fowl may not be the best layer, nor will the best layer likely excel as a table fowl; so a choice must be made in accordance with the object desired. It is unremunerative to endeavor to make a table fowl of a breed whose sole attribute is egg production, and *vice versa*. The happy medium, or general purpose fowl is found in one of the varieties of Plymouth Rock or Wyandotte.

One More Suggestion. Why does the breeder of cattle introduce thoroughbred blood into his stock? Solely for the purpose of increasing his profits, whether he is breeding for beef, milk or butter He simply exercises his intelligence in selecting blood noted for beef if his business is fattening cattle; a breed noted for milk production, if he be a milkman, or a strain that will improve the quality of the milk, if he be a butter maker.

It is evident similar intelligence must be exercised by the breeder of fowls, whether he is breeding for egg production or for table purposes. Introduce the thoroughbred blood, and as your profits increase you motto will be, "Blood will tell."

THE DUTY THE FARMER OWES TO THE GOVERNMENT AND POULTRY ASSOCIATIONS.

By E. H. Benjamin, Ottawa, Ont.

To some the above will seem a strange heading for a paper, but really so much has been written, published and talked about in the poultry interest that one finds it a hard matter to say anything new. Hence I take the above heading for this paper.

Some one may ask, What duty does the farmer owe to the Government and Poultry Associations?

I will endeavor to point out what I think his duty is to both. When a parent provides the means to educate his child for a certain profession or trade, and affords him every opportunity to acquire the knowledge necessary to fit him for the successful operation of the same, it is the child's duty to repay in some shape its parent's provision for his education. The same obligation rests with the farmer. The Government gives a grant to the Associations, for the purpose of encouraging the poultry interests, by awarding premiums for the best specimens of the various breeds. Who are the parties that make this display? They are the fancy breeders or instructors. In schools there must be teachers of the various branches. The teachers in the Poultry Associations are the exhibitors and breeders. They have spent time and money in educating themselves in a thorough knowledge of the characteristics of the various breeds and bringing them to the state of perfection we see them in at exhibitions.

The breeders have also acquired skill and knowledge in the crossing of different breeds, with a view to the creation of a superior layer or market fowl. But while the crossing of certain breeds in the skilled breeders' hands will give excellent results, it unfortunately happens that the crossing of breeds, as it occurs on most farms, is more a matter of accident than method. Such lack of interest and knowledge on the part of the farmer is to be deplored.

In order to know how to make good crosses the farmer and his family will require a knowledge of the different breeds. He or they have to learn how to make desirable crosses. The farmer, or member of his family, who takes up this part of his farming industry, can best and quickest obtain the required knowledge by becoming a member or members of a Poultry Association, by attending the exhibitions and by making personal enquiries of those who have made poultry rearing a study, and at the same time see the result of their skill and experience in the fine specimens exhibited. A personal interview of ten or fifteen minutes with a practical breeder, will have more beneficial and satisfactory results than listening to a dozen or more lectures.

Now, I think it is the clear duty of the farmer and his family to attend these exhibitions, or schools, for through them he gains knowledge which enables him to make perfect his stock, and which in time brings in an increased revenue to him. By his attendance at the shows he proves to the Government that he appreciates, and approves of the expenditure of the money by which he obtains the required information with very little outlay on his part.

Again, the farmer by attending these exhibitions learns how to properly house and feed his fowls. He sees how useless is the happy-go lucky way most farmers adopt. He learns that by properly feeding half the quantity of food formerly used will suffice, and so this is another branch learned by attending the exhibitions, or schools. He also learns the proper method of feeding and caring for his fowls at the moulting period. I feel convinced that a great loss of stock is sustained during this moulting time by the farmer not understanding the proper treatment needed. On too many farms three months, and sometimes more, in egg production are lost, simply because every bit of the nitrogenous food they get goes to the support of life and the sending out of a new crop of feathers. Frequently the kind of nourishment supplied is not of the kind to send the feathers out rapidly, and the fowl goes about half stripped of its plumage, a dead weight and expense meanwhile.

Now, all the advantages enumerated can be enjoyed by the farmer and his family if they will only attend the annual poultry shows in his neighborhood. It is for his benefit that they receive Government aid. The object is purely an educational one. As has already been said opportunity is given for enquiry. Then lecturers from the Dominion and Local Governments are present to instruct, by addresses, as to the best breeds for egg and flesh production, how to properly house, feed, care for and mate the birds. In these different ways are the Governments striving to interest the farmers in improved methods of poultry culture; and properly cared for poultry will not only bring money into the farmers' pockets but be a source of wealth to the country. The Governments have the same right, having adopted the means they have, to expect the farmer to show his appreciation of their efforts by attending the shows, as the farmer has to expect his sons and daughters to make effort to learn, after having provided for their education.

THE BREEDER OF POULTRY.

By "Zim."

In speaking of breeding thoroughbred poultry we wish it to be correctly understood, that we are not speaking of the person who is noted in his or her neighborhood as a success in raising any given number of pure bred or cross bred fowls out of a certain number of chicks hatched from the eggs, or how fine and healthy they look after they are matured, or of how many eggs he is capable of making a certain number of his fowls produce. The art of doing all this, any and all will admit, is a science, and is or would be very valuable to the scientific breeder. Yet a man could be possessed of each and all of the above qualities and still not be a successful breeder in the correct sense of the term. A man to be what we call a successful breeder is a man gifted with qualities that only a comparatively few have. Certainly he is a really good judge of the breed or breeds he is interested in, very often a deal better than any understand, except a very few gifted like himself and interested in the same breed. They understand each other and see far more of the finer and more difficult points or qualities to be desired in the breeds in which they are interested and on which their thoughts are centered. A scientific breeder is gifted with a foresight that tells him that a male bird he sees has qualities in him that just fits him to be mated to a certain hen or hens that he has. Very often, if asked, he would be unable to put his reasons into words so that his questioner could comprehend his meaning, yet he knows he is right. He is a thoughtful man, a man who does not believe in theories but in practice. He makes notes ; takes nothing for granted. It must prove itself when put in practice. He can take a flock of ordinary or fair specimens of any of the breeds he understands and raise better, more typical specimens from them by mating them his way, scientifically, than his friend or neighbor who has none of his qualities and ability can from the winners at Madison Square Garden. He understands full well that one sort of in-breeding will ruin any variety, while another sort of in-breeding will intensify and perpetuate any of those qualities desired and harm the breed in no way. In fact, he is the man who has brought all our valuable and beautiful breeds up to the high standard they now occupy, and it is this sort of men, the genuine breeders, who build up the business, and who every year raises a few birds that are not for sale regardless of prices offered, simply because they need them as breeders and they are beyond value in dollars and cents to them.

ARTIFICIAL INCUBATION.

By C. J. Daniels, Toronto.

It is not to be wondered at that much thought and labor should have been devoted to the subject of hatching by artificial means. Early chickens are important to all poultry-keepers whatever be the object they have in view, and to the fancier who desires to have birds fully matured and ready for exhibition for the autumn shows, they are absolutely essential to success, but hens rarely want to set at such seasons unless perhaps in the case of Cochins or Brahma pullets, and as these seldom go long enough with their chicks for very cold weather, the obtaining of suitable mothers early in the year is one of the fancier's most anxious cares. Often indeed all his efforts fail, and he is doomed to see such eggs as money could not purchase wasted for want of hens to set upon them, while at the same time he would be willing to give almost any price for the means of turning them into those chickens which he has well founded hopes would win him many a prize at next season's shows. The man keeping poultry for the market finds himself also handicaped getting sitters. Having a large flock of birds he has the greater chance of finding a few early sitters amongst his flock ; he gladly would set more if he could, remembering the high prices of the early markets which well repay extra housing, feeding and care. It is known that for hundreds of years chickens have been hatched in immense numbers, both in Egypt and China with no apparent difficulty, and with very little failure. There the climate or temperature is very even and near the degree required to hatch the egg. There large rooms are devoted to the hatching process, very little artificial heat being required.

The first thing to be considered is the incubator. There are many good machines in the market. If we have no knowledge in this direction we should send for the catalogues of several leading makes of machines and then make our selection. Do not consider the price, but endeavor to get the best there is in the market. Very rapid strides have been made these last few years in perfecting the incubator, and every vexing question of moisture and ventilation has lately been solved most successfully.

A dry well-ventilated cellar is a good place to set up a machine. The object is to get as even a temperature as possible, for sudden change from cold to heat will affect the machine; about sixty degrees is a good temperature, the main thing is evenness. Have the room well ventilated, but be sure and have no draughts directly on the machine, neither should the sun's rays be allowed to strike it. Keep the room sweet smelling and the air pure. Set the machine perfectly level and solid so that there will be no jar.

Other things being equal, the eggs are the direct cause of good or poor hatches, and the hens that laid the eggs are at the root of the whole matter, while the owner has it within himself to cause success or failure. It is best if the operator can raise his own eggs; it is cheaper, and then he has the power to raise eggs from any variety or grade he chooses, and to have fertile eggs that will hatch if he has done his part faithfully.

Another thing to consider is the variety of fowl, and there is quite a list to select from. The following are all yellow skinned fowls, and are the varieties most in demand in Canada and America as broilers and roasters: Wyandottes, five varieties, golden, silver, white, buff and black; Plymouth Rocks, three varieties, barred, white, buff; Brahmas, two varieties, light and dark; Javas, three varieties, black, white, mottled. White skinned fowls are preferred in England and France, such as Houdan, Minorca, Dorking, etc. The pure Indian Game is an ideal table fowl. If cross bred fowls are preferred, I would recommend a cross of Indian Game cock or golden or white Wyandotte, Java or Brahma hens, or white or buff Leghorn cock on Rock, Wyandotte or Brahma hens, and you will get a good growing chick. Have bright, active cocks, and the eggs will be sure to produce good, healthy, quick-growing chicks.

Never let eggs get chilled, and do not keep them over three weeks before setting. The fresher the better. If kept over one week, turn them half over three or four times a week.

Testing the Eggs. It is best to test the eggs on the seventh and fourteenth days. By the seventh day we can not only remove the infertile eggs but also the weak ones, viz.: those eggs that had vitality enough to start, but not enough to carry them through.

These can easily be picked out after a little practice by comparing them with the fertile ones. The novice should mark all doubtful eggs, and after the hatch these should be opened and notes taken. By the seventh day a live egg will show a small black spot with red veins running out in all directions and partly filling the egg.

The dead germ will show probably the same, only the development will not be so complete, according to the date of the germ's death.

Again, the egg may have a dark or addled appearance, and the contents mass at the top as the egg is slowly turned, or a few red veins may be seen to adhere to the inside of the shell while the balance of the egg will appear clear. Remove all such eggs at the last testing, take out all the eggs that are not properly developed. At this stage the egg ought to be nearly opaque, then the dead germ will look somewhat similar to the live one, but the contents will turn as the egg is turned, and a little experience will teach what eggs to remove with tolerable certainty.

There are many causes why chicks die in the shell. In many cases the incubator is at fault. If you are using a poor incubator you must look for poor results. Lots of people buy a machine because its cheap. This is the rock they have made their fatal mistake on, and had their hopes of poultry-raising smashed to pieces simply because they had poor tools to work with. If a machine is bought that you have to sit up at nights and watch to see that it does not run too high or too low, or that you are not quite sure that you are putting in enough moisture to either give life or drown the chick, you will soon give up the whole business in disgust. I would again emphasize that the only way to succeed is to buy the best machine there is to be bought.

Again, there are other causes why eggs do not hatch. Stale eggs—eggs from sickly or inbred stock, over fat hens, lack of vigor in cocks, lack of uniformity in egg shells. In fact, to sum it all up, the breeding stock is as important as the machine.

After the eighteenth day the machine ought to be closed and not opened again on any account until the hatch is complete. I always leave my chicks in the incubator at the least twenty-four hours after they are out of shell, and find they do so much better. They dry off and gain strength, and get as bright as gold buttons, ready for their first meal. Sometimes I give first meal in incubator. Another thing I have found very beneficial is to sprinkle mica crystal grit, chicken size, on bottom of incubator. About seventeen or eighteen days you will be surprised how readily the little fellows will eat it, and it seems to set their teeth on edge for a good meal. Try it next time.

As to brooding and feeding I have not space enough allowed me in this article to go into that. I will just add this: keep brooders at a temperature of about 100 degrees, gradually lowering it as chicks grow older. Do not neglect to keep them clean; feed no wet sloppy food, and don't let them get wet from their drinking water.

THE POULTRY INDUSTRY A HELP TO THE FARMERS.

By Rev. Thos. Geoghagan, Hamilton.

The claim that Ontario is the "banner Province" of the Dominion is universally conceded. The soil is fertile, the air bracing, the necessaries of life abundant and easily attainable, the means of communication with all parts of the world are excellent and daily improving, the facilities for the transportation of produce of all kinds is more than equal to the demand, and yet the complaint is made every day that "farming does not pay." Homesteads that have been cleared by the sturdy and determined settlers of the past and more patient generation are being deserted on all sides, and young men are flocking into the cities to glut the labor market and reduce wages below the standard at which men can live honest, wholesome lives, and keep the wolf from the door. The centralization of population is a condition of this age which has to be accepted. It will not, however, do to say that improvement in labor-saving machines in the department of agriculture has made hard times by driving working people into the cities and towns. For while it is true that with modern appliances the number of hands required upon the farm in the old lines of work is not so great as in the past, it is also true that new departments might be opened up productive of good results and capable of readjusting conditions so that the same amount of helpers could be used upon the land. The farm hand has suffered no more from labor-saving machinery than any other class of workers. He feels his position more keenly because he is less resourceful. Men in all walks of life have suffered and will suffer. We are not at the end, only at the beginning of inventions for saving labor and adapting the forces of nature to do the bidding of cultivated thought and intelligence. We are on the march, and we must be prepared to take the double at any moment.

There are ten applicants for every vacancy in any city establishment. The country has heretofore been acting upon the city, and the city must in time react upon the country.

The clots of humanity crushing themselves out of shape in large centres must be dispersed, and this great country has space enough and channels enough in which to absorb them. Since the opening up of our vast prairies and boundless wheat belts of the west, it would be impossible for the early farmer to do as his father did in early days, make grain the chief and only means of revenue. Even if we had not the competition of the boundless west there are many farms in Ontario that would not pay to grow grain upon. Young as the country is you will find hundreds of farms worked out and only capable of growing Canadian thistles and other noxious weeds. Hungry land can no more yield hearty crops than hungry hens can lay eggs.

There are many lines which the Ontario farmer might get into to improve his present condition. There is nothing, however, that will give better returns on investment than poultry. This country affords the greatest possibilities. The climate is favorable. Food is cheap and abundant. With cold storage and rapid transit we can land fresh eggs, early broilers, and all kinds of dressed or live poultry, in an incredibly short time in the market of the great metropolis of the world. Poultry products are never out of season. Fashions may change with the years but a fresh egg or a well cooked fowl will at all times find abundance of takers. Sam Slick said many years ago that the people of Nova Scotia needed to do a good deal more cyphering before getting the best returns from their farms. The same holds good in Ontario to-day. Few of those who live by the soil can tell you anything about departmental profits on the farm. In ancient times the nations that stood highest in arts and sciences gave a high place to the cultivation of poultry and the preservation of poultry fruit. In the sculptures unearthed in the Valley of the Nile, scribes are seen in the market place noting downthe articles sold, and on the farm taking an account of the products, to the number of eggs laid of each hen. Among other things unearthed a few years since in Egypt were eggs apparently as fresh as the day upon which they were laid. The people of France and other European countries encourage and foster the poultry industry. It is for the great mass of the small farmers, cottagers and artisans the chief source of revenue.

The French not only supply their own market but export to England over \$15,000-000 of this class of food annually. If European complications should arise where will John Bull look for his fresh eggs and tender poultry? Surely to the men of his own kith and kin who are working out their destinies on this side the Atlantic. But can we accommodate the old gentleman? We may talk as we please about Federal Union but nothing will hurry it about more quickly than giving the English people something good to eat. The average Britisher can fight. Yes, he can fight the size of himself of any kind of humanity. But he can do it best after a good breakfast. We in this country owe the British nation a good deal. The army and navy are maintained for our protection, and it is only reasonable that we should help to feed them, especially as they are willing to take our best products and to give us the highest market value in return. If England found herself in a tight place Uncle Sam might send her some warships and soldiers, but he could not send her fresh eggs as he does not raise enough to supply the home market. And Canada—fair Canada of ours—she of the fertile plains and the smiling cornfields, with millions of acres of broken lands, rich and fertile, so far with all the shipping facilities, with all the nice things said about her during and since the Jubilee—sent last year just \$978,479 to all countries, Great Britain included. The following are the values per province.—Ontario, \$365,785; Quebec, \$536,767; Novia Scotia, \$56.24; New Brunswick, \$17,824; Manitoba, \$16; British Columbia, \$13; Prince Edward Island, \$52,400; North West Territory, \$———. It is remarkable that the increase since 1893 has not been in proportion to the great increased shipping facilities. In the year 1893 we exported \$868.007, or just \$110,472 more than last year The proportional growth has not been equal either to the increased shipping facilities or to the advancement in the improvement in stock. The Ontario Government never did a wiser thing, nor one more to the advantage of the farmer, than when it established the poultry department in connection with the Model Farm at Guelph. But no matter how progressive or paternal a Government may be the best results can never be attained until every householder awakens to a sense of duty to their own interests and to the interests of the community in which they live, and take advantage of every honest and honorable opportunity of improving their financial condition. This country must for many years to come be an agricultural country. The great manufacturing cities of the Old World long established and strong in their own lines in plant and machinery, as well as in skilled labor, will continue to attract labourers and buyers. We in this country will long look to them for many articles necessary to our comfort and convenience.

But they must look to us for many articles of food. The Canadian mills cannot turn out the equal of a West of England broadcloth. The Canadian hen can, however, with proper care and attention, make as sweet meat and produce as fresh and well-flavored eggs as any bird of her kind in the world. It is said there is always room at the top—that the best will always find market. There is no line more fully exemplified than the egg and poultry business. The wider a man's experience is, the more he knows of agriculture and the things that pay on the farm, the less does he appreciate ripe eggs or those that have lain until foreign odours have penetrated the pores of the shell. If it be true that short accounts make long friends, it is not less true that promptly gathered eggs are best for market and best for table use. It is a wonder that the average Englishman will touch a Canadian egg. What we have forwarded to them in the past has been anything but satisfactory. "Poorly packed," "Not assorted," "Kept until stale," are the reports made by Canadian agents at English ports. European producers who understand their business, and are neither too proud nor too lazy to attend to their department promptly and intelligently, can pocket over fifteen millions of dollars on eggs yearly while from the English market Canadians cannot get up to one million.

Just think of it. Fifteen million dollars would pay interest on a large number of mortgages, would wipe out a great many liabilities, and would improve the financial condition of many a discouraged and depressed Canadian farmer.

WHAT I KNOW ABOUT POULTRY.

By James Anderson, Springfield Farm, Guelph, Ont.

In talking to a veteran poultry breeder lately I made the remark that there was not the same amount of money made from breeding poultry as there was twenty years ago—so many more in the business now. He replied, "If you have the best you can always find a demand for them." And I believe he is correct, as at our recently-held poultry show at Guelph I sold some of my prize geese and some of my prize turkeys very satisfactorily, while inferior stock you could scarcely give away.

Now, as I am a farmer myself and have been breeding poultry for the last 38 years, I will endeavor from a farmer's standpoint to give my experience to my brother farmers and others interested what little I know about chickens, turkeys, geese and ducks. I am convinced the best utility breed of fowls for a farmer to raise is the Plymouth Rock or the Wyandotte. I have tried 7 or 8 different breeds, and for a general purpose fowl nothing can beat the above. You have some four different colors of each to choose from, as they are all equally good for either egg production or table use. I have also a great liking for the light Brahma, having bred them for 25 or 30 years, and find them excellent, hardy birds; excellent winter layers if you get the right stamp; good mothers and not so persistent sitters as some breeds If for eggs only, nothing can beat the brown or white Leghorn, but the eggs are too small for shipping to the British market, the demand being for a large brown egg, which either the Wyandottes, P. Rocks, or light Brahmas supply. I often use the large light Brahma hen for setting my Toulouse goose eggs in the spring before the goose is inclined to sit, as I have known them to lay 35 or 40 eggs before the incubating fever came on them. I invariably set my duck eggs with the light Brahma hens. They can be moved without the slightest trouble, and are the quietest, easiest handled breed I know of.

One of my brother farmers remarked to me recently that there was more money in keeping hens than fattening steers these times. He keeps over 200 hens, and for the last two winters has sold to the two leading hotels in the city of Guelph $35 or $40 worth of eggs per month for the four months, commencing December 1st, getting 20 to 25 cents a dozen for them. Profitable as raising pigs has been of late years, it is never to be compared to chicken raising, as the same amount of grain fed to chickens as it takes to fatten a hog would bring double the amount of profit. So much has been said and written in our poultry papers and farm journals of late about how to feed poultry for the best production of eggs, and how to prepare them for the British market, that it would be superfluous for me to reproduce it here. The whole secret of success lies in keeping your fowls in a moderately warm place, feed them the right kind of food, supply them with a dust bath, keep them clean, free from vermin of all kinds, give them plenty of ground bones, green food of some kind, grit for digestion, oyster shells crushed for the formation of the shell of the egg, plenty of skim milk, which contains a great deal of allbumen, of which the white of the egg is chiefly composed. I find cut clover hay, if cured green, is excellent food for hens in winter. If you attend the above advice Biddy will shell out eggs all winter and cackle and be happy ; and above all if you have any first-class chickens or eggs for sale advertise well. I have been very successful in raising turkeys, and have got good prices for them. I made it a point when getting fresh blood always to get the best. I once paid $10 for a young gobbler, which was considered in these days an exhorbitant price, but it was the best paying investment I ever made, as I sold over $100 of his progeny next season. I sold to Mr. Page, Superintendent of Walnut Grove Poultry Farm, South Bend, Indiana, a year ago, a gobbler that now weighs 46½ lbs. He has never been beaten at the different poultry shows in Indiana and elsewhere in the U. S., so Mr. Page informed the "Mercury" reporter and myself yesterday when he visited our Guelph Fat Stock and Live Poultry Show, and he was one of the progeny of my $10 gobbler. So you see, as the veteran breeder remarked to me, "It pays to keep the best." And you will always find a market for them. Turkeys are a very valuable adjunct to the profits of the farm. One of my neighbors informs me that his wife keeps the house in groceries, etc., from the profits of her turkeys alone. Another neighbor informs me that his sister sold last year 95 turkeys, getting 8 and 10 cents a lb. for them. She fattened them principally on shorts and boiled potatoes. Turkeys are great foragers and consume millions of grasshoppers and other injurious insects. They are tender when young, but the hardiest of all domestic fowls when adult ; in fact they will not stand close confinenent, and too warm a place in winter will be sure to bring on roup or some other disease. I have had trouble with lice on the young ones, but a little insect powder or sulphur dusted over them will soon cure that. I find chopped dandelion leaves and young onion tops mixed with a little scalded corn meal excellent food for young turkeys, the dandelions being an excellent tonic. Beware of wet damp grass or heavy showers of rain when very young. After they are six weeks or two months old they as a rule are very hardy. I consider the M. Bronze the most profitable and most hardy variety. I have had young turkeys, dressed for the table, at our Guelph Fat Stock Show, weighing eighteen or nineteen lbs. each, for which I received 10 cents a lb. I had a one and a half year old bird "dressed" weighed over thirty lbs. last year and for which I got first prize at "the Smithfield of Canada." I showed one this year alive, weighing at same show thirty-eight lbs.—last year's bird. Now this seems like blowing, but it is not, as I want to show you what my brother farmers can do as well as I can if they only keep the best of everything.

I give my birds no special care—in fact I could make a great deal more out of them if I gave them more attention. But as I have rented my farm for the last few years, and as I have all the grain to purchase I feed my fowls, I find it costs more than when I had the granary bin to go to and help myself, and they, too, often have to forage for themselves.

Geese. When I commenced farming 38 years ago, I had a great antipathy to keep geese, as I always understood they injured the pasture so that other animals would not eat after them, but after 35 years experience I find they are the most profitable kind of poultry a farmer can raise, provided he can keep them out of his grainfields. I find the Toulouse the hardiest, most prolific and easiest fattened. A cross with the African and Toulouse makes a very large bird. I have seen them weigh over thirty lbs., and show at our Christmas fat stock show twenty-three and twenty-four lbs. dressed for the table—shown by a Mr. Wm. Thompson. Mr. Buchanan, my next neighbor, has taken the prize for fat geese at the same show for eighteen years in succession with the same cross. He called it Chinese, but it is the African; his weighed nineteen and twenty lbs. dressed. Geese live to a great age, some say one hundred years. Mr. Chas. O. Flagg, says he has known a Toulouse goose lay sixty-five eggs in one season. I have had them lay forty-five in one season. If you want them to lay on just shut them up for a few days when the sitting fever comes on and feed them sparingly and they will soon commence laying again.

William Rankin, a veteran goose breeder, cites an instance of a goose owned by a man in Boxfor, Mass., where it was the property of one family for 101 years and was then killed by the kick of a horse. Some fanciers say a goose will breed for fifty years and do well. I had an old Toulouse goose twenty-five years which bred well to that age and was accidentally killed, I believe, while I was away in the old country. Ganders should not be kept so long, as they are more prolific from two to ten years of age. A gander will mate with three or four females and the eggs are prolific, but he generally has a preference for one particular favorite, whose nest he will guard with special care. Mr. Rankin says he has made as much from one Toulouse goose in one year as from the best cow in his stable. I can believe it if, as he says, sixty-five eggs can be got and hatched out, as they are always worth $5 and $6 a pair for breeding purposes. I can get that for all I can produce. And above all, what is better than a good, well cooked young goose for a Christmas dinner? They are very easily fattened. I shut them up for three weeks and feed them on boiled potatoes, mixed with oat meal, corn meal or a little shorts, and a little Thorley's food or other cattle spice as a relish through it.

I see by the papers that a Toronto firm has been shipping tons of turkeys, etc., to the Old Country this season, and that the firm of Meldrum &Co., Montreal, are receiving for shipment to England between 2,000 and 4,000 turkeys daily, and will continue the same for another month. They expect to ship altogether between 60,000 and 80,000 birds. We should appreciate the efforts of the Hon. Mr. Fisher and Prof. Robertson in providing cold storage for poultry and other perishable farm products that the farmer produces.

Ducks. My experience in duck-raising has extended over some thirty-eight years—in fact ever since I have farmed for myself—and as the river Speed runs through the centre of my farm I have one of the best places for duck culture in the Dominion. After the first six weeks they can find their own living, as the river abounds in crawfish and other mollusks on which they delight to feed. They are always fat. There is a pasture on both sides of the river, and geese and ducks luxuriate there. I have tried the three different breeds, Pekin, Aylesbury and Rouen. The former is the most popular, as it is the largest, at least to look at, commences to lay the earliest, and where you have plenty of water is a profitable duck to raise. The Aylesbury is more tender, although an excellent table bird. I find the Rouen the most profitable of the three breeds. They are hardy, easily fattened, and if you have the right breed will weigh just about as much as the other breeds. I have had them dressed eight lbs. each at our Christmas fat stock show. Ducks are omniverous, are great feeders, and if you feed them well from the time they are hatched they ought to be fit for market at three months old, which is the proper time to sell, as the prices are higher then than in the fall. The same feed will fatten them as geese, and there is a greater demand for good fat young ducks than for any other class of poultry. And a more toothsome bird cannot be put on the table than a well cooked, well fattened young duck. The Cayuga is a smaller bird, but is a very hardy duck, and is excellent for the table. They have more the flavor of the wild duck than the others, and are highly appreciated by gourmands for their delicate flavor. I have now given you my experience, and hope it may benefit some one.

"IFS" AND "ITS" FOR FARMERS ON POULTRY.

BY JOSEPH DILWORTH, HASTINGS.

If a farmer wants to make money out of poultry, let him provide suitable buildings. If a farmer will use his brains at the same time he uses his hands and feet, in raising poultry for profit, he is bound to succeed. It is important that he should make a good beginning, and it is equally important that he should begin at the right time. If you want hens for egg production, keep small breeds—Leghorns, Andalusians, Minorcas. If for general purpose, Plymoth Rocks, Wyandottes.

If you want your hens to lay the bulk of their eggs in December, January, February March and April, commence feeding in November the following: Cooked lean meat every other morning, scraps from the table mixed with equal parts of shorts, ground barley, ground oats, and plenty of clean water; for the evening meal give good sound wheat, and a change with Indian corn twice a week, also ground oyster shell, ground bone and a liberal supply of green stuff. This being regularly done along with comfortable accommodation, the supply of eggs will follow. It is claimed that a pen of pullets without male birds will produce eggs at one-third less cost. If a farmer would remove all the male birds from his flock, after the breeding season is over, and put the eggs in a cool, dry cellar, the eggs would keep perfectly good for winter use.

It is a bad thing to let your fowl have access to dirty water, and I believe it is one of the causes of many diseases. If you want to prevent feather-eating, give boiled meat or liver, two or three times a week, and don't have them too much crowded, having at least six inches of space for each bird on perches. It is a very great mistake to keep one bird more than you have room for, as each bird should have not less than six to eight square feet. If you can't do this, you had better kill the rest. It never pays to keep a hen more than three laying seasons. Under no consideration keep fifty fowls if you have only room for thirty. If a farmer would take care of the poultry manure, by keeping it in a dry shed during the winter months, he would find it of untold value as a fertilizer. It is said by good authority that hen manure is worth one-half the cost of the food the fowl will eat. The following is a correct comparison: In a ton of well rotted barnyard manure there are six pounds of phosphoric acid, ten pounds of potash, and eleven pounds of nitrogen. In a ton of hen manure there are forty pounds of phosphoric acid, forty-one pounds of potash, and sixty-seven pounds of nitrogen. In speaking with a prominent farmer on the manure subject, he told me he saved all his hen manure and treated it as follows: To every barrel of hen manure he added one barrel of lime, and two barrels of wood ashes, mixed them together and allowed them to heat up. After cooling off for a few days he put it through a coarse sieve, then added another barrel of wood ashes, and he declares it to be the best fertilizer he ever used, and that his root crops were immense.

It is a bad thing to have sick poultry, and also quite unnecessary to have them, so that a few words at this time on this question may not be amiss. There are no animals more naturally healthy than poultry, the trouble generally being with the owner. That which would make a human being sickly, will make poultry sickly. We will suppose six or eight of you were crowded into a small room, with scarcely room enough to swing a cat, and with no ventilation, compelling you to breathe the same air over and over again, day after day, and month after month, do you think you would be healthy? Or, if you were compelled to drink impure water, and eat unwholesome food constantly, do you think you would feel well? I fear not. It is precisely the same with poultry as with yourselves. More than nine-tenths of the sickness with fowl is occasioned by a badly ventilated building, a cold damp floor, impure water, unwholesome food, too much crowded, too much food, and too little exercise. If your poultry house is cold I would not advise you to gorge them with a hot breakfast in the winter months, but rather give them dry grain, buried deep in the chaff or litter, so that they can scratch to their hearts' content from daylight till dark. A sensible woman said, "My fowls are never troubled with croup or colds, because I never allow them, either old or young, to roost out of doors, I keep them in their house during wet or cold windy days, and as soon as the nights get cool, I keep them in until nine or ten o'clock in the morning, and then at night their last feed is given inside, and the door or hole shut. I used to be troubled some years ago, and found it was the young stock and late moulting hens that commenced first, but the above treatment is a preventive. Experience has been a good teacher to me." Its a very common thing for a farmer to have roosts placed from five to twelve feet high, which is not only thoughtless but positively cruel, thus causing the birds to alight very heavily on the floor, bruising the bottom of the feet in so doing, and the feet become hot and feverish, painful, and more or less swollen. Sometimes an abscess forms and fills with pus, and such being the case, it must be opened with a sharp knife or razor and poulticed twice a day until the inflammation is reduced. Corns are also caused by perches being too high, and by perches that are too small and too narrow, which compel the fowls to grasp them too tightly, in order to maintain their position. This firm grasp, night after night, affects the circulation of the part of the foot that comes in closest contact with the perch, and thus results in swelling and thickening of the skin. To prevent this you should have broad, flat perches, say 2x4 scantling, flat side down and not too high from the floor, in any case not more than two feet, and for heavy birds not more than one foot. Keep the floor covered with a dry, soft litter, in which to alight.

If you want to be a successful poultry raiser and fancier, whether you be farmer or yeoman, you must have the "American standard." I am a firm believer in having a standard for everything; I also believe in having a high standard, one that will require the best skill to reach. I have no use for John Brown's standard any more than I have for John Smith's. Let us stick to the authorized standard. I do hope that before long England, Ireland and Scotland will adopt the American standard, and before the next revision I hope they will send their representatives to take part in it.

POULTRY EXHIBITION.

HELD AT THE CITY OF TORONTO, JANUARY 9TH TO 13TH, 1899.

List of varieties on exhibition and the number of each :

Varieties.	No. of specimens.	Varieties.	No. of specimens.
Brahmas	81	Houdans	22
Cochins	102	Creve Cœurs	3
Plymouth Rocks	270	La Fleche	10
Games and Game Bantams	335	Polands	108
Bantams	173	Red Caps	5
Langshans	66	Sultans	6
Wyandottes	203	A. O. V. Fowls	41
Leghorns	230	Orpingtons	13
Andalusians	24	White Wonders	22
Hamburgs	55	Cross Breds	3
Dorkings	66	Dressed fowls and eggs	9
Dominiques	12	Turkeys	60
Javas	43	Geese	45
Spanish	24	Ducks	76
Minorcas	72	Pheasants and Pigeons	242
			2,421

Names of places represented in the exhibition, and the number of specimens from each :

Place.	County.	No. of entries.	Place.	County.	No. of entries.
Angus	Simcoe	14	St. Marys	Perth	18
Brantford	Brant	39	Sheffield	Wentworth	8
Bowmanville	Durham	26	St. Thomas	Elgin	30
Bridgeburg	Welland	13	Stratford	Perth	25
Bracondale	York	2	St. Catharines	Lincoln	16
Davisville	York	6	Toronto	York	494
Dresden	Kent	2	Tilsonburg	Oxford	35
Dunbarton	Ontario	10	Wilton Grove	Middlesex	21
Durham	Grey	28	Woodstock	Oxford	29
Deer Park	York	14	Whitby	Ontario	41
Drumquin	Halton	8	Watford	Lambton	10
Eglinton	York	19	Welland	Welland	18
Fergus	Wellington	19	Weston	York	17
Georgetown	Halton	22	Wyoming	Lambton	7
Guelph	Wellington	88	Owen Sound	Grey	17
Galt	Waterloo	7			
Grimsby	Wentworth	6			
Glencoe	Middlesex	7		Quebec.	
Hamilton	Wentworth	57			
Kingston	Frontenac	58	East Angus	Quebec	3
Kossuth	Waterloo	6	Jerome	Quebec	16
Kleinburg	York	5	Sherbrooke	Quebec	8
London	Middlesex	498			
Lindsay	Victoria	14		United States.	
Malvern	York	8			
Morden	Manitoba	2	East Aurora	New York	10
Milton	Halton	32	Egypt	New York	15
Mitchell	Perth	27	Fabius	New York	15
Norway	York	7	E. Litchfield	Conn	2
Norwich	Oxford	8	Fisher's Island	New York	31
North Glanford	Wentworth	11	Johnston's Creek	New York	50
Oshawa	Ontario	25	Malden	Mass	16
Oil Springs	Lambton	2	Monroe	Conn	10
Osaca	Durham	2	Meadville	Pa	8
Ottawa	Carleton	4	New Haven	Vermont	13
Petrolea	Lambton	13	Oswego	New York	23
Port Hope	Durham	66	Patterson	New York	27
Parkdale	York	3	Piermont	New Hampshire	9
Palmerston	Wellington	56	Rochester	New York	12
Paris Station	Brant	43	Sprakers	New York	6
Strathroy	Middlesex	29	Waltham	Mass	11
Rockton	Wentworth	16	Winchester	New Hampshire	27
					2,421

PRIZE AWARDS.

List of Prize Winners at the Ontario Poultry Show of 1899, Held at Toronto, January 9th to 13th.

Trophy Cups.

Donated by the American Poultry Association, open to members A.P.A., for the best 2 Cocks, 2 Hens, 2 Cockerels and 2 Pullets in the following classes (one or more specimens taken from each or all from one of the varieties comprising the class named):

1. Asiatic class.—Won by Wm. McNeil, London, Ont.
2. American class.—Won by James Forsythe, Owego, N.Y.
3. Game class.—Won by E. M. & W. Ferguson, Fisher's Island, N.Y.
4. Polish class.—Won by Allan Bogue, London, Ont.

Toronto Poultry and Pet Stock Association Cups.

For best collection, one color, in each of the following varietiies:

1. Brahmas.—Won by Sage & Garside, London, Ont.
2. Cochins.—Won by Wm. McNeil, London, Ont.
3. Plymouth Rocks.—Won by R. H. Essex, Toronto.
4. Wyandottes.—Won by Jas. Arthur, London.
5. Minorcas.—Won by G. W. Jerome & Co., Fabius, N.Y.
6. Hamburgs and Red Caps.—Won by Richard Oke, London.
7. Game Bantams.—Won by H. B. Donovan, Toronto.
8. Ornamertal Bantams, solid color.—Won by Wm. McNeil, London.
9. Miss. Dominiques, Sultans, Latleche, Creves, and A. O. V.—Won by R. Oke, London.
10. Geese and Ducks.—Won by O'Brien & Colwell, Paris Station.
11. Turkeys.—Won by W. H. Beattie, Wilton Grove.

Hiram Walker & Sons' Cup.

For best pair of Fowls in Show, to be won three times.—Won by Wm. McNeil, London.

Reliable Poultry Journal Cup.

For best Cock, Hen, Cockerel and Pullet (White Wyandottes), to be won three times)—Won by A. R. Shilling, Egypt, N.Y.

Standard Silver Plate Co. Cup.

For best collection of Pigeons.—Won by H. B. Donovan, Toronto.

ASIATICS.

(For the initials and post office addresses of winners see List of Membeıs.)

Light Brahmas.

Cock.—1st and 4th, Hutton; 2nd, Sisley; 3rd, Secker.
Hen.—1st, Cox; 2nd and 3rd, Hutton; 4th, Gould.
Cockerel.—1st, Cox; 2nd and 3rd, Hutton; 4th, Gould.
Pullet.—1st, 3rd and 4th, Hutton; 2nd, Cameron.
Best male, Cox; best female, Hutton.
Best cock, Hutton; best hen, Cox.
Best pair, Cox; best four pullets, Hutton.

Dark Brahmas.

Cock.—1st and 2nd, Sage & Garside; 3rd, John Thomson.
Hen.—1st and 3rd, Sage & Garside; 2nd, Mantel.
Cockerel.—1st and 2nd, Sage & Garside: 3rd, John Thomson.
Pullet.—1st and 2nd, Sage & Garside.
Best male, Sage & Garside; best female, Sage & Garside.
Best cockerel, Sage & Garside; best collection (light included), Sage & Garside.

Buff Cochins.

Cock.—1st, Wyatt ; 2nd, Stewart ; 3rd, Pierce Bros. ; 4th, Hare.
Hen.—1st and 3rd, Hare ; 2nd and 4th, Dr Bell.
Cockerel.—1st, Hare ; 2nd, Dr. Bell ; 3rd, Emrick ; 4th, Stewart.
Pullet.—1st, Stewart ; 2nd, Wyatt ; 3rd, Hare ; 4th, Dr. Bell.
Best male, Hare ; best female, Hare.
Best cockerel and pullet, Stewart ; best bird of 1898, Hare.
Best pair, Hare ; best collection, one color, Wm. McNeil (White Cochins).

Partridge Cochins.

Cock.—1st, Oke ; 3rd, Plastow.
Hen.—1st and 2nd, Wyatt ; 3rd, Oke.
Cockerel.—1st and 2nd, Wyatt ; 3rd, Oke.
Pullet.—1st and 3rd, Wyatt ; 2nd, Oke.
Best male, Oke ; best female, Wyatt.
Best pair, Wyatt.

Black Cochins.

Cock.—1st, Tozer ; 2nd and 3rd, Millard.
Hen.—1st, Millard ; 2nd, Emrick ; 3rd, George Bogue.
Cockerel.—1st and 2nd, Millard ; 3rd, George Bogue.
Pullet.—1st, 2nd and 3rd, Millard.
Best male (white included), McNeil ; best female (white included), Millard.
Best pair (any color), McNeil ; best pair (black), Millard.

White Cochins.

Cock.—1st, 2nd and 3rd, McNeil.
Hen.—1st, Millard ; 2nd and 3rd. McNeil.
Cockerel.—1st and 2nd, McNeil ; 3rd, Millard.
Pullet.—1st and 2nd, McNeil ; 3rd, Millard.

Black Langshans.

Cock.—1st, R. B. Hill ; 2nd, Karn ; 3rd, Scott ; 4th, McCurdy.
Hen.—1st, Scott ; 2nd and 4th, McCurdy ; 3rd, Armstrong Bros.
Cockerel.—1st, McCurdy ; 2nd, Davidson ; 3rd and 4th, Scott.
Pullet.—1st and 2nd, McCurdy ; 3rd, Scott ; 4th, E. J. Deway.
Best Cockerel, McCurdy.

A. O. Color Langshans.

Cock.—1st, Webber.
Hen.—1st, Webber ; 2nd, Karn ; 3rd, W. E. Robinson.
Cockerel.—1st, Webber ; 2nd, Karn ; 3rd, Burns.
Pullet.—1st, W. E. Robinson ; 2nd, Webber ; 3rd, Karn.
Best collection (black included), F. R. Webber ; pair. Webber.
Best female, Scott ; best two pairs (one dressed), McCurdy.
A. P. A. Cup.—Best collection in the Asiatic classes, Wm. McNeil.

AMERICAN CLASSES.

Barred Plymouth Rock.

Cock.—1st, J. H. Thompson ; 2nd, Ferguson ; 3rd, Bright ; 4th, Schwab Bros.
Hen.—1st, McCormack & Sons ; 2nd, Bright ; 3rd, Knight ; 4th, J. H. Thompson.
Cockerel.—1st, Miller ; 2nd and 3rd, Bright ; 4th, Bennett.
Pullet.—1st, Ferguson ; 2nd, Faulkner ; 3rd and 4th, Bright.
Specials.—Best cock, hen, cockerel, pullet, Bright.
Best collection (one color), R. H. Essex.
Best bird and pair and pullet, Ferguson.
Best cock, Thompson ; hen, McCormick ; cockerel, Miller.

White Plymouth Rock.

Cock.—1st, Ferguson ; 2nd, Daniels ; 3rd, Barker & Muir.
Hen.—1st, Rice ; 2nd, Daniels ; 3rd, Jerome & Co. ; 4th, Ferguson.
Cockerel.—1st, Rice ; 2nd, Barker & Muir ; 3rd, H. Elliott.
Pullet.—1st, Minshall ; 2nd. Rice ; 3rd and 4th, Jerome & Co.
Specials.—Largest collection and best male Ferguson.
Best female and hen and pair, R ce.

Buff Plymouth Rock.

Cock.—1st, Forsythe ; 2nd, Essex ; 3rd, Henderson & Billings ; 4th, Daniels.
Hen.—1st, Forsythe ; 2nd and 3rd, Essex ; 4th Kedwell
Cockerel.—1st, Scott ; 2nd, Forsythe ; 3rd, Essex ; 4th, Bonnick.
Pullet.—1st, Foley ; 2nd Essex ; 3rd, Cook ; 4th, Livingstone.
Best male, (white included) Forsythe ; best female, (white included) Foley.
Best cock and hen, Forsythe ; best collection (buffs), Essex.

Golden Wyandottes.

Cock.—1st, Graham ; 2nd, Oldrieve ; 3rd, Wray Bros ; 4th, Henderson & Billings.
Hen.—1st, Graham ; 2nd, Magill ; 3rd and 4th, Lenton.
Cockerel.—1st, Wray Bros. ; 2nd and 4th, Oldrieve ; 3rd, Magill.
Pullet.—1st, Graham ; 2nd and 3rd, Magill ; 4th, Lenton.
Best male, Wray Bros. ; best female, A. W. Graham.
Special.—Best hen and pullet, Graham ; best collection (one color), Arthur (Silver).

Silver Wyandottes.

Cock.—1st, Arthur ; 2nd, Henderson & Billings ; 3rd and 4th, J. E. Meyer.
Hen.—1st, Wray Bros. ; 2nd and 3rd, Arthur ; 4th, Henderson & Billings.
Cockerel.—1st and 4th, Henderson and Billings ; 2nd and 3rd, Arthur.
Pullet.—1st, Arthur ; 2nd, Meyer ; 3rd, Geo. Bogue ; 4th, Wray Bros.
Specials.—Best male and cockerel, Henderson & Billings ; best female, Jas. Arthurs ; best hen, Wray Bros.

Black Wyandottes.

Cock.—1st, Wedgery ; 2nd and 3rd, Grimsley.
Hen.—1st and 3rd, Grimsley ; 2nd, Wedgery.
Cockerel.—1st, Wedgery ; 2nd, Geo. Bogue ; 3rd, Oke.
Pullet.—1st and 3rd, Wedgery ; 2nd, Grimsley.
Specials.—Best male and pullet, Wedgery ; best female, Grimsley.

Buff Wyandottes.

Cock.—1st, Forsythe ; 2nd, Shilling ; 3rd, Essex.
Hen.—1st, Forsythe ; 2nd and third, Mrs. Shales.
Cockerel.—1st, Forsythe ; 2nd, Mrs. Shales ; 3rd, Dundas.
Pullet.—1st, Mrs Shales ; 2nd, Forsythe ; 3rd, Dundas ; 4th, Shilling.
Specials.—Best male, female and hen, Forsythe ; best bird shown by lady, Mrs. Shales.

White Wyandottes.

Cock.—1st, Shilling ; 3nd, Moore ; 3rd, Mrs. Shales ; 4th, Massie.
Hen.—1st, Moore , 2nd, Shilling ; 3rd, Bryant ; 4th, Mrs. Shales.
Cockerel.—1st and 3rd, Shilling ; 2nd Massie ; 4th, Forsythe.
Pullet.—1st, Massie ; 2nd, A. Hill ; 3rd, Forsythe ; 4th, Moore.
Specials.—Best male and largest collection, Shilling ; best female and pair, Massie ; best cock, hen cockerel and pullet, Shilling.

Dominiques.

Cock.—1st, Fink ; 2nd, Geo. Bogne.
Hen.—1st, Fink ; 2nd, Geo. Bogue.
Cockerel.—1st, Geo. Bogue.
Pullet.—1st, Geo. Bogue ; 2nd, Luxton ; 3rd, Luxton.
Specials.—Best male, (miscellaneous) Fink ; best female, (miscellaneous) Oke ; collection, (miscellaneous and French included) Oke.

Black Javas.

Cock.—1st, Turpin & Peters ; 2nd and 4th, Thos. Brown ; 3rd, Webber.
Hen.—1st, Knight ; 2nd and 3rd, Thos. Brown ; 4th, Webber.
Cockerel.—1st Knight ; 2nd Webber ; 3th, Cale & Merry.
Pullet.—1st and 2nd, Barker and Muir ; 3rd, Thos. Brown.
Specials.—Best male (Java) Turpin & Peters ; best female, Knight ; best black hen, Knight ; collection (one color) Thos. Brown.

A. O. Color Javas.

Cock.—1st, Oke ; 2nd, Webber.
Hen.—1st, Oke ; 2nd, Daniels ; 3rd, Webber.
Cockerel.—1st, Oke ; 2nd and 3rd, Daniels
Pullet.—1st and 2nd, Oke.
A. P. A. Cup.—Best collection American classes, Jas. Forsythe.

White Wonders.

Cock.—1st, 2nd and 3rd, Mrs. May French.
Hen.—1st, 2nd and 3rd, Mrs. May French ; 4th, H. W. Heath.
Cockerel.—1st, Mrs. May French.
Pullet.—1st, 2nd and 3rd, Mrs May French ; 4th, H. W. Heath.
All specials in this class, Mrs. French.

MEDITERRANEAN CLASSES.

R. C. White Leghorns.

Cock.—1st, Burn ; 2nd, Page ; 3rd, W. J. Bell.
Hen.—1st, Oke ; 2nd, Page ; 3rd, W. J Bell.
Cockerel.—1st, Page ; 2nd, Oke ; 3rd, Tozer.
Pullet.—1st Page ; 2nd, Oke ; 3rd, Burn.
Specials.—Best white male, Page ; best white female, Ramsay.

S. C. White Leghorns.

Cock.—1st, Doyle ; 2nd, Rice ; 3rd, A. W. Graham.
Hen.—1st and 2nd, Ramsay ; 3rd, S. R. Graham ; 4th, Chambers.
Cockerel.—1st, Wolfe ; 2nd and 4th, Trew ; 3rd, Ramsay.
Pullet.—1st, Ramsay ; 2nd, Thos. Brown ; 3rd, Chambers ; 4th, Rice.
Specials.—Best white cockerel, Wolfe.

Black Leghorns.

Cock.—1st, A. G. Brown.
Hen.—1st, Daniels ; 2nd, A. G. Brown ; 3rd, Bonnick ; 4th, Irving.
Cockerel.—1st, A. G. Brown ; 2nd, Phipps Bros. ; 3rd, Murray.
Pullet.—1st, Daniels ; 2nd and 3rd, A. G. Brown ; 4th, Phipps Bros.
Best male, A. G. Brown ; best female, E. J. Daniels ; best pullet, Daniels.

R. C. Brown Leghorns.

Cock.—1st and 3rd, Henderson & Billings ; 2nd, Boyle & Son.
Hen.—1st, Henderson & Billings ; 2nd, Tozer ; 3rd, Boyle & Son.
Cockerel.—1st, Tozer ; 2nd, Henderson & Billings ; 3rd, Thos. Brown.
Pullet.—1st, Henderson & Billings ; 2nd, Roddy ; 3rd, Boyle & Son.
Specials.—Largest collection, (one color) Bryant ; best brown male and cockerel, Forsythe ; best brown female, James & Taggart ; best R. C. pair, Henderson & Billings.

S. C. Brown Leghorns.

Cock.—1st, Dewar Bros. ; 2nd, Forsythe ; 3rd, Tozer ; 4th, L. G. Henderson.
Hen.—1st and 3rd, Forsythe ; 2nd, Dewar Bros. ; 4th, Thos. Brown.
Cockerel.—1st, Forsythe ; 2nd, Knight ; 3rd, L G. Henderson ; 4th, Dewar Bros.
Pullet.—1st, James & Taggart ; 2nd, Bradley ; 3rd, Dewar Bros. ; 4th, Forsythe.
Largest collection S. C. B., Tozer.

Buff Leghorns.

Cock.—1st, Berner ; 2nd, Dundas ; 3rd and 4th, Hollingshead.
Hen.—1st, Berner ; 2nd and 3rd, Whillans ; 4th, Dundas.
Cockerel.—1st, Spry & Mick ; 2nd, S. N. Graham ; 3rd, Dundas ; 4th, Doyle.
Pullet.—1st and 2nd, Berner ; 3rd, Spry & Mick ; 4th, Pearson.
Best male, Berner ; best pair, Berner ; best female, Berner ; cockerel and best pair chicks, Spry & Mick.

Black Spanish.

Cock.—1st, Burn ; 2nd, Knight , 3rd, Henderson & Billings.
Hen.—1st and 2nd, Hare ; 3rd, Henderson & Billings.
Cockerel.—1st and 3rd, Hare ; 2nd, Corcoran.
Pullet.—1st and 3rd, Hare ; 2nd, Corcoran.
Best male, F. C. Hare ; best cockerel, Hare ; best female, Hare ; best collection, (Andalusians included) Newton Cosh.

Black Minorcas.

Cock.—1st and 2nd, Carter ; 3rd, Mrs Shales.
Hen.—1st and 2nd, Minshall ; 3rd Carter ; 4th, Jarrot.
Cockerel.—1st, Senior ; 2nd, Durston ; 3rd, Minshall ; 4th, Jarrott.
Pullet.—1st, Minshall ; 2nd, Durston ; 3rd, Carter ; 4th, Gray.
Best male, T. J. Senior ; best female, J. H. Minshall ; best pullet, Minshall ; best pair chicks, Durston : best cockerel, Senior.

White Minorcas.

Cock.—1st, Jerome & Co. ; 2nd, Senior ; 3rd, Essex.
Hen.—1st and 2nd, Jerome & Co. ; 3rd, Murray.
Cockerel.—1st, 2nd and 3rd, Jerome & Co. ; 4th, Senior.
Pullet.—1st, 2nd and 3rd, Jerome & Co. ; 4th, Senior.
Best collection, (one color) Jerome ; best male and female and pullet, Jerome.

Andalusians.

Cock.—1st and 2nd, Cosh ; 3rd, Knight.
Hen.—1st and 2nd, Cosh ; 3rd, Knight.
Cockerel.—1st, 2nd and 3rd, Cosh.
Pullet.—1st and 2nd, Cosh ; 3rd, Knight.
Best male, Cosh ; best hen, Cosh ; best female, Cosh.

HAMBURG CLASSES.

G. S. Hamburgs.

Cock.—1st. McNeil ; 2nd, Oke.
Hen.—1st, Oke ; 2nd, McNeil.
Cockerel.—1st, Oke ; 2nd, McNeil.
Pullet.—1st, McNeil ; 2nd, Oke.
Best cockerel, Oke ; best collection, (one color including Red Caps) Oke.

S. S. Hamburgs.

Cock.—1st, McNeil ; 2nd, Oke.
Hen.—1st, Oke ; 2nd, McNeil.
Cockerel.—1st, McNeil ; 2nd, Oke.
Pullet.—1st, McNeil ; 2nd, Oke.
Best male (G. S. included) McNeil ; best female, (G. S. included) McNeil ; best bird of 1898, (all Hamburgs included) McNeil ; best silver pullet, McNeil.

G. P. Hamburgs.

Cock.—1st, McNeil ; 2nd, Oke.
Hen.—1st, McNeil ; 2nd, Oke.
Cockerel.—1st, McNeil ; 2nd, Oke.
Pullet.—1st, Oke ; 2nd, McNeil.

S. P. Hamburgs.

Cock.—1st and 3rd, Oke ; 2nd, McNeil.
Hen.—1st and 2nd, Oke.
Cockerel.—1st, McNeil ; 2nd and 3rd, Oke.
Pullet.—1st, McNeil ; 2nd and 3rd, Oke.
Best male, (G. P. included), McNeil ; best female, (G. P. included), Oke ; best pullet, (S. P.), McNeil.

Black Hamburgs.

Cock.—1st, McNeil ; 2nd, Oke ; 3rd, Turp.
Hen.—1st, Oke ; 2nd, McNeil ; 3rd, Jas. Henderson.
Cockerel.—1st, McNeil ; 2nd, Oke ; 3rd, Elliott.
Pullet.—1st, McNeil ; 2nd, Oke ; 3rd, Jas. Henderson.
Best male, McNeil ; best female, McNeil ; best hen, Oke.

Red Caps.

Cock.—1st, Daniels.
Hen.—1st and 2nd, Daniels.
Cockerel.—1st, Daniels.
Pullet.—1st, Daniels.
Best male, C. J. Daniels ; best female, C. J. Daniels ; best hen, C. J. Daniels.

GAMES.

Black Red Game.

Cock.—1st, John Crowe ; 2nd, Close Bros. ; 3rd, Pierce Bros. ; 4th, Main.
Hen.—1st, Barber ; 2nd, Main ; 3rd and 4th, Pierce Bros.
Cockerel.—1st, Main ; 2nd, Jno. Crowe ; 3rd and 4th, Pierce Bros.
Pullet.—1st and 4th, John Crowe ; 2nd, McLand ; 3rd, Main.
Best bird of 1898, Wm. Barber ; best collection (one color), Ferguson (Indian Game).

Brown Red Game.

Cock.—1st, Pierce Bros. ; 2nd and 3rd, Barber.
Hen.—1st and 4th, Barber ; 2nd and 3rd, Jno. Crowe.
Cockerel.—1st, Pierce Bros. ; 2nd and 3rd, Close Bros.
Pullet.—1st, Pierce Bros. ; 2nd and 3rd, Barber.
Best male (Black R. included), Pierce Bros. ; best female (Black R. included), John Crowe ; best cockerel, Pierce Bros.

Duckwing Game.

Cock.—1st and 2nd, Barber ; 3rd, Pierce Bros.
Hen.—1st, Troth ; 2nd, Pierce Bros. ; 3rd. Barber.
Cockerel.—1st and 2nd, Barber ; 3rd, Close Bros.
Pullet.—1st, Goulding & Son ; 2nd and 3rd, Barber.

Pyle Game.

Cock.—1st, Jno. Crowe ; 2nd, Pierce Bros. ; 3rd, Barber ; 4th, O'Brien & Colwell.
Hen.—1st, Pierce Bros. ; 2nd, Barber ; 3rd, John Crowe ; 4th, Close Bros.
Cockerel.—1st and 3rd, Barber ; 2nd, Pierce Bros. ; 4th, Close Bros.
Pullet.—1st and 4th, Jno. Crowe ; 2nd, Sherlock ; 3rd, Barber.
Best male (Duckwing included), Barber ; best female (Duckwing included), Troth ; best pullet, Jno. Crowe.

Indian Game.

Cock.—1st, Ferguson ; 2nd, Richardson ; 3rd, Currie and Wright.
Hen.—1st and 2nd, Ferguson ; 3rd, Richardson.
Cockerel.—1st, Nims ; 2nd and 3rd, Ferguson ; 4th, Hillman.
Pullet.—1st and 3rd, Ferguson ; 2nd, W. E. Robinson.

A. O. S. Variety Game.

Cock.—1st, Ferguson ; 2nd, Daniels ; 3rd, Spraker ; 4th, Burn.
Hen.—1st, Burn ; 2nd, Daniels ; 3rd, Spraker ; 4th, Ferguson.
Cockerel.—1st, Ferguson ; 2nd, Spraker ; 3rd and 4th, Daniels.
Pullet.—1st and 4th, Spraker ; 2nd, Daniels ; 3rd, Ferguson.
Best male (Indian included), not awarded ; best female (Indian included) and pair, Ferguson. A.P.A. Cup—Best collection of Games, E. M. & W. Ferguson.

GAME BANTAM CLASSES.

Black Red Game Bantams.

Cock.—1st, C. R. Crowe ; 2nd, Dewar Bros. ; 3rd, Barber.
Hen.—1st, Dewar Bros. ; 2nd, Barber ; 3rd, C. R. Crowe.
Cockerel.—1st, Barber ; 2nd, C. R. Crowe ; 3rd, Furminger ; 4th, Oldrieve.
Pullet.—1st and 2nd, Barber ; 3rd, Oldrieve ; 4th, C. R. Crowe.

Brown Red Game Bantams.

Cock.—1st, Turville ; 2nd, Oldrieve ; 3rd, Jas. McCormack.
Hen.—1st, Oldrieve ; 2nd and 3rd, Turville.
Cockerel.—1st, Bonnick ; 2nd and 3rd, Barber.
Pullet.—1st and 3rd, Turville ; 2nd, Bonnick.
Best male (Black Red included), not awarded ; best female (Black Red included) not awarded ; best bird of 1898, and cockerel, Barber ; best collection (one color), Donovan (A.O.V.)

Duckwing Game Bantams.

Cock.—1st, Oldrieve ; 2nd, Turville ; 3rd, Barber.
Hen.—1st, Barber ; 2nd, Oldrieve ; 3rd, Close Bros.
Cockerel.—1st, Turville ; 2nd, Barber ; 3rd, Close Bros.
Pullet.—1st, Close Bros. ; 2nd, Turville ; 3rd, Barber.
Best pullet, Close Bros.

Pyle Game Bantams.

Cock.—1st, Close Bros. ; 2nd and 3rd, Barber.
Hen.—1st, Close Bros. ; 2nd and 3rd, Barber.
Cockerel.—1st and 2nd, Barber ; 3rd, Close Bros.
Pullet.—1st, Mitchheltree ; 2nd and 3rd, Barber.
Best male (Duckwing included), Turville ; best female (Duckwing included), Mitchetree ; best cockerel, Barber ; best collection (Pyle), Barber.

A. O. V. Game Bantams.

Cock.—1st and 3rd, Donovan ; 2nd, Keiley.
Hen.—1st, 2nd and 3rd, Donovan.
Cockerel.—1st and 2nd, Donovan ; 3rd. Keiley.
Pullet.—1st and 2nd, Donovan ; 3rd, Keiley.
Best male, H. B. Donovan ; best female, Donovan.

ORNAMENTAL BANTAMS.

Golden Sebright.

Cock.—1st, Oke ; 2nd, McNeil.
Hen.—1st, Oke ; 2nd, McNeil ; 3rd, C. R. Crowe.
Cockerel.—1st, McNeil ; 2nd, Oke.
Pullet.—1st, Oke ; 2nd, McNeil ; 3rd, C. R. Crowe.
Best male (Silver included), Oke ; best female (Silver included), Oke ; best collection, ornamental (one color), McNeil ; best collection, ornamental (parti-color), Oke ; best pair, Oke ; best cockerel, McNeil.

Silver Sebright Bantams.

Cock.—1st, Oke ; 2nd, McNeil.
Hen.—1st, Oke.
Cockerel.—1st, Oke ; 2nd, McNeil ; 3rd, C. R. Crowe.
Pullet.—1st, Oke ; 2nd, McNeil ; 3rd, Murray.

White or Black R. C. Bantams.

Cock.—1st, McNeil ; 2nd, Oldrieve ; 3rd, Tozer.
Hen.—1st, McNeil ; 2nd, Tozer ; 3rd, Oke.
Cockerel.—1st, McNeil ; 2nd, Oke ; 3rd, C. R. Crowe.
Pullet.—1st, Oke ; 2nd, Webber ; 3rd. McNeil.
Best male, McNeil ; best female, McNeil ; best cockerel and pullet, Oke.

White Cochin Bantams.

Cock.—1st and 2nd, McNeil ; 3rd, Donovan.
Hen.—1st, Rankin Bros. ; 2nd, Tozer ; 3rd, McNeil.
Cockerel.—1st, 2nd and 3rd, McNeil.
Pullet.—1st, McNeil ; 2nd, Tozer ; 3rd, Karn.
Best male and female, McNeil ; best hen, Rankin.

Buff Cochin Bantams.

Cock.—1st, McNeil ; 2nd, Bonnick ; 3rd, Oke.
Hen.—1st, McNeil ; 2nd, Barber & Muir ; 3rd, Oke.
Cockerel.—1st, Oke ; 2nd, McNeil ; 3rd, Bonnick.
Pullet.—1st, McNeil ; 2nd, Oke ; 3rd, Tozer.
Best male, Oke ; best female, McNeil ; best collection, McNeil.

A. O. V. Cochin Bantams.

Cock.—1st and 3rd, Keiley ; 2nd, Moore.
Hen.—1st and 4th, Keiley ; 2nd and 3rd, D. A. Nichols.
Cockerel.—1st, Nichols ; 2nd, Keiley ; 3rd and 4th, Moore.
Pullet.—1st and 2nd. Keiley ; 3rd and 4th, Moore.
Best male and best female, Keiley.

White Booted Bantams.

Cock.—1st, Oke.
Hen.—1st and 2nd, Oke.
Cockerel.—1st, Oke.
Pullet.—1st, Oke.
Best male (including A. O. V. Bantams) and female, Oke.

Black Tailed Japanese Bantams.

Cock.—1st, McNeil ; 2nd, Daniels ; 3rd, Oke.
Hen.—1st, McNeil ; 2nd, Tozer ; 3rd, Oke.
Cockerel.—1st, Oke ; 2nd, McNeil.
Pullet.—1st, McNeil ; 2nd, Tozer ; 3rd, Oke.
Best male and female, McNeil ; best cockerel, Oke.

Polish Bantams.

Cock.—1st, McNeil ; 2nd, Oke.
Hen.—1st, McNeil ; 2nd, Oke.
Cockerel.—1st, Donovan ; 2nd, McNeil ; 3rd, Oke.
Pullet.—1st, McNeil ; 2nd, Oke.
Best male, best female, best pullet, McNeil.

A. O. V. Ornamental Bantams.

Cock.—1st, Burn ; 2nd, McNeil ; 3rd, Oke.
Hen.—1st, Oke ; 2nd, McNeil ; 3rd, Burn.
Cockerel,—1st, Oke ; 2nd, McNeil ; 3rd, Murray.
Pullet.—1st, Oke ; 2nd, McNeil ; 3rd, Murray.

ENGLISH CLASSES.

Silver Grey Dorkings.

Cock.—1st, McKee ; 2nd, Burn ; 3rd, Furminger.
Hen.—1st, A. Bogue , 2nd, Cox ; 3rd, Furminger.
Cockerel.—1st and 4th, Corcoran ; 2nd and 3rd, Furminger.
Pullet.—1st and 2nd, Corcoran ; 3rd and 4th, Furminger.
Best bird in English class, John Laurie.
Best pair and best cockerel, Corcoran.
Best male, John McKee ; best female, A. Bogue.

Colored Dorkings.

Cock.—1st and 3rd, A. Bogue ; 2nd, Corcoran.
Hen—1st, Laurie ; 2nd, Corcoran ; 3rd, A. Bogue.
Cockerel.—1st, Laurie ; 2nd, Corcoran ; 3rd, A. Bogue.
Pullet.—1st and 4th, Laurie ; 2nd and 3rd, A. Bogue.
Best male and Cock, A. Bogue.
Best female, J. Laurie.

White Dorkings.

Cock.—1st, A. Bogue.
Hen.—1st and 2nd, A. Bogue.
Cockerel.—1st and 2nd, A. Bogue.
Pullet.—1st and 2nd, A. Bogue.
Best hen, A. Bogue.

POLISH CLASSES.

White Crested Black Polands.

Cock.—1st, A. Bogue ; 2nd, Bryant ; 3rd, McNeil.
Hen.—1st, A. Bogue ; 2nd, McNeil ; 3rd. Bryant.
Cockerel.—1st, A. Bogue ; 2nd, McNeil ; 3rd, Goulding & Son.
Pullet.—1st McNeil ; 2nd, A. Bogue ; 3rd, Bryant.
Best male, female and cock, A. Bogue.
Best bird in Polish class, A. Bogue.

Golden Polands.

Cock.—1st, McNeil ; 2nd, A. Bogue.
Hen.—1st, McNeil ; 2nd, A. Bogue.
Cockerel.—1st, A. Bogue ; 2nd, McNeil.
Pullet.—1st, McNeil ; 2nd, A. Bogue.
Best male and female, McNeil.
Best cockerel, A. Bogue.

Silver Polands.

Cock.—1st and 2nd, Burn.
Hen.—1st and 2nd, Burn.
Cockerel.—1st and 2nd. Burn.
Pullet.—1st and 2nd, Burn.
Best male, female and cockerel, Burn.

White Polands.

Cock.—1st, McNeil ; 2nd, Bogue ; 3rd, Bryant.
Hen.—1st, McNeil ; 2nd, Bryant ; 3rd, A. Bogue.
Cockerel.—1st. A. Bogue ; 2nd, McNeil ; 3rd, Bryant.
Pullet.—1st, McNeil ; 2nd, Bryant ; 3rd, A. Bogue.
Best male (white or buff), A. Bogue.
Best female (white or buff), McNeil.

Golden Bearded Polands.

Cock.—1st, A. Bogue ; 2nd, McNeil ; 3rd, James Brown.
Hen.—1st, McNeil ; 2nd, A. Bogue ; 3rd, James Brown.
Cockerel.—1st, A. Bogue ; 2nd, McNeil.
Pullet.—1st, McNeal ; A. Bogue.

Silver Bearded Polands.

Cock.—1st, A. Bogue ; 2nd, McNeil.
Hen.—1st, A. Bogue ; 2nd, McNeil.
Cockerel.— 1st, A. Bogue ; 2nd, McNeil.
Pullet.—1st, McNeil ; 2nd, A Bogue.

White Bearded Polands.

Cock.—1st, McNeil ; 2nd, A. Bogue.
Hen.—1st, McNeil ; 2nd, A. Bogue.
Cockerel.—1st, McNeil.
Pullet.—1st, McNeil ; 2nd, A. Bogue.

Buff Laced Polands.

Cock.—1st, 2nd and 3rd, McNeil.
Hen.—1st, 2nd and 3rd, McNeil ; 4th, Howard.
Cockerel.—1st and 3rd, McNeil ; 2nd, Bryant.
Pullet.—1st and 2nd, NcNeil ; 3rd and 4th, Bryant.
A. P. A. cup, best collection of Polish, A. Bogue.

FRENCH CLASSES.

Houdans.

Cock.—1st, A. Bogue ; 2nd, Forsythe ; 3rd, Trew.
Hen.—1st, Forsythe ; 2nd, Trew ; 3rd, A. Bogue.
Cockerel.—1st Forsythe ; 2nd, A. Bogue ; 3rd, Trew.
Pullet.—1st, Forsythe ; 2nd and 3rd, Trew.
Best collection and best bird in French classes, James Forsythe ; best male, A. Bogue ; best female, Forsythe.

Creve Cœurs.

Hen.—1st Oke.
Pullet.—1st, Oke.
Best male, female, hen, and pullet, Oke.
Best bird in French classes (Houdans not included), Oke.

La Fleche.

Cock.—1st and 2nd, Oke.
Hen.—1st and 2nd, Oke.
Cockerel.—1st, Geo. Bogue ; 2nd and 3rd, Oke.
Pullet.—1st and 2nd, Oke ; 3rd, Geo. Bogue.

MISCELLANEOUS CLASSES.

Sultans.

Cock.—1st and 2nd, Oke.
Hen.—1st and 2nd, Oke.
Cockerel.—1st, Oke.
Pullet.—1st, Oke.

Orpingtons.

Cock.—1st, 2nd and 3rd, Chambers.
Hen.—1st, 2nd and 3rd, Chambers.
Cockerel.—1st, 2nd and 3rd, Chambers.
Pullet.—1st, 2nd and 3rd, Chambers.
Best collection, Chambers.
Best male and female, and cockerel, Chambers.

A. O. V. Fowls.

Cock.—1st, McNeil ; 2nd, Daniels ; 3rd, Howard ; 4th, Thos. Brown.
Hen.—1st, Donovan ; 2nd, McNeil ; 3rd and 4th, Howard.
Cockerel.—1st, Dains ; 2nd, Donovan ; 3rd, Massie ; 4th, Daniels.
Pullet.—1st, Dains ; 2nd, McNeil ; 3rd, Tozer ; 4th, Donovan.
Best bird and best cock, McNeil.
Best hen, Donovan.

Cross-Bred Chicks.

Cockerel.—1st, Scott ; 2nd, O'Brien & Colwell.
Pullet.—1st, Scott.

Dressed Fowls.

Dressed chickens—McCurdy, 1st ; W. H. Chambers, 2nd.
Dressed duck—Geo. Brown, 1st.
Specials—Best pair chicks, 1898, and best pair, McCurdy.
Best pair ducks, 1898, Colson.

Eggs.

J. E. Jarrott, 1st ; Karn, 2nd ; Daniels, 3rd.

TURKEYS.

Bronze, 2 Years Old and Upwards.

Cock.—1st and 3rd, Ford ; 2nd, Beattie.
Hen.—1st, Beattie ; 2nd, Ford ; 3rd, Jas. Anderson.

Bronze, 1 Year Old and Under 2.

Cock.—1st, W. J. Bell ; 2nd, Beattie ; 3rd Anderson.
Hen.—1st, Beattie ; 2nd, Bell ; 3rd, J. H. Henderson.

Bronze of 1898.

Cock.—1st, Ford ; 2nd, Beattie ; 3rd, C. B. Gould.
Hen.—1st, Beattie ; 2nd, Ford ; 3rd, Gould.

Best collection of bronze, Beattie ; best male, Bell ; best female, Beattie.

White or Black.

Cock (Old).—1st, Thos. Brown ; 2nd, Beattie ; 3rd, Beattie.
Hen (Old).—1st, Beattie : 2nd, Brown ; 3rd, Brown.
Cock (1898).—1st, Beattie ; 2nd, Brown ; 3rd, Beattie.
Hen (1898).—1st, Beattie ; 2nd, Brown ; 3rd, Beattie.

A. O. V.

Cock (Old).—1st. Beattie ; 2nd, Ford ; 3rd, Luxton.
Hen (Old).—1st, Beattie ; 2nd, Ford ; 3rd, Luxton.
Cock (1898).—1st, Beattie ; 2nd, Luxton ; 3rd, Luxton.
Hen (1898).—1st, Beattie ; 2nd, Luxton ; 3rd, Luxton.
Best male, white, black or A.O.V., Brown.
Best female, white, black or A.O.V., Beattie ; best collection white, black or A.O.V., Beattie.
Best collection any one color, Beattie.

GEESE AND DUCKS.

Toulouse Geese.

Gander (Old).—1st, A. Bogue; 2nd, Webber; 3rd, O'Brien & Colwell.
Goose (Old).—1st, O'Brien & Colwell; 2nd, Knight; 3rd, Webber.
Gander (1898).—1st and 3rd, A. Bogue; 2nd, O'Brien & Colwell.
Goose (1898).—1st and 3rd, A. Bogue; 2nd, O'Brien & Colwell.
Best collection Toulouse and male, A. Bogue.
Best female Toulouse, A. Bogue.

Bremen Geese.

Gander (Old).—1st and 2nd, O'Brien & Colwell; 3rd, Webber.
Goose (Old).—1st, Webber; 2nd and 3rd, O'Brien & Colwell.
Gander (1898).—1st and 2nd, O'Brien & Colwell; 3rd, Lawrie.
Goose (1898).—1st and 3rd, O'Brien & Colwell; 2nd, Lawrie.

A. O. Variety of Geese.

Gander (Old).—1st, O'Brien & Colwell; 2nd, Luxton.
Goose (Old).—1st, O'Brien & Colwell; 2nd, Luxton.
Gander (1898).—1st, O'Brien & Colwell; 2nd, Luxton.
Goose (1898).—1st, O'Brien & Colwell; 2nd and 3rd, Luxton.
Best male (Bremen included) O'Brien & Colwell.
Best female (Bremen included) Webber.

Aylesbury Ducks.

Drake (Old).—1st and 2nd, A. Bogue; 3rd, Knight.
Duck (Old).—1st and 2nd, A. Bogue; 3rd, O'Brien & Colwell.
Drake (1898).—1st, A. Bogue; 2nd, O'Brien & Colwell; 3rd, Webber.
Duck (1898).—1st, OBrien & Colwell; 2nd and 3rd, A. Bogue.
Best pair and male, A. Bogue.
Best female, O'Brien & Colwell.

Pekin Ducks.

Drake (Old).—1st, A. Bogue; 2nd, Webber; 3rd, O'Brien & Colwell.
Duck (Old).—1st, A. Bogue; 2nd, O'Brien & Colwell; 3rd, Knight.
Drake (1898).—1st and 4th, A. Bogue; 2nd, O'Brien & Colwell; 3rd, Webber.
Drake (1898).—1st and 3rd, O'Brien & Colwell; 2nd, A. Bogue; 4th, Webber.
Best male and best pair, A. Bogue.
Best female, O'Brien & Colwell.

Rouen Ducks.

Drake (Old).—1st, Colson; 2nd, O'Brien & Colwell; 3rd, Knight.
Duck (Old).—1st, Colson; 2nd, O'Brien & Colwell; 3rd, Knight.
Drake (1898).—1st, O'Brien & Colwell; 2nd, A. Bogue; 3rd, Colson.
Duck (1898).—1st and 3rd, O'Brien & Colwell; 2nd, A. Bogue.
Best male, (A.O.V. included), Colson; best female, (A.O.V. included), O'Brien & Colwell.

A. O. V. Ducks.

Drake (Old).—1st, Burn; 2nd, Geo. Bogue; 3rd, Daniels.
Duck (Old).—1st, Geo. Bogue; 2nd, Burn; 3rd, Daniels.
Drake (1898).—1st, Burn; 2nd, Geo. Bogue; 3rd, Luxton.
Duck (1898).—1st, Geo. Bogue; 2nd, Burn; 3rd, Luxton.
Best collection of geese and ducks together, O'Brien & Colwell.

PHEASANTS IN PAIRS.

English.—1st, Geo. Angus; 2nd, Angus.
Golden.—1st. Geo. Angus; 2nd, R. Oke.
Silver.—1st, R. Oke; 2nd, Geo. Angus; 3rd, W. M. Anderson.
Lady Amherst.—1st, G. Angus; 2nd, R. Oke.
Reeves.—1st, G. Angus.
First best collection, Dr. T. S. McGillivary.
Second best collection, Richard Oke.

PIGEONS.

Best collection all varieties, H. B. Donovan; best pairs all varieties, H. B. Donovan.

Carriers (Black).

Cock.—1st, Anderson; 2nd, Baulch. *Hen.*—1st, Baulch; 2nd, Anderson.

Dun Carriers.

Cock.—1st and 2nd, Anderson. *Hen.*—1st and 2nd, Anderson.

A. O. S. V. Carriers.

Cock.—1st and 2nd, Anderson. *Hen*:—1st, Anderson; 2, Baulch.
Best pair carriers, W. M. Anderson.

White Pouters.

Cock.—1st, and 2nd, J. H. Magill. *Hen.*—1st, Magill; 2nd, Anderson.

Blue Pied Pouters.

Cock.—1st, Magill. *Hen.*—1st, Anderson; 2nd, Magill.
Best cock, Magill.

Black Pied Pouters.

Cock.—1st and 2nd, Magill. *Hen.*—1st and 2nd, Magill.

Yellow or Red Pouters.

Cock.—1st, Anderson; 2nd, Magill. *Hen.*—1st, Anderson; 2nd, Magill.
Best collection pouters, Magill; best bird, Magill; best cock, Magill.

Short-Faced Tumblers.

Hen.—1st, Anderson.

A. O. S. V. Tumblers.

Cock.—1st and 2nd, Donovan. *Hen.*—1st and 2nd, Donovan.
Best tumblers, Donovan.

Red Barbs.

Cock and *Hen.*—1st for both, Anderson.

Black Barbs.

Cock.—1st, Anderson.

A. O. S. C. Barbs.

Hen.—1st and 2nd, Anderson.

White Trumpeters.

Cock.—1st and 2nd, Baulch. *Hen.*—1st and 2nd, Baulch.

A. O. S. C. Trumpeters.

Cock.—1st and 2nd, Baulch. *Hen.*—1st and 2nd, Baulch.
Best trumpeters, Baulch.

Red or Yellow Jacobins.

Cock.—1st and 2nd, Massie. *Hen.*—1st and 2nd, Massie.

White Jacobins.

Cock.—1st and 2nd, Massie. *Hen.*—1st and 2nd, Massie.

A. O. S. C. Jacobins.

Cock.—1st and 2nd, Massie. *Hen.*—1st and 2nd, Massie.
Best Jacobin, Massie.

R. C. Antwerps.

Cock.—1st, Donovan; 2nd, J. B. Jones. *Hen.*—1st and 2nd, Donovan.

Silver Dun Antwerps.

Cock.—1st, Donovan; 2nd, Jones. *Hen.*—1st and 2nd, Donovan.
Best Antwerp, Donovan.

White Fantails.

Cock.—1st and 2nd, Massie. *Hen.*—1st and 2nd, Massie.

Blue Fantails.

Cock.—1st, Anderson. *Hen.*—1st, Anderson.
Best hen, Anderson.

Red or Yellow Magpie.

Cock.—1st and 2nd, N. S. Jones. *Hen.*—1st and 2nd, N. S. Jones.

A. O. S. C. Magpie.

Cock.—1st, Jones; 2nd, Anderson. *Hen.*—1st, Anderson; 2nd, Jones.
Best cock, best hen, Jones.

Show Homers.

Cock.—1st and 2nd, N. D. McPhie. *Hen.*—1st and 2nd, McPhie.
Largest collection and best pairs, McPhie.

Swallows.

Cock.—1st and 2nd Donovan. *Hen.*—1st and 2nd, Donovan.
Best swallow, Donovan.

Dragoons.

Cock.—1st and 2nd, G. J. Dunn. *Hen.*—1st and 2nd, G. J. Dunn.

Archangels.

Cock.—1st, Anderson. *Hen.*—1st, Anderson.

Nun.

Cock.—1st and 2nd, Donovan. *Hen.*—1st and 2nd, Donovan.

Owl.

Cock.—1st and 2nd, Donovan. *Hen.*—1st and 2nd, Donovan.

Black Turbit.

Cock.—1st and 2nd, Donovan. *Hen.*—1st and 2nd, Donovan.

A. O. C. Turbit.

Cock.—1st, Nickle ; 2nd, Donovan. *Hen.*—1st, Donovan ; 2nd, Nickle.
Best Turbit, Donovan.

A. O. S. V. Pigeons.

Cock.—1st, W. E. Robinson ; 2nd, Donovan. *Hen.*—1st, W. E. Robinson ; 2nd, Donovan.

RABBITS.

Lopeared—Solid Color.

Buck.—1st and 2nd, Fox. *Doe.*—1st and 2nd, Fox.
Best lopeared, Fox ; best collection (one color), Fox.

A. O. V. Lopeared.

Buck.—1st and 2nd, Fox. *Doe.*—1st and 2nd, Fox.

Dutch Rabbits.

Buck.—1st and 2nd, Fox. *Doe.*—1st and 2nd, Fox.
Best Dutch rabbits, Fox,

A. O. V. Rabbits.

Buck.—1st and 2nd, Fox. *Doe.*—1st and 2nd, Fox.

Belgian Hares.

Buck.—1st and 2nd, Fox. *Doe.* 1st and 2nd, Fox.
Best collection, Fox ; best buck, Fox.

Green Parrot.

1st, A. H. Lake.

EASTERN ONTARIO POULTRY ASSOCIATION.

REPORT OF THE SECRETARY.

I have the honor to submit the annual report of the Eastern Ontario Poultry Association. The exhibition this year was held at Brockville, and marked a new era in the history of the Association. In the first place there were over a thousand birds on view, but still more important, the show was visited by an unusually large number of people. This, too, included farmers and their wives, a class that it has hitherto been found exceedingly hard to reach. The Brockville members gave the Association a most enthusiastic and splendid support, and the amount of voluntary and unpaid work done in connection with the exhibition could not be realized only by an eye witness. The Association was at a very great disadvantage on account of the want of coops. This leads to very great expense in making temporary coops, which, too, are never very satisfactory. Fifty turkey and goose coops had been ordered, but they only arrived just as the exhibition closed. The Association has two hundred wire pigeon and bantam coops; but for fowl coops we are dependent upon 108 old folding wooden coops that are not strong enough to stand handling by railway, and these always have to be supplemented at extravagant cost by temporary coops. It may be well to point out here that the Eastern Ontario exhibitions are managed, as to expense, in an altogether different manner from the exhibitions of the Ontario Poultry Association. The Eastern Ontario assumes the whole expense of running the exhibition, the local members merely supplying voluntary labor, special prizes, etc. In the Eastern part of Canada there are only a few cities and towns in which it would be possible to have an exhibition, and the inclination of the Association at present is to go to each of these in turn. We have not, like the Ontario, a number of places clamoring for the exhibition and bidding one against the other. We rather occupy the position of a missionary, and it really is most gratifying to see what good results are being developed by our missionary efforts. If the Association had a proper outfit of wire coops there are places that we could afford to visit that cannot now be reached on account of expense, and in this way our power for doing good would be very materially increased.

It is the fashion now-a-days to decry the fanciers upon the ground that they are solely interested in developing fancy points to the neglect, and indeed to the prejudice, of the practical points. While there may be a fragment of truth in this, it is in my view a most unfair statement of the case. All real progress in the raising and in the improvement—practical improvement I mean—of stock is due to those who may properly be termed fanciers. "The American Standard of Perfection," with all its faults, is very severe in the matter of weight, and a bird that is much under weight has no chance of winning. Anyone carefully examining the practical classes, as opposed to the ornamental classes, at an exhibition will be struck above everything else with the size of the specimens, and this improvement in size is steadily going on. I can remember when I first began to breed white Wyandottes some years ago the difficulty was to get birds of a standard weight; now it is very common for the birds to be largely overweight. Plymouth Rocks have increased in size, and so it may be said of several other breeds. White Leghorns, that have no standard weight, are improving in this respect, too.

When you come to turkeys, geese and ducks the improvement is still more marked. Now, what we want in the interest of practical poultry is to increase the numbers of the fanciers and so increase the quantity of good stock in the country, and then to get the farmers to grade up their stock by the use of the fanciers' culls—culls not in the sense of being birds of inferior vigor or size, but merely unfit for exhibition purposes. It is in this way that other classes of farm stock have been improved, and it is only in this way, and by the purchase of eggs for sitting, that we can hope that farmers will improve their poultry. Exhibition birds are too costly for the ordinary farmer to buy, and many of the exhibition points would be wholly useless to him.

Another thing that the fanciers, and they only, are able to teach is how to mate the birds to produce best results. The sooner that the old notion, bred of ignorance, that any male will do for breeding purposes is put down the better. No intelligent farmer desiring to improve the beef qualities of his herd would use a Jersey bull any more than a man who wished to improve a dairy herd would use a Hereford bull, and so it is with poultry. Here the fancier becomes valuable. for he can tell at a glance what breed should be used. He will also tell a farmer what the best style of hen house is, and what is the best way of feeding and otherwise caring for the flock. When you come to fattening poultry, killing and dressing for the market, you go outside the fanciers' sphere, and must go to the specialist. In this connection I would recommend a little work by Brown on poultry fattening. In this book will be found a most complete description of what is necessary.

This year we have again to thank the late Governor-General, the Earl of Aberdeen, for a very handsome silver cup, which was offered for competition for the best pen consisting of a cock, two hens, cockerel and two pullets of either Andalusians, Black Minorcas, white Minorcas or white brown or buff single comb Leghorns. The cup was won in a very keen competition by Mr. Peter McGregor, of Almonte, with a pen of Andalusians. Lord Aberdeen's kind interest in and generous assistance to the Association will not be forgotten by its members. Lord Aberdeen did not simply give the cups, but he also took an interest in the classes of birds that should compete for them, and desired that they should be open only to such breeds as were of practical value from a farmer's stand point. The first two cups were given for general purpose breeds, and the last for the egg breeds.

A special meeting was held during the show week at which the constitution was revised, and a public free meeting was also held at which an address was very kindly given by Professor Robertson on "Poultry for the English Market," and a short address was also given by the undersigned. These public meetings will, I think, be the means of distributing much valuable information.

I would again suggest that some combined effort should be made to make these poultry exhibitions of more value to the farmers. I think if we could get the beekeepers to join with the poultry men and make a display at the exhibition it would be a great advantage. I think, too, that the exhibitions should be advertised more extensively in the country districts surrounding the place of holding the exhibition. Then, if efforts were made to get good educational exhibits of poultry appliances, models of poultry houses suitable for the farm and give good prizes for dressed poultry, a prize sufficient to justify a man in killing really good birds, and prizes for the different grades of feathers, a distinct step in advance would be made. There was no exhibit that created more interest than the exhibit of eggs and a brooder full of live chickens hatched in January, that Mr. D. H. Davis, of Almonte, most kindly and generously brought at his own expense to help the Association, and this class of exhibits should, in my opinion, be encouraged.

I am, Sir,

Your most obedient servant,

FRANCIS H. GISBORNE,

OTTAWA, February 6th, 1899. Secretary-Treasurer.

ANNUAL AND SPECIAL MEETING.

A special meeting of the Association was called by the President to revise the Constitution and By-laws, and was held in the Town Council chamber at Brockville on Wednesday evening, January 2, Mr President Osborne in the chair.

The Secretary-Treasurer explained the object of the meeting, and gave a short account of the history of the Association, and of the decision of the Minister of Agriculture, given under section four of the Agriculture and Arts Act, that the Association was only entitled to four directors instead of nine, as it had previously been the custom to elect.

After an extensive debate the following Constitution was passed by the meeting:

CONSTITUTION.

Article 1.

The name of the Association shall be *The Eastern Ontario Poultry Association.*

Article 2.

The object of the Association shall be to encourage the breeding and development of poultry by means of exhibitions, and by the collecting and disseminating of practical information relating thereto.

Article 3.

1. There shall be a patron, an Honorary President, and such honorary vice-presidents as may from time to time be appointed.

2. The officers of the Association shall be a President, two Vice-Presidents, four Directors, a Secretary-Traasurer, or a Secretary and a Treasurer, and one Auditor (who shall be a professional accountant), and in addition to the directors herein provided for the members may at the annual meeting elect as an additional director any official of the Ontario Agricultural College and Experimental Farm.

3. The officers, with the exception of the Secretary-Treasurer, or the Secretary and the Treasurer (who shall be appointed by the Board of Directors), shall be elected by ballot at the annual meeting, and they shall hold office for one year, or until their successors are duly elected. Vacancies occurring during the interim shall be filled by the Board of Directors.

Article 4.

The Association shall consist of such persons as shall pay the annual membership fee of one dollar.

Article 5.

1. Upon any member being charged with wilful misrepresentation or dishonest dealing in connection with the poultry interests, the Board of Directors or a special meeting called for that purpose shall examine into the matter, and if the charge is sustained the offending party may be expelled or suspended by a two-thirds vote of the directors or of the members present at such meeting as the case may be. All other questions shall be decided by a majority vote.

2. Any member who shall at any time during the holding of the exhibition use any contemptuous or abusive language to or of any judge in consequence of an award made by him shall forfeit his right to any premiums to which he might otherwise be entitled.

Article 6.

1. The annual meeting of the Association shall be held at 8 p.m. on Wednesday of the same week in the same town or city as the exhibition is held in, and only *bona fide* members who have paid their membership fee annually and for the ensuing year at or before the date of closing entries shall be entitled to vote at such annual meeting. The annual exhibition shall be held in the third full week in January.

2. At the annual meeting the officers shall be elected for the ensuing year; the judge or judges shall be chosen; and the place selected for holding the next annual exhibition.

Article 7.

The Board of Directors shall hold a meeting at Ottawa at 8 p.m. on Wednesday in the second week during the holding of the Central Canada Fair, or on such other day during the fair as may be fixed by the President, or in his absence by one of the Vice-Presidents, at which the prize list shall be revised and all necessary arrangements made for the holding of the then next annual exhibition. The directors shall meet at 7.30 p.m. to hear the suggestions that any member may think proper to make.

ARTICLE 8.

The Constitution and By-laws of the Association shall not be altered or repealed except by a two-thirds vote at the annual meeting, or at a special meeting called for that purpose, of which at least two weeks' notice shall be given by public advertisement.

ARTICLE 9.

1. The President shall preside at all meetings of the Association, and on all occasions where the Association is officially represented. He shall appoint all special committees unless otherwise ordered, and shall call special meetings at the request of three members of the Board of Directors.

2. In the absence of the President one of the Vice-Presidents shall have the powers and assume the duties of the President. In the absence of the Vice-Presidents the members present shall appoint a presiding officer from among their number.

3. The Secretary-Treasurer shall conduct all correspondence, keep a record of the proceedings of meetings, shall have charge of the books and papers of the Association, and shall keep on fyle a list of the entries and prizes at each exhibition. He shall receive all fees, special cash prizes and other moneys of the Association, and shall deposit the same to the credit of the Association in one of the chartered banks or in the Government Savings Bank. His books shall at all times be at the command of the Board of Directors. He shall prepare a financial statement and a report for the Minister of Agriculture. He shall forward to the Auditor all his account books and vouchers at least two weeks before the annual meeting.

The meeting then confirmed the Constitution and By-laws, and resolved that they be acted under immediately and that the meeting be the annual meeting for the ensuing year.

It was decided unanimously that the next exhibition be held at Ottawa.

The officers were then elected and Mr. Sharpe Butterfield was elected Judge.

It was also resolved, practically unanimously, that in future the exhibitions should be judged by comparison, any member wishing to have his birds scored to apply at the time of making his entries, and to deposit ten cents for each bird he desired to have scored.

After passing votes of thanks to the Mayor and Council of the town, and the many kind Brockville friends who had contributed to the great success of the exhibition, the meeting adjourned.

PUBLIC MEETING.

The Association has for the last two or three years held a free public meeting during the exhibition, at which addresses are given upon practical poultry subjects. The chair was occupied by Mr. W. M. Osborne, President of the Brockville Poultry Association.

POULTRY RAISING FOR THE BRITISH MARKET.

BY PROF. J. W. ROBERTSON, DOMINION COMMISSIONER OF AGRICULTURE.

The speaker prefaced his remarks on the subject at issue by congratulating the Association upon the excellence of the exhibition just held, and said he was also much pleased to know that the people of Brockville and vicinity had lent their assistance not only as exhibitors but in the way of attendance. He then dealt at some length regarding the distinction between what was known as the poultry fancier and the man who raised poultry for profit, and said the people of Canada had but recently arrived at that stage where the hen came within the range of their vision. There was a time when nothing smaller than a horse was visible to them. Their visions gradually expanded until the cow, the sheep and the hog came into view, and now so small an object as a hen was plainly discernible.

Treating of the English market for poultry he said the taste of the consumer over there has changed decidedly within the past few years. Taste had its changes over there, and these were as plainly marked as in the sleeves of fashionable ladies' gowns. For instance, it was not the fashion in England to have cheese on the tea table. You could not get it, because it was not genteel. It was fashionable, however, to serve cold chicken, not only on the tea table, but everywhere. He had never remarked a more decided change than that which had taken place in England in this respect during the past four years. He had known four shillings to be paid for a single fowl, and had seen a pair sold for ten shillings. In this connection he might say that the man who ranted about England's decaying trade, did not know what he was talking about; England was growing richer and richer, and her people wanted the best. In Canada we had been in the habit of killing chicken as they ran. Running on the part of a chicken gave capital feathers no doubt, but the meat so furnished was not the kind wanted anywhere. To illustrate the difference between properly fattened fowl and those killed on the run, as it were, the speaker said that on one occasion recently he purchased on the Ottawa market 101 chickens of an average lot. After two days he killed three of these birds, had them cooked by steam until they were as tender as they could be make, and set them aside for two days. He then separated all the eatable part from the bone, being careful to have the latter carefully scraped. He found that he had just exactly two pounds six ounces of edible meat from the three birds. The remaining 98 were fattened for nearly six weeks, and three of them treated in the same way, yielded seven pounds six ounces of edible meat. In other words he got more edible meat from one of the fattened chickens than from all three of those killed on the run. He contended that if the farmers would adopt the English and French methods of fattening they could develop an enormous trade right in Canada and a still more enormous trade in England.

The English method, he said, was to take birds from two and a half to three months old when they would weigh about three pounds. Older birds gave less profit. They were put in crates made of slats, about $6\frac{1}{2}$ feet long and 16 inches square inside. The slats were wide enough apart to allow the birds to put their necks out. The floors were also of slats in order to allow the droppings to fall to the ground and thus keep the crates clean. They were elevated above the ground, and were usually made with three compartments. In England the birds were small and the crates sometimes held fifteen chickens to a compartment. In front of each crate was a V-shaped trough $2\frac{1}{2}$ by 3 inches long and kept suspended by hooks. This was on a level with the floor, and the birds were able to put their necks through the slats and feed. The elevation of the crates were usually about three feet, and sand was placed underneath to catch the droppings. In some cases gypsum was used in this deposit, which was thus converted into excellent manure. The cages were cleaned thoroughly every two or three days. The food supplied was simply oats, ground hulls, and all so fine that the hulls almost entirely disappeared. This was mixed with skimmed milk, preferably sour, and mixed until it was quite thick. He had found that in Canada it was best to add a little salt to the mixture, though it was not in use in England. No other food was used whatever. The feeding continued for fourteen or twenty days, light for a week, and afterwards the process known as cramming was resorted to. A cramming machine was nothing more than a hopper fitted with a small force pump and a rubber tube, and by its use chickens were supplied with sufficient milk and ground oats to fill their crops. An expert could thus feed chickens at the rate of 300 per hour. The process was not cruel as was claimed by some would-be philanthropists. On the contrary the chickens would actually open their beaks to be fed, and he knew of a case where a very sick chicken was by its use entirely restored to health. It was often necessary to feed sick birds by hand in order to save them. During the last ten days of the feeding a small portion of rendered tallow was mixed with the food, the proportion being one pound to 70 or 100 chickens, though later this might be increased to one pound for 50 chickens. By this process the fattening was not only hastened but the meat was rendered juicy. It had also been found advisable to use a little sulphur under the wing and about the tail as a precaution against vermin. This use of sulphur also imparted a better color to the skin. The killing should be done by wringing the neck. The Englishman wanted his fowl with the head on as he then knew all the blood remained in the body.

The professor then exhibited some specimens of fowl dressed in the way that is required for the English market. The head and upper part of the neck not being plucked, the wing feathers were also left on, and the skin should not be broken in any way. The birds should be starved for eighteen hours before killing in order to have the crops empty. Fowl thus fed and dressed had been sent from here to England, hung up there for four days, and the dealer reported them in prime condition. Care should be taken not to break the skin, as birds with this defect could not be kept in cold storage for two months without injury. The plucking must be done dry, and the breast bone should not be broken. In England what was known as a shaping board was used, a simple contrivance in which the bird after killing is placed to cool to give it a more attractive shape. The birds should be packed with one thickness of paper placed round the breast and body in shallow boxes holding, say, a dozen pairs packed in two rows one layer deep. The birds should be carefully selected as to weight; the birds in a box not to vary more than a pound in weight, as mixing large and small birds together resulted in their being all averaged small when the price was being fixed. They should be very carefully packed so that they may not be injured or bruised. The speaker also referred to recent experiments made at the experimental station at Carleton Place, showing the benefits of systematic feeding. A lot of 133 birds were fattened there, the original cost being fifty cents a pair. They were fed six weeks, though four weeks would have afforded better results, and the total cost of purchase, feeding, crating, transportation and selling commission totalled \$1.06 per pair. They were sold for \$1.75 per pair, going off like hot cakes at sixteen cents per pound wholesale. There was an enormous market for them. "We should export," the Professor said, "several million dollars' worth of chickens in the next five years, and thus lay the foundation of a business which will be larger in twenty years than the cheese trade and give more profit."

After Professor Robertson had concluded his remarks, Mr. Gisborne addressed the meeting, and, with the help of some of the prize birds which had been brought over from the exhibition hall, explained what the fancier was striving for in connection with plumage. He also pointed out the requirements for a good market fowl, and the kind of bird the British poulterer required for the best market. Attention, too, was drawn to the heavy weights required in the so-called fanciers' fowls, and to the manner in which the best parts of the bird were developed; for instance, by careful breeding both the length and also the width and depth of the breast had been largely increased. Inferior parts, such as the legs, were kept small. Reference was here made to the turkeys in the show weighing over forty pounds apiece, and to Indian game cockerels weighing ten and eleven pounds each.

POULTRY.

By W. M. Osborne, Brockville.

The poultry-yard is regarded one of the most insignificant parts of the farm, and is more often thought by the farmers to be more of a nuisance than anything else on the farm—only to be tolerated, in fact, by the women folk. So firmly grounded is this opinion in the masculine mind that no effort is made to ascertain the real value of the poultry industry, and the statistics of our country are quoted in vain.

In Ontario there are, according to the last census, 179,582 farmers, say 180,000, and allowing on an average of twelve hens on each of these farms, if they lay seven dozen of eggs each this would make 15,120,000 dozen, but if they laid as they should with proper care at least double that number, you get with eggs at ten cents a dozen three million and twenty-four thousand dollars. These figures are, of course, very much underestimated, and no allowance is made for the thousands of people that keep poultry who are not farmers. But confining ourselves merely to the farmers and the seven dozen eggs of bird, we find the money value of the eggs to be, in round numbers, a million and a half of dollars. Certainly such an industry—an industry carried on with the smallest of outlays and the quickest of returns—is worthy of some attention. You may say that the larger part of this poultry product is consumed at home, our export of eggs to our two principal customers being only about seven and a half million dozens in 1897, but it is none the less valuable upon that account. If we could only increase the consumption of poultry and eggs in our farmers' families ten-fold, and reduce proportionately the use of salt pork and grease, the annual saving in doctor and medicine bills, and the greater amount of work accomplished consequent upon improved health, would probably amount to more than the total present value of the poultry industry.

With regard to the value of eggs as food, all our great chemists proclaim them to be the cheapest and most nutritious articles of diet. Like milk, eggs are a complete food in themselves, containing everything necessary to the development of perfect animals—as is manifest from the fact that the chicks are formed from them. It seems a mystery how muscles, bones, feathers, and everything that a chick requires for its perfect development are made from the yolk and white of an egg; but such is the fact, and it shows how complete a food an egg is. It is easily digested if not damaged in cooking; indeed, to my mind, there is no more concentrated and nourishing food than eggs. The albumen, oil and saline matter are, as in milk, in the right proportions for sustaining animal life. Two or three boiled eggs, with the addition of a slice or two of bread and good butter, will make a meal for any man or woman and is good enough for a king to sit down to. You take the average food a hen will consume in a year, and I have proved from experience that with a grass run in summer time a hen can be fed all that is necessary on one bushel of corn or wheat, and any fair laying strain will lay at the least from ten to fifteen dozen of eggs in a year. This is equivalent to saying that three and one-tenth pounds of corn will produce when fed to a hen five-sixths of a pound of eggs, but the same weight of pork requires five pounds of corn for its production. Taking into account the nutriment in each and the comparative prices of the two on an average, the pork is about three times as costly a food as the eggs, while it is certainly less healthful.

There is no healthier or easier business that I know of than poultry keeping. In the United States you will find, I am sure, many widows who have been left with families of small children dependent upon them, who have made a living by keeping poultry; and many maiden ladies whom life's lottery has left without a household mate and protector, persons of inferior health who have neither the strength nor ability for severe bodily or mental exertion which is required in other branches of industry; and laborers whose scanty earnings are barely sufficient to feed and clothe the wife and little ones who, if they could have the use of a small piece of land, might not very materially improve their circumstances by keeping poultry. If any of you take the *Poultry Monthly Journal* you will see in this month's supplement about a number of female fanciers who are making a profitable business out of the busy little hen, and let us remind you that this is not one of to-day and gone to-morrow. There is always a good demand in the winter for fresh eggs at a high price, and if "Biddy" is kept warm and comfortable you will not look in vain for eggs when prices are at their very highest.

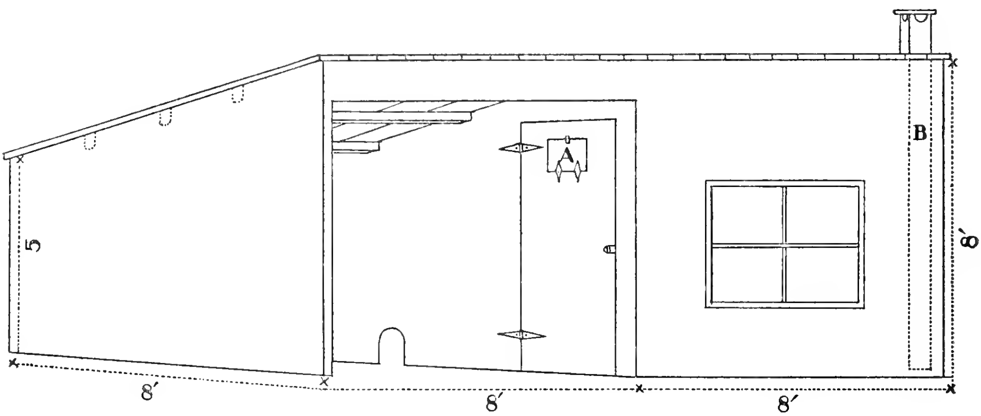
Poultry Houses.

There are few things which relate to the purely practical affairs about which more money is wasted than in hen houses. Never a season goes by that I do not hear of some extravagant and useless expenditure for housing a few birds. Then there is the other side of the question, where the small farmer thinks that any sort of a structure will do well enough for the "chickens," as he never fails to call even birds that have long since retired from the active exercise of their business.

The consensus of opinion among the most advanced of poultry men is that what is called the scratching shed form of poultry house is undoubtedly the best. It gives the fowls a maximum of warmth, shelter, room, sunshine and air with a minimum of cost.

The accompanying sketch will give a general idea of the plan of such a house, designed for construction with the least waste from sixteen foot boards and scantling. The covering of the roof may be of any durable water-tight material. In this section of country cedar shingles are the best. The house consists of a room eight feet square with a shed open to the south of the same dimensions. The dimensions can, however, be changed to suit the size of the flock or any other purpose. It is much to be regretted that both the Dominion and Ontario Governments have put up such expensive houses for the poultry. It has always seemed to the writer that the buildings upon a farm that is intended to act as a practical teacher to our farmers ought to be in most cases just such buildings as a good farmer himself ought to have. These scratching shed poultry houses enlarged with a passage-way running along the back would have been very suitable even for the purposes of the Government farms. If, however, for other reasons it was thought desirable to put up fancy buildings for the poultry, would it not be well to at least have at the Government farms a specimen poultry house built that would be within an ordinary farmer's means, so that farmers could see what is the best form of building to adopt.

A great trouble in the sections of Ontario where the frost is severe in winter is the proper ventilation of the hen houses. I have found a ventilator in the door of the hen house marked A in the plan, and a wooden or metal pipe with the lower end close to the floor the most satisfactory. The ventilator in the door should be supplied with a hinged shutter. To close the pipe I have found a cloth rolled into a ball or a whisk of straw the most satisfactory.



The walls of the hen house proper should be double, and unless the outer and inner coverings can be made air-tight with building paper, the hollow space should be filled in with tan bark saw-dust, dry earth or sand. The walls may be made air-tight with building paper with little trouble or expense by putting the paper over the studs before the outside sheeting is put on and then tacking the laps of the paper to the sheeting from the inside and then battening the paper on the inside sheeting with strips of wood or laths.

I use tar paper, and find that the tar paper takes whitewash well enough if the latter is not made too thin and the tar paper is allowed to become dry and hard before it is whitewashed.

The other fittings of the fowl house should be as simple as possible, but a shelf should always be placed under the perches to catch the droppings, what poultry men call a dropping board ; and this for two reasons, first on account of the ease with which the droppings can be removed, and secondly because these droppings have no straw or refuse mixed with them and are therefore equal to the best guano for fertilizing purposes.

POULTRY FOR MEAT.

By F. H. Gisborne, Ottawa.

There is no question so much debated as the respective merits of the different breeds of fowl, and there is no controversy so hopeless. One insuperable difficulty to the settlement of the dispute is that hardly any two flocks of the same breed even are of equal merit, though, of course, each breed has certain characteristic features in common. In this connection the poultry raisers on the continent of Europe teach us an admirable lesson. They for some time have been breeding birds for certain good market points, and for this purpose have selected birds of any breed that possessed them in a marked degree. The result is that their fatted fowl command prices that fairly makes the Canadian poultryman's mouth water. It is quite time that we realized that for market purposes we must raise a bird of good average size, light in bone and offal, and broad and long in breast. (I use "breast" in the cook's sense of the word.) There are probably none of the breeds commonly seen in our exhibition pens that would be ideal birds, but by judicious crossing there is no doubt that a type can easily be created. In fact to a limited extent some of our poultry raisers have already done so. The Indian game, for instance, gives us great breadth of breast, but the breast is short and the meat is too dry. Crossing the Indian game with the Plymouth Rock, or with the Dorking, produces good results, but the experiments in crossing so far have not been conducted systematically enough. In order to arrive at any satisfactory conclusion extensive experiments should be made and repeated during several years. The Belgian and French peasants have been most successful in producing good market varieties, and I am proud enough of Canada to believe that our Canadian farmers need not take a back seat in any company. What we want is to draw attention to the requirements of the poultry market.

For that market we require, as I have said above, a fair-sized bird, not too large and not too small—say from 6 to $7\frac{1}{2}$ pounds plucked but not drawn, or with head and shanks removed. I think, too, that the effort to breed yellow legs and skins is a great mistake, especially a yellow skin, which is always coarse and unpleasant looking. The Americans have advocated yellow skins for years past, probably from patriotic motives to be different from other people. Both French and English poulterers want a white skin, and I think we can hardly make a mistake in following two nations so famous for skill in cooking and love of good victuals, especially as we are now trying to extend our trade in poultry with England. Our Plymouth Rocks and Wyandottes, though both very good breeds, have the objectionable characteristic of turning the food into layers of fat upon the sides of the breast and in the intestines. This makes the weight of the offal disportionately large. If these breeds are used as a base for the formation of a market food they should be crossed with some bird such as the Indian game that has not the same habit of body. The fanciers have always had difficulty in breeding the strongly colored yellow legs, which is so often accompanied with a yellow skin in both these varieties, so that there would be no trouble in getting rid of that objectionable feature, and by selecting long bodied birds (the fanciers with a singular perversion of taste have for years been trying to breed short bodied birds though the standard has recently been slightly modified in this respect) with white skins and small bones, and then occasionally introducing Indian game blood and utterly ignoring color of plumage, I feel confident that a first class market bird could be produced, that properly grown and fattened, would command such a price both in our own and the English markets as would materially increase the size of the poultryman's wallet. It would be a bird, too, that would be a fair egg producer and a good breeder—in other words, a first-class farmer's bird.

ARE FANCIERS INJURING OUR FOWLS?

By C. J. Devlin, of Ottawa.

It appears to be one of those stock ideas on the subject of poultry raising which drift about from one writer to another, and are eagerly seized on by those who seem to view with distrust any attempt to show that pure-bred stock of any kind is better than that which has been produced from hap-hazard mating.

These critics appear to believe that better results will follow the plan of some farmers who know nothing whatever about the individual laying qualities of any of the mixed breed of hens in their flocks, and who therefore make no selection of the best layers from which to secure eggs for hatching, but take them indiscriminately from the whole flock, little and big, ill formed and good shaped, good and poor layers, mated, it may be said, with a male sprung from a poor laying mother, and kept over winter, perhaps, because he was so unthrifty and weak of constitution as to be unfit to sell or kill in the previous fall; and from such sources the stock is replenished.

I do not think that the foregoing is an overdrawn illustration of the "method" adopted on very many farms. Just how the stamina, laying qualities and thriftiness of fowls can be secured by such work I fail to see. If the average farmer obtains a few pure-bred and good fowls, say of the Plymouth Rock breed, one does not have to wait many seasons to see the stock become greatly deteriorated in size and general excellence as layers. I think those who have noticed the introduction of pure-bred poultry upon farms will agree that this is the usual result.

Now let us for a moment look and see what work the fancier does in order to make his stock fit for the show. He is governed by a standard of excellence which states the weight, shape and charisticstics his fowls must have if he wants to win prizes and have high scoring birds. The result is that his whole care and time is given to the production of the most perfect specimens, not merely in the matter of feathers, but as perfect specimens as possible in size, vigor, full breasts, and other points that are of as special value in a practical and economic sense as from a "fancy" point of view.

Take the Plymouth Rock again, a breed that I am mostly interested in and have made a study of. Its productions and its propagation to the present time are due wholly to the fanciers. If it were not for them there would be no Plymouth Rock worthy the name in the course of a very short time. There is a science in keeping a breed of fowls to a rigid standard, and the average farmer does not possess a knowledge of that science, and yet the average farmer would be very sorry to have this magnificent breed of fowls lost to the world in its present shape and excellence.

It is a mistaken idea to think for a moment that the fanciers as a class are indifferent to the laying qualities of their fowl. Those most worthy of the name, and those who to-day are doing most to advance the interests of the "fancy," are striving to build up most perfect flocks in all respects, and they are succeeding, too, I feel assured. I would like some one to point out to me a farmer who has tried to increase the size of his fowl or their eggs, and who every year selects the most prolific layers as breeding stock. The truth of the matter is that the people of this country are indebted to the fanciers for every valuable breed of poultry they have, for our fowls would long since, but for their care in keeping the breed pure and of fine quality, have degenerated into the nondescript collections that are to be seen in nine out of ten farmyards. I am further of the opinion that it is high time that, if justice cannot be done them, they should at least be freed from the unjust charge of having been an injury to our domestic breeds of poultry. Some few individuals, improperly called fanciers, have perhaps bred their flocks with such poor judgment as to cause them to lose stamina; but the great body of fanciers, who are working intelligently and for the good of the practical as well as æsthetic side of poultry culture, should not be held responsible for the failures of a few breeders.

I strongly imagine that one of the chief reasons why some may speak against the fancy—from an experience, perhaps, with a few pure-bred fowls purchased from some fancier—is because they do not give these fowl proper treatment in order to secure the best results. It is but natural that when taking home a fine trio or breeding hen, for which a good price has been paid, that nothing should be thought too good for these birds. They are often penned up by themselves, and fed, perhaps, a dozen times a day on all sorts of good things; and as a result the fowls become fat and indolent. They, therefore, lay indifferently, and the eggs that are laid are naturally largely infertile. The birds and their breeder are therefore blamed for what was, perhaps, wholly the fault of the purchaser.

Let the fancier have his due; he has done and is doing the farmer and practical poultryman an exceedingly good turn.

PRIZE LIST.

Light Brahma.

Cock.—1st, E. W. Pearen; 2nd, W. R. Knight; 3rd, A. P. Mutchmor.
Hen.—1st and spl., E. W. Pearen; 2nd, W. R. Knight; 3rd, A. P. Mutchmor.
Cockerel.—1st, E. W. Pearen; 2nd, J. Gilroy.
Pullet.—1st, E. W. Pearen; 2nd, J. Gilroy.

Dark Brahma.

Cock—1st and spl., C. J. Daniels: 2nd, E. W. Pearen; 3rd, A. W. Garrett.
Hen.—1st and spl., C. J. Daniels; A. W. Garrett; 3rd, E. W. Pearen.
Cockerel.—1st. E W. Pearen; 2nd, C. J. Daniels.
Pullet.—1st, C. J. Daniels; 2nd, E. W. Pearen.

Buff Cochin.

Cock.—1st, A. P. Mutchmor; 2nd, C. J. Daniels; 3rd, E. W. Pearen.
Hen.—1st, C. J. Daniels; 2nd, E. W. Pearen.
Cockerel.—1st and spl., C. J. Daniels; 2nd, R L. Wright.
Pullet.—1st, C. J. Daniels; 2nd, A. P. Mutchmor; 3rd, R. L. Wright.

Partridge Cochin.

Cock.—1st and spl., E. W. Pearen.
Hen.—1st, E. W. Pearen.
Cockerel.—2nd. E. W. Pearen.
Pullet.—2nd, E. W. Pearen.

Black or White Cochin.

Cock.—1st, E. W. Pearen.
Hen.—1st, E. W. Pearen; 2nd, E. W. Pearen.
Cockerel.—1st and spl., W. R. Knight; 3rd, Jno. Bedlow.
Pullet.—1st, W. R. Knight; 2nd, E. W. Pearen; 3rd, E. W. Pearen.

Langshan.

Cock.—1st and spl, Cranston & Milne; 2nd, Turpin & Peters; 3rd, E. W. Pearen.
Hen.—1st, Cranston & Milne; 2nd, Turpin & Peters; 3rd, W. M. Bailie; 4th W. R. Knight.
Cockerel.—1st, Cranston & Milne; 2nd, Cranston & Milne; 3rd, A. P. Mutchmor; 4th, W. M. Baillie.
Pullet.—1st, W. M. Baillie; 2nd, Cranston & Milne; 3rd, Turpin & Peters; 4th, W. M. Baillie.

Java.

Cock.—1st, Turpin & Peters; 2nd, C. J. Daniels; 3rd, W. H. Reid.
Hen.—1st, C. J. Daniels; 2nd, W. R. Wright; 3rd, Turpin & Peters.
Cockerel.—1st, W. R. Knight; 2nd, Turpin & Peters.
Pullet.—1st, W. R. Knight; 2nd, W. H. Reid; 3rd, Turpin & Peters.

Silver Grey Dorkings.

Cock.—1st and spl., E. W. Pearen; 2nd, J. W. Neilson.
Hen.—1st and spl., J. W. Neilson; 2nd, E. W. Pearen.
Cockerel.—1st, Jno. Bedlow.
Pullet.—E. W. Pearen; 2nd, Jno. Bedlow.

Dorkings A.O.V.

Cock.—1st and spl., Jno. Bedlow; 2nd and spl., W. M. Osborne; 3rd, J. W. Neilson.
Hen.—1st and spl., Jno. Bedlow; 2nd, J. W. Neilson; 3rd and spl., W. M. Osborne.
Pullet.—1st, J. W. Neilson.

Barred Plymouth Rocks.

Cock.—1st and spl., Turpin & Peters.
Hen.—1st and spl. and 2nd, Devlin & Jacques; 3rd, J. Gilroy.
Cockerel.—1st and spl. and 2nd, Devlin & Jacques; 3rd, D. Cumming; 4th, Turpin & Peters.
Pullet.—1st and spl. and 3rd, Devlin & Jacques; 2nd, C. J. Daniels; 4th, Turpin & Peters.

White Plymouth Rocks.

Cock.—1st and spl., W. E. Young; 2nd, C. J. Daniels; 3rd, F. Blaine.
Hen.—1st and spl., C. J. Daniels; 2nd, E. W. Pearen; 3rd, F. Blaine.
Cockerel.—1st and spl., Jno. Vance; 2nd, A. P. Mutchmor; 3rd, C. J. Daniels.
Pullet.—1st and spl., W. M. Baillie; 2nd, E. Cooper; 3rd, Jno. Vance; 4th, A. P. Mutchmor.

Buff Plymouth Rocks.

Cock.—1st, C. J. Daniels; 2nd, J. H. Parsons.
Hen.—1st and spl., J. H. Parsons; 2nd, C. J. Daniels.
Cockerel.—1st, J. H. Parsons; 2nd, E. H. Benjamin; 3rd, W. N. Graham.
Pullet.—1st, J. H. Parsons; 2nd, E. H. Benjamin; 3rd, C. J. Daniels.

Golden L. Wyandottes.

Cock.—1st, G. S. Oldrieve, 92.
Hen.—2nd, C. M. Taylor, 89; 3rd, G. S. Oldrieve, 88.
Cockerel.—1st and spl., G. S. Oldrieve, $93\frac{1}{2}$; 2nd, Turpin & Peters, $92\frac{1}{2}$; 3rd, G. S. Oldrieve, $92\frac{1}{4}$; 4th, F. J. Blake, $91\frac{3}{4}$.
Pullet.—1st and spl., C. J. Daniels, 93; 2nd, Turpin & Peters, $91\frac{1}{4}$; 3rd and 4th, G. S. Oldrieve, $90\frac{3}{4}$, $90\frac{1}{2}$.

Silver L. Wyandotte.

Hen.—2nd, Jno. Bedlow, $89\frac{1}{2}$.
Cockerel.—1st and spl., F. J. Blake, $90\frac{1}{4}$; W. R. Knight, 90; W. W. Graham, $88\frac{3}{4}$; C. J. Daniels, $87\frac{3}{4}$.
Pullet.—1st and spl., F. J. Blake, $93\frac{1}{2}$; W. R. Knight, $92\frac{3}{4}$; W. N. Graham, 91; C. J. Daniels, 91.

Buff Wyandottes.

Cock.—1st, W. M. Baillie.

White Wyandottes.

Cock.—2nd and spl., E. W. Pearen, 88; J. E. Ruddick, 88.
Hen.—1st and spl., E. W. Pearen, 93; C. J. Daniels, $91\frac{3}{4}$; J. E. Ruddick, 89.
Cockerel.—1st and spl., G. C. Howison, $92\frac{1}{4}$; J. Vance, $90\frac{1}{4}$; R. McMullen, 90 and $89\frac{3}{4}$.
Pullet.—1st and spl. and 4th, G. Higman, $93\frac{3}{4}$ and $91\frac{1}{4}$; G. C. Howison, 92 and $91\frac{3}{4}$.

Black Spanish.

Cock.—1st and spl., J. W. Neilson; 2nd, E. W. Pearen; 3rd, W. R. Knight.
Hen.—1st. R. Sinclair; 2nd, W. R. Knight; 3rd, J. W. Neilson.
Cockerel.—1st W. R. Knight; 2nd, Jno. Bedlow; 3rd, J. W. Neilson.
Pullet.—1st and 2nd spl., V. Fortier; 2nd, W. R. Knight; 3rd, J. W. Neilson.

Andalusian.

Cock.—1st, W. R. Knight, $90\frac{3}{4}$: W. M. Osborne, $90\frac{1}{4}$; P. McGregor, 90.
Hen.—1st and spl. and 3rd, P. McGregor, $95\frac{1}{4}$ and $93\frac{1}{2}$; W. R. Knight, $94\frac{1}{4}$.
Cockerel.—1st and spl., W. M. Osborne, 92; W. R. Knight, $91\frac{1}{2}$; P. McGregor, 91.
Pullet.—W. R. Knight, 94; P. McGregor, $93\frac{1}{4}$ and $91\frac{1}{2}$.

Black Minorca.

Cock.—1st and spl., A. P. Mutchmor, $92\frac{1}{2}$; W. H. Armstrong, 90; W. M. Osborne, $87\frac{1}{2}$.
Hen.—W. M. Osborne, $93\frac{1}{2}$; W. H. Armstrong, 93; A. P. Mutchmor, $92\frac{1}{2}$ and $90\frac{1}{2}$.
Cockerel.—W. H. Armstrong, $92\frac{1}{4}$ and $89\frac{1}{4}$; W. P. Fenwick, $90\frac{1}{2}$; A. P. Mutchmor, $87\frac{1}{4}$.
Pullet.—1st and spl., A. P. Mutchmor, 95; W. P. Fenwick, $93\frac{1}{4}$ and 93; W. H. Armstrong, $91\frac{3}{4}$.

White Minorcas.

Cock.—2nd and spl., W. M. Osborne, 88.
Hen.—Spl., W. M. Osborne, $91\frac{1}{2}$, $91\frac{1}{4}$, 90.
Cockerel.—Spl., W. M. Osborne, $90\frac{3}{4}$ and $88\frac{1}{2}$.
Pullet.—Spl., W. M. Osborne, $93\frac{1}{2}$ and $89\frac{1}{4}$; W. H. Reid, 91.

White S. C. Leghorns.

Cock.—Spl., S. N. Graham, $92\frac{1}{2}$; W. H. Reid, $91\frac{1}{2}$; J. J. Gill, $89\frac{3}{4}$ and 89.
Hen.—Spl., J. E. Ruddick, $94\frac{1}{2}$; E. Cooper, 93; W. H. Reid, 93; Cranston & Milne, $92\frac{3}{4}$.
Cockerel.—Spl., S. N. Graham, $93\frac{1}{2}$; W. M. Osborne, 93; Cranston & Milne, $92\frac{1}{4}$; A. P. Mutchmor, $91\frac{1}{2}$.
Pullet.—Spl., W. M. Osborne, 94; J. J. Gill, $93\frac{3}{4}$; J. E. Ruddick, $93\frac{1}{4}$; S. N. Graham, $92\frac{3}{4}$.

Brown S. C. Leghorns.

Cock.—Spl., W. H. Armstrong, $92\frac{1}{4}$; R. Sinclair, $90\frac{1}{2}$; Taggart & James, $88\frac{3}{4}$.
Hen.—Spl, Taggart & James, $91\frac{3}{4}$; Jno. Bedlow, $91\frac{3}{4}$; (Taggart & James, A. P. Mutchmore, W. H. Armstrong, tie at $91\frac{1}{2}$).
Cockerel.—Spl., Taggart & James, 93; R. Sinclair, $92\frac{3}{4}$; A. P. Mutchmor, $92\frac{1}{4}$; Taggart & James, 92.
Pullet.—Spl., Taggart & James, 95 and $93\frac{1}{2}$; A. P. Mutchmor, $92\frac{1}{2}$; W. H. Eves, $92\frac{1}{2}$.

Black Leghorn.

Cock.—1st, Cranston & Milne.
Hen.—1st and spl., Cranston & Milne; 2nd, A. W. Garrett; 3rd, C. J. Daniels.
Cockerel.—1st and spl., V. Fortier; 2nd, W. N. Graham.
Pullet.—1st and 2nd, Cranston & Milne; 3rd, C. J. Daniels.

Buff Leghorn.

Cock.—1st, J. H. Parsons, $90\frac{3}{4}$; 2nd, W. F. Lowe, $88\frac{3}{4}$; 3rd, C. J. Daniels, 88.
Hen.—1st and spl., J. H. Parsons 94; 2nd, W. F. Lowe, $92\frac{3}{4}$; 3rd, C. J. Daniels, $91\frac{1}{4}$.
Cockerel.—1st, J. H. Parsons, $90\frac{1}{2}$; 2nd, C. J. Daniels, $90\frac{1}{2}$; 3rd, S. N. Graham, $90\frac{1}{4}$.
Pullet.—1st, W. F. Lowe, $93\frac{1}{2}$; 2nd, J. H. Parsons, $92\frac{1}{4}$; 3rd, J. E. Ruddich, $91\frac{3}{4}$; 4th, S. N. Graham, $91\frac{1}{2}$.

R. C. Brown Leghorn.

Cock.—1st, Turpin & Peters; 2nd, E. W. Pearen.
Hen.—1st, G. S. Oldrieve; 2nd, E. W. Pearen; 3rd, Turpin & Peters.
Cockerel.—1st and spl., G. S. Oldrieve; 2nd, E. W. Pearen; 3rd, W. H. Eves.
Pullet.—1st, W. H. Eves; 2nd and 3rd, G. S. Oldrieve.

A. O. V. R. C. Leghorn.

Cock.—Spl. and 1st, J. W. Neilson.
Hen.—Spl. and 1st, J. W. Neilson; 2nd, W. H. Reid.
Cockerel.—Spl. and 1st, A. Mutchmor; 2nd, J. W. Neilson; 3rd, C. J. Daniels.
Pullet.—Spl. and 1st, J. W. Neilson; 2nd, C. J. Daniels; 3rd, A. P. Mutchmor.

Black Hamburg.

Cock.—1st, H. E. Beckworth; 2nd, R. Sinclair.
Hen.—1st, R. Sinclair; 2nd, W. R. Knight; 3rd, H. E. Beckworth.
Cockerel.—1st and spl., V. Fortier; 2nd, R. Sinclair; 3rd, W. H. Reid.
Pullet.—1st, H. E. Beckworth; 2nd, W. H. Reid; 3rd, R. Sinclair; 4th, V. Fortier.

Pencilled Hamburg.

Cock.—1st, W. R. Knight; 2nd, E. W. Pearen; 3rd J. W. Neilson.
Hen.—1st, W. R. Knight; 2nd, E. W. Pearen.
Cockerel.—1st, W. R. Knight; 2nd, H. E. Beckworth.
Pullet.—1st, J. W. Neilson; 2nd, W. R. Knight; 3rd and 4th, H. E. Beckworth.

Golden Spangled Hamburg.

Cock.—1st, J. W. Neilson.
Hen.—1st and 2nd, J. Bedlow; 3rd, J. W. Neilson.
Cockerel.—1st, H. E. Beckworth; 2nd, J. W. Neilson.
Pullet.—1st, H. E. Beckworth; 2nd, J. W. Neilson.

SILVER SPANGLED HAMBURG.

Cock.—1st and spl., Wm. Osborne; 2nd, W. R. Knight; 3rd, H. E. Beckworth.
Hen.—1st and spl., W. R. Knight; 2nd and 4th, H. E. Beckworth; 3rd, E. W. Pearen.
Cockerel.—1st and spl., V. Fortier; 2nd, E. W. Pearen.
Pullet.—1st and spl. and 3rd, V. Fortier; 2nd, J. A. Derbyshire.

W. C. BLACK POLISH.

Cock.—1st, V. Fortier; 2nd, C. J. Daniels.
Hen.—1st, C. J. Daniels; 2nd, V. Fortier; 3rd, A. P. Muchmor.
Cockerel.—1st, A. P. Mutchmor; 2nd, W. R. Knight.
Pullet.—1st and spl., V. Fortier.

GOLDEN POLISH.

Cock.—1st, C. J. Daniels; 2nd, V. Fortier; 3rd, H. E. Beckworth.
Hen.—1st, V. Fortier; 2nd, H. E. Beckworth; 3rd, C. J. Daniels.
Cockerel.—1st, V. Fortier.
Pullet.—1st, V. Fortier; 2nd and 3rd, H. E. Beckworth.

SILVER POLISH.

Cock.—1st, H. E. Beckworth; 2nd, V. Fortier; 3rd, J. W. Neilson.
Hen.—1st, E. W. Pearen; 2nd and 3rd, H. E. Beckworth.
Cockerel.—1st, H. E. Beckworth; 2nd, V. Fortier.
Pullet.—1st, H. E. Beckworth; 2nd, V. Fortier.

POLISH A. O. V.

Cock.—1st and 2nd, V. Fortier; 3rd, E. W. Pearen.
Hen.—1st and 2nd, V. Fortier; 3rd, H. E. Beckworth.
Cockerel.—1st and 2nd, V. Fortier; 3rd, H. E. Beckworth.
Pullet.—1st, H. E. Beckworth; 2nd and 3rd, V, Fortier.

HOUDAN.

Cock.—1st and spl., E. W. Pearen; 2nd, C. J. Daniels; 3rd, H. E. Beckworth.
Hen.—1st and spl., C. J. Daniels; 2nd, W. R. Knight; 3rd, A. W. Garrett.
Cockerel.—1st, A. W. Garrett.
Pullet.—1st, H. E. Beckworth; 2nd, C. J. Daniels; 3rd, W. R. Knight; 4th, A. W. Garrett.

RED CAPS.

Cock.—1st and spl., W. M. Osborne; 2nd, C. J. Daniels.
Hen.—1st and spl., C. J. Daniels; 2nd, J. W. Neilson; 3rd, W. M. Osborne.
Cockerel.—1st and spl., C. J. Daniels.
Pullet.—1st and spl., C. J. Daniels.

A. O. V. FOWL.

Cock.—1st, C. J. Daniels.
Hen.—1st, C. J. Daniels.
Cockerel.—1st, C. J. Daniels.
Pullet.—1st, C. J. Daniels.

BLACK RED GAME.

Cock.—1st, G. S. Oldrieve.
Hen.—1st and 2nd, G. S. Oldrieve.
Cockerel.—1st, G. S. Oldrieve.
Pullet.—1st and 2nd, G; S. Oldrieve.

BROWN RED GAME.

Cock.—1st and 2nd, G. S. Oldrieve.
Hen.—1st, D. Rook; 2nd and 3rd, G. S. Oldrieve.
Cockerel.—1st, G. S. Oldrieve.
Pullet.—1st, G. S. Oldrieve.

Duckwing Game.

Cock.—1st, G. S. Oldrieve.
Hen.—1st, G. S. Oldrieve.
Cockerel.—1st, G. S. Oldrieve.
Pullet.—1st, G. S. Oldrieve.

Red Pyle Game.

Hen.—1st and 2nd, G. S. Oldrieve.

Cornish Indian Game.

Cock.—1st and spl., J. H. Parsons ; 2nd, J. W. Neilson ; 3rd, C J. Daniels.
Hen.—1st and 2nd, J. H, Parsons ; 3rd, J. W. Neilson.
Cockerel.—1st and 2nd, J. H. Parsons ; 3rd, J. W. Neilson.
Pullet.—1st and spl. and 2, J. H. Parsons ; 3rd, J. W. Neilson.

O. S. V. Game or White Indian Games.

Cock.—1st, V. Fortier ; 2nd, C. J. Daniels.
Hen.—V. Fortier ; 2nd, C. J. Daniels ; 3rd, J. H. Parsons.
Cockerel.—1st, V. Fortier ; 2nd, J. H. Parsons ; 3rd, C. J. Daniels.
Pullet.—1st, C. J. Daniels ; 2nd, V. Fortier.

Old English or Pit Games.

Cock.—1st and spl. and 2nd, E. H. Benjamin ; 3rd, J. Bedlow.
Hen.—1st and spl. and 2nd, E. H. Benjamin ; 3rd, D. Rook.
Cockerel.—1st, C. J. Daniels ; 2nd, D. Rook ; 3rd, J. Bedlow.
Pullet.—1st, C. J. Daniels ; 2nd, D. Rook.

Black R. Game Bantam.

Cock.—1st and 3rd, A. P. Mutchmor ; 2nd, G. S. Oldrieve.
Hen.—1st, A. P. Mutchmor ; 2nd, G. S. Oldrieve ; 3rd, D. Rook.
Cockerel.—1st, G. S. Oldrieve ; 2nd, A. P. Mutchmor.
Pullet.—1st, G. S. Oldrieve ; 2nd, A. P. Mutchmor ; 3rd. D. Rook.

Brown Red Game Bantam.

Cock.—1st, G. S. Oldrieve ; 2nd, A. P. Mutchmor.
Hen.—1st and 2nd, G. S. Oldrieve ; 3rd, A. P. Mutchmor.
Cockerel.—1st, A. P. Mutchmor.
Pullet.—1st and 2nd, A. P. Mutchmor.

Duckwing Game Bantam.

Cock.—1st, G. S. Oldrieve ; 2nd, D. Rook ; 3rd, A. P. Mutchmor.
Hen.—1st, G. S. Oldrieve ; 2nd, D. Rook ; 3rd, A. P. Mutchmor.
Cockerel.—1st, A. P. Mutchmor ; 2nd, D. Rook.
Pullet.—1st, D. Rook ; 3rd, C. Hudson.

Red Pile Game Bantam.

Cock.—1st, A. P. Mutchmor ; 2nd, G. S. Oldrieve.
Hen.—1st and 3rd, G. S. Oldrieve ; 2nd, A. P. Mutchmor.
Cockerel.—1st and 2nd, A. P. Mutchmor.
Pullet.—1st and 2nd, A. P. Mutchmor.

Golden Sebright.

Cock.—1st, Cranston & Milne ; 2nd, W. H. Reid ; 3rd, E. W. Pearen.
Hen.—1st and 3rd, Cranston & Milne ; 2nd, W. H. Reid.
Cockerel.—1st, G. S. Oldrieve ; 2nd, W. H. Reid ; 3rd, Cranston & Milne.
Pullet.—1st and 3rd, G. S. Oldrieve ; 2nd, Cranston & Milne : 4th, E. W. Pearen.

SILVER SEBRIGHT.

Cock.—1st, W. H. Reid; 2nd, H. E. Beckworth; 3rd, A. P. Mutchmor.
Hen.—1st, H. E. Beckworth; 2nd, A. P. Mutchmor; 3rd, W. H. Reid.
Cockerel.—1st, W. H. Reid; 2nd, A. P. Mutchmor; 3rd, G. S. Oldrieve.
Pullet.—1st, G. S. Oldrieve; 2nd, A. P. Mutchmor; 3rd, G. S. Oldrieve.

R. C. BLACK BANTAMS.

Cock.—1st, G. S. Oldrieve; 2nd, W. H. Reid.
Hen.—1st, G. S. Oldrieve; 2nd, W. H. Reid; 3rd, E. W. Pearen.
Cockerel.—1st, Cranston & Milne; 2nd, G. S. Oldrieve.
Pullet.—1st, G. S. Oldrieve; 2nd, Cranston & Milne.

COCHIN BANTAM.

Cock.—1st, Cranston & Milne; 2nd, W. M. Osborne; 3rd, A. P. Mutchmor; 4th, C. J. Daniels.
Hen.—1st and 2nd, W. H. Reid; 3rd, Cranston & Milne; 4th, A. P. Muchmor.
Cockerel.—1st, A. P. Mutchmor; 2nd, W. M. Baillie; 3rd, J. Bedlow; 4th, E. W. Pearen.
Pullet.—1st and 4th, A. P. Mutchmor: 2nd, Cranston & Milne; 3rd, E. W. Pearen.

JAPANESE BANTAMS.

Cock.—1st, C. J. Daniels; 2nd, H. E. Beckworth.
Hen.—1st, Cranston & Milne; 2nd, H. E. Beckworth; 3rd, C. J. Daniels.
Cockerel.—1st, Cranston & Milne; 2nd, H. E. Beckworth; 3rd, C. J. Daniels.
Pullet.—1st and 3rd, Cranston & Milne; 2nd, C. J. Daniels.

O. V. BANTAMS.

Cock.—1st, V. Fortier; 2nd, W. H. Reid.
Hen.—1st, V. Fortier; 2nd, W. H. Reid.

TURKEYS—BRONZE.

Cock.—1st, D. Cumming; 2nd, J. W. Neilson.
Hen.—1st and 2nd, D. Cumming.
Cockerel.—1st, spl. and 3rd, D. Cumming; 2nd, J. W. Neilson.
Pullet.—1st and 2nd, D. Cumming; 3rd, J. W. Neilson.

O. V. TURKEYS.

Cock.—1st, D. Cumming.
Hen.—1st, A. Thompson: 2nd, D. Cumming.
Cockerel.—1st, D. Cumming; 2nd, A. Thompson.
Pullet.—1st, A. Thompson; 2nd, D. Cumming.

TOULOUSE GEESE.

Old Gander.—1st, A. Thompson; 2nd, W. R. Knight.
Old Goose.—1st, A. Thompson; 2nd, W. R. Knight; 3rd, D. Cumming.
Young Gander.—1st, A. Thompson; 2nd and 3rd, D. Cumming.
Young Goose.—1st and 2nd, A. Thompson; 3rd, D. Cumming.

EMBDEN.

Old Gander.—1st, A. Thompson.
Old Goose.—1st, A. Thompson.
Young Gander.—1st and 2nd, A. Thompson; 3rd, J. W. Neilson.
Young Goose.—1st, J. W. Neilson; 2nd and 3rd, A. Thompson.

A. O. V. GEESE.

Old Gander.—1st, A. Thompson; 2nd, D. Cumming.
Old Goose.—1st, A. Thompson; 2nd and 3rd, Cranston & Milne.
Young Gander.—1st, A. Thompson; 3nd, D Cumming.
Young Goose.—1st, A. Thompson; 2nd, D. Cumming.

Rouen Ducks.

Old Drake.—1st, W. R. Knight; 2nd, J. W. Neilson ; 3rd, D. Cumming.
Old Duck.—1st, W. R. Knight; 2nd, J. W. Neilson ; 3rd, D. Cumming.
Young Drake.—1st, S. W. Neilson ; 2nd, D. Cumming ; 3rd, D. Cumming.
Young Duck.—1st, D. Cumming ; 2nd, J. W. Neilson.

Pekin Ducks.

Old Drake.—1st, Cranston & Milne ; 2nd, J. W. Neilson : 3rd, W. R. Knight.
Old Duck.—1st, J. W. Neilson ; 2nd, W. R. Knight; 3rd, D. Cumming.
Young Drake.—1st, J. W. Neilson ; 2nd, Cranston & Milne.
Young Duck.—1st, J. W. Neilson ; 2nd and 3rd, Cranston & Milne.

Aylesbury Ducks.

Old Drake.—2nd, W. R. Knight.
Duck.—1st, W. R. Knight.

O. V. Ducks.

Old Drake.—1st, J. W. Neilson ; 2nd and 3rd, A. Thompson.
Old Duck.—1st, D. Cumming ; 2nd, J. W. Neilson ; 3rd, A. Thompson.
Young Drake.—1st, J. W. Neilson ; 2nd, D. Cumming ; 3rd, A. Thompson.
Young Duck.—1st, D. Cumming ; 2nd, J. W. Neilson ; 3rd, A. Thompson.

Farmers' Pens—Heavy Breeds.

1st, J. W. Neilson ; 2nd, J. E. Ruddick ; 3rd, J. Gilroy.

Farmers' Pens—Light Breeds.

1st, Geo. C. Brown ; 2nd, J. H. Parsons ; 3rd, J. E. Ruddick.

Guinea Fowl.

1st, C. J. Daniels ; 2nd, Cranston & Milne.

Guinea Pigs.

1st, Geo. C. Howison.

Brown Eggs.

1st, C. J. Daniels ; 2nd, Turpin & Peters ; 3rd, J. W. Neilson ; 4th, D. Cumming.

White Eggs.

1st, J. E. Ruddick ; 2nd, R. Sinclair ; 3rd, D. Cumming ; 4th, J. W. Neilson.

Heaviest Dozen.

1st, J. E. Ruddick.

Dressed Poultry.

D. Cumming.

Pigeons.

A. P. Mutchmor.—Pouters, white, 1st cock, 2nd hen ; Carriers, 1st hen ; Barbs, black or blue, 1st and 2nd cock, 1st and 2nd hen ; Barbs, A. O. C., 1st cock ; Jacobins, red or yellow, 1st and 2nd cock, 1st and 2nd hen ; Jacobins, A. O. C., 1st and 2nd cock, 1st and 2nd hen ; Fantails, white, plain head, 1st cock, 1st hen; Fantails, black or blue, 2nd cock, 2nd hen ; Fantails, A. O. C., 1st cock ; Russian Trumpeters, black, 1st cock, 1st hen ; Tumblers, S. F., 1st and 2nd cock, 1st and 2nd hen ; Tumblers, L. F., 1st and 2nd cock, 1st and 2nd hen ; Antwerps, L. F., 1st cock ; English owls, 1st and 2nd cock, 1st hen ; Owls, African, 2nd, hen ; Swallows, red or yellow, 1st and 2nd cock, 1st and 2nd hen ; Swallows, blue or black, 1st and 2nd cock, 1st and 2nd hen ; Swallows, A. O. C., 1st cock ; Archangels, crested, 1st cock, 1st hen ; Magpies, black, 1st and 2nd cock, 1st hen ; Magpies, A. O. C , 1st and 2nd cock, 1st and 2nd hen ; Nuns, black, 1st and 2nd cock, 1st and 2nd hen ; Dragoons, 1st and 2nd cock, 1st and hen ; A. O. V. pigeons, 1st and 2nd cock, 1st and 2nd hen.

W. H. Reid.—Pouters, black or blue, 1st hen ; Pouters, A. O. C., 1st cock, 1st hen ; Fantails, white, plain head, 2nd cock, 2nd hen ; Fantails, black or blue, 1st cock, 1st hen ; Fantails, A. O. C., 2nd hen ; Archangel, crested, 2nd hen.

B. Webb.—Fantails, A. O. C., 2nd cock, 1st hen ; Owls, African, 1st and 2nd cock, 1st hen ; Archangels, crested, 2nd cock.

W. F. Nickle.—Turbits, red or yellow, 1st and 2nd cock, 1st and 2nd hen ; Turbits, A. O. C., 1st and 2nd cock, 1st and 2nd hen.

NUMBER OF ENTRIES.

Brahmas	21	Redcaps	7
Cochins	30	A. O. V	4
Langshans	25	Games	65
Javas	16	Bantams	136
Dorkings	18	Turkeys	17
Plymouth Rocks	51	Geese	29
Wyandottes	65	Ducks	43
Black Spanish	19	Guinea fowl, pair	2
Andalusians	16	Guinea pigs, "	1
Minorcas	38	Farmers' pens	8
Leghorns	137	Eggs, dozen	22
Hamburgs	64	Pigeons	122
Polish	64	Dressed poultry	1
Houdans	18		

Score of first four pens competing for cup presented by the Earl of Aberdeen.

—	P. McGregor. (Andalusians.)	Taggart & James. (Brown Leghorns.)	A. P. Mutchmor. (Black Minorcas.)	W. H. Armstrong. (Black Minorcas.)
Cock	90	88¾	92½	90
Hen	93½	91½	90½	90¼
Hen	95¼	91¾	92¼	93
Cockerel	91	93	87¼	92¼
Pullet	93¼	95	91	91¼
Pullet	91½	93½	95	91¾
Total	554½	553½	548¾	548½

This cup was competed for by pens of Andalusians, Black Minorcas, White Minorcas and single comb White, Brown or Buff Leghorns. Mr. S. N. Graham's pen of White Leghorns scored 554¾ and Mr. Gill's 549¾, but the heavy handicap of a point and a half prescribed by the "American Standard of Perfection" put them at too great a disadvantage.

APPENDIX.

LIST OF MEMBERS FOR 1899.

POULTRY ASSOCIATION OF ONTARIO.

Name.	Post Office.	Varieties exhibited.
Anderson, James	Guelph	Bronze Turkeys.
Arthur, James	London	Silver Wyandottes.
Armstrong Bros	Fergus	Langshans, Barred P. Rocks, S. Wyandottes and Minorcas.
Angus, George	London	Pheasants.
Anderson, W. M	Palmerston	Pigeons of all varieties.
Burn, M. T	Tilsonburg	Langshans, Javas, Leghorns, Spanish Game, Dorkings and Silver Polands and Ducks.
Bogue, Allan	London	Hamburgs, Dorkings, Houdans, Polands, Toulouse Geese, Aylesbury, Rouen and Pekin Ducks.
Bell, Dr. A. W	Toronto	Buff Cochins.
Beattie, W. H.	Wilton Grove	White Minorcas, Colored Dorkings, Bronze, White, Black and Buff Turkeys.
Barber & Co	Toronto	All varieties of Games and Game Bantams.
Bennett, J. E	Toronto	Barred Plymouth Rocks.
Brown, Thos	Durham	Barred and White Rocks, Javas, White and Brown Leghorns, and White and Black Turkeys.
Barker & Muir	Weston	White Rocks, White Wyandottes, White Leghorns, Black Red Bantams, Javas.
Bell, W. J	Angus	R. C. White Leghorns and Bronze Turkeys.
Baulch, J. H	Port Hope	Carriers, Trumpeters and Dragon Pigeons.
Bonnick, Charles	Eglington	Buff Rocks, Black Leghorns, Brown Red Game, Buff Cochin Bantams.
Brown, A. G	Watford	Black Leghorns.
Bradley, John	Milton	Brown Leghorns.
Bell & Shoff	Toronto	Barred P. Rocks.
Bradley, J. G	London	Barred P. Rocks.
Bogue, Geo	Strathroy	Black Cochins, Silver and Black Wyandottes, Dominiques, Cochin Bantams, Ducks.
Bryant, B. F	Johnson Creek, N.Y.	White Wyandottes, Buff Leghorns, W. C. B. White and Buff Laced Polands.
Blythe, A. C	Toronto	Light Brahmas.
Berner, G	Toronto	Buff Leghorns.
Blair, Wm	Toronto	White Wyandottes.
Brown, James	Toronto	Dark Brahmas, White Rocks, Golden Polands.
Bedford, John	Toronto	Buff Leghorns.
Brown, George	Toronto	Silver Wyandottes and Pekin Ducks.
Bright, W. E	Waltham, Mass	Barred P. Rocks.
Boyles & Son	Meadville, Pa	R. C. Brown Leghorns.
Cale & Merry	Stratford	White Wyandottes, Javas, Rose Comb Bantams.
Crowe, John	Guelph	Black Red, Brown Red and Pyle Game.
Cox, T. A	Brantford	Light Brahmas, Langshans, Silver Wyandottes, S. G. Dorkings.
Cosh, Newton	Brantford	Andalusians.
Cornahan, Peter	Whitby	Mottled Leghorns.
Chambers, John	Toronto	Barred P. Rocks, S. C. White Leghorns.
Carter, J. S	Toronto	Black Minorcas.
Crowe, C. R.	Guelph	Black Red Game Bantams, Golden, Silver and White Bantams.
Close Bros	Mitchell	Black Red, Brown Red, Dorking and Pyle, both Game, and Game Bantams.
Corcoran, J. L	Stratford	Spanish, Silver Grey and Colored Dorkings.
Currie & Wright	Owen Sound	Black Red Games, Indian Games, and Pyle Games.
Colson, John	Guelph	Rouen Ducks and dressed poultry.
Cameron, John	Brantford	Light Brahmas.
Cook, H. J	Woodstock	Buff Rocks and Buff Wyandottes.
Cockburn, W. B.	Woodstock	Light Brahmas.
Chambers, W. H	Toronto	Orpingtons.

LIST OF MEMBERS.—*Continued.*

Name.	Post Office.	Varieties exhibited.
Downs, S	Toronto	Barred P. Rocks.
Dains, Geo. W	E. Litchfield, Conn.	Buff Brahmas.
Donovan, H.B	Toronto	Cochin, Polish and A. O. V. Game Bantams, and a large assortment of Pigeons.
Daniels, C. J	Toronto	Black Langshans, Silver Grey Dorkings, Plymouth Rocks, Wyandottes, Javas and Leghorns of all kinds, Minorcas, Red Caps, Indian Sumatra Game, Cochin and Japanese Bantams.
Dewey, E. J	Toronto	Black Langshans.
Durston, Robt	Toronto	Black Minorcas.
Dewar Bros	Milton	S. C. Brown Leghorns, Black Red Game Bantams.
Dundas, Jas	Deer Park	Buff Wyandottes, Buff Leghorns, Minorcas.
Dickenson, E., jr	North Glanford	Barred Plymouth Rocks.
Davidson, W	St. Thomas	Black Langshans.
Doyle, H. G	Woodstock	Buff Leghorns.
Dunn, G. J	Hamilton	Dragon Pigeons.
Elliott, W	Oshawa	White P. Rocks. Black Hamburgs.
Essex, R. H	Toronto	Buff Rocks, Buff Wyandottes, White Minorcas.
Emrick, Henry	Bridgeburg	Black and White Cochins.
Faulkner, A. D. H	East Aurora, N.Y.	Barred P. Rocks and Silver Wyandottes.
Fox, Wm	Toronto	Rabbits of all kinds.
Ford, James	Drumquin	
Ferguson, E. M. & W	W. Fishers' Island, NY	Barred and White Rocks, Indian Games, Pekin Ducks.
Foley, J. J	Brantford	Buff Rocks.
Fink, A.	Woodstock	Dominiques.
Furminger, S. D.	St. Catharines	Black Red and Pyle Game, Silver Grey and Colored Dorkings.
Farrel, M. L	Oil Springs	Indian Game.
Forsythe, James	Owego, N.Y.	Buff Rocks, Buff and White Wyandottes, Brown Leghorns, Houdans.
Gunning, John	Sherbrooke, Que	Andalusians.
Graham, A. W	St. Thomas	Black Langshans, Golden Wyandottes, White Leghorns.
Graham, S. N	Kingston	White and Buff Leghorns.
Goddard, Geo	Woodstock	Silver Grey Dorkings,
Grimsley, Chas	Toronto	Black Wyandottes.
Gray, Geo	Oshawa	Dark Brahmas, White Rocks, Black Minorcas.
Gould, Chas. B	Glencoe	Bronze Turkeys, Light Brahmas.
Goulding & Son	Toronto	Black Red, Brown Red, Dorking and Pyle, Games, W. C. B. Polands.
Hillman, James	E. Angus, Que	A. O. V. Game.
Henderson, James	Toronto	Black Hamburgs.
Hollingshead, —	Kleinburg	Silver Wyandottes and Buff Leghorns.
Henderson, J. S	Rockton	Bronze Turkeys.
Heath, H. W	Piermont, N.H	White Wonders.
Hutton, F. G	Welland	Light Brahmas.
Howard, A. McL	Toronto	Black Red Games, W. C. B. and Buff Laced Polands and A. O. V. Fowls.
Holton, W. A	Hamilton	Light Brahmas.
Hill, R. B	Hamilton	Black Langshans.
Henderson & Billings	St. Marys	Barred and Buff Rocks, Golden and Silver Wyandottes, Brown and Buff Leghorns, Spanish.
Hare, F. C	Whitby	Buff Cochins and Black Spanish.
Henderson, G. G	Hamilton	S. C. Brown Leghorns
Hill, A	Wyoming	W. Rocks, W. Wyandottes and Brown Leghorns.
Irving, W. H	Owen Sound	Black Leghorns.
James & Taggart	Ottawa	Barred P. Rocks, Brown Leghorns.
Jones, I. B	Toronto	Antwerp Pigeons.
Jones, N. S	Hamilton	Magpie Pigeons.
Jarrott, J. E	Toronto	Black Minorcas.
Jerome, C. W. & Co.	Fabius, N.Y	White Plymouth Rocks and White Minorcas.
Kerr, W. J	Toronto	Buff Leghorns.
Knight, W. R*	Bowmanville	Rocks, Javas, Brown Leghorns, Spanish, Andalusians, Bronze Turkeys, Toulouse Geese, and Ducks.
Karn, H	Guelph	Langshans, Black Red Game, W. Cochin Bantams.
Kedwell, J. W	Petrolia	Barred, White and Buff Plymouth Rocks.
Keiley, T. J	London	Games and Cochin Bantams.
Kettlewell, N. T	London	White Wyandottes.
Lightfoot, A	Parkdale	Brown Leghorns.
Lenton, James	Oshawa	Golden and Silver Wyandottes.

LIST OF MEMBERS.—*Continued.*

Name.	Post Office.	Varieties exhibited.
Lawrence, W. D	Morden, Man	Silver Wyandottes.
Luxton, A. G. H	Georgetown	Dominiques, Bronze Turkeys, Geese and Ducks.
Livingstone, J. A	Grimsby	Buff Plymouth Rocks.
Lake, Arthur	Toronto	Barred Plymouth Rocks.
Lawrie, John	Malvern	Colored Dorkings, Bronze Turkeys, Bremen Geese
Main, William	Milton West	
Miller, Geo. W	London	Barred P. Rocks and Buff Leghorns.
Minshall, J. H	Brantford	White P. Rocks and Black Minorcas.
Murray, W. G	Strathroy	Black Leghorns, White Minorcas, Silver S. and Rose Comb Bantams.
Mitcheltree, W. L	London	Pyle game.
Massie, Chas	Port Hope	White Wyandottes, Jacobin and Fantail Pigeons.
Magill, J. H	Port Hope	Golden Wyandottes and Pouter Pigeons.
Meyer, J. E	Kossuth	Silver Wyandottes.
Millard, R. B	London	White and Black Cochins
Moore, F. G. L	London	White Wyandottes, Cochin Bantams.
Manson, G. E	Toronto	Pyle Game.
Milne, F. E	Kingston	Langshans, White and Black Leghorns.
Munro, D	London	
McNeil, Wm	London	White Cochins, Bantams, Hamburgs and Polands.
McCurdy, R	London	Black Langshans and Dressed Poultry.
McGregor, Mrs. G. H	Davisville	White Wyandottes and Pekin Ducks.
McKee, John	Norwich	Silver Grey Dorkings.
McNeil, C. H	London	White and Black Cochin Bantams.
McLoud, William	London	Barred P. Rocks and Black Red Game.
McConnell, R	London	Black Langshans.
McKenzie, W. D	Brantford	Andalusians
McCammon, Thos	Paris	Black Red Game.
McCormick, Jas	Rockton	Rocks, Spanish, Brown Red Game, Rouen Ducks.
McPhie, N. D	Hamilton	Show Homer Pigeons.
McGillivray, Dr	Hamilton	Large Collection Pheasants.
Nickle, W. F	Kingston	
Nantel, W. B	Jerome, Que	Light & Dark Brahmas, Partridge & White Cochins,
Nichols, D. A	Munro, Conn	Black Cochin Bantams
Nims, E. T	Dresden	Indian Game.
Niven, Dr. J. S	London	Pheasants and Red Caps.
Oke, R	London	
O'Neil, J. N	Toronto	White Minorcas.
Oldrieve, G. S	Kingston	Golden Wyandottes, Black Red, Brown Red and Duckwing Game and Game Bantams.
O'Brien & Colwell	Paris	Barred Rocks, Duckwing and Pyle Game, Geese and Ducks, all varieties.
Oakley, H. B	Toronto	Indian Game.
Phipps Bros	Grimsby	Black and Buff Leghorns.
Pearson, W. T	Toronto	Buff Leghorns.
Parsons, J. H	Osaca	Buff P. Rocks.
Plastow, S	Rockton	Partridge Cochins.
Powell, F. A	Norway	White Wyandottes, Black Minorcas.
Page, J. L	Woodstock	White Leghorns.
Porteous, J. W	Galt	Barred Rocks Pyle game.
Pierce Bros	Winchester	Buff Cochins, Black Red, Brown Red Duckwing and Pyle Games.
Roddy, G. J	London	Brown Leghorns.
Robinson, W. E	London	Langshans, Indian Game.
Ramsay, John	Owen Sound	White Leghorns.
Rice, Thos	Whitby	White P. Rocks, White and Brown Leghorns.
Robinson, Willard E	Malden, Mass	Large variety of Pigeons.
Richardson, M	Hamilton	Barred Rocks and Indian Game.
Rankin Bros	Owen Sound	White Cochin Bantams.
Spraker, J. A	Sprakers, N.Y	White games.
Sutton, J. H	Toronto	Buff Cochins.
Sherlock, Thos	London	Pyle Game.
Sage & Garside	London	Dark Brahmas.
Spry & Mick	Toronto	Buff Leghorns.

LIST OF MEMBERS.—*Concluded.*

Name.	Post Office.	Varieties exhibited.
Shales, Mrs. J. H	Toronto	Buff Cochins, Buff and White Wyandottes, Black Minorcas.
Scott, T. H	St. Thomas	Langshans and Buff P. Rocks and Cross Breeds.
Shilling, A. R	Egypt, N.Y	White Wyandottes.
Stewart, C. A	London	Buff Cochins, Cochin Bantams.
Sisley, Sidney	Sheffield	Black Leghorns
Shaw, A	Toronto	Buff Plymouth Rocks.
Seeker, Will	Dunbarton	Light Brahmas and White Wyandottes.
Schwab Bros	Rochester, N.Y	Barred Plymouth Rocks.
Senior, T. J	Hamilton	Black and White Minorcas.
Thompson, John	Fergus	Dark Brahmas.
Turp, F. W	Toronto	Black Hamburgs.
Troth, F	Toronto	Duckwing, Pyle and Birchen Game.
Thompson, Robt	Toronto	Barred P. Rocks.
Trew, D. C	Lindsay	White Leghorns and Houdans.
Turpin & Peters	Kingston	Langshans, Barred Rocks, Golden Wyandottes, Javas.
Tozer, W. H	London	Black Cochins, White Rocks, Leghorns, Black Hamburgs, Indian Game, Ornamental Bantams and Pigeons.
Turville, F. N	London	Brown Red and Duckwing Game.
Thompson, J. H	Patterson, N.Y	Barred Plymouth Rocks.
Wanless, John	Bracondale	Black Langshans.
Wray Bros	London	Golden and Silver Wyandottes.
Webber, F. R	Guelph	Langshans W. or B. (P.C.B.) Bantams, Black Javas, A.O.C. Javas, Aylesbury and Pekin Ducks, Toulouse Geese.
Wyatt, Hugh	London	Buff and Partridge Cochins.
Westwood, W. J		White Minorcas and Black Rose Comb Bantams.
Wedgery, Jas	Woodstock	Black Wyandottes.
Whillans, Geo	Toronto	Buff Leghorns.
Wolfe, W. J		S. C. White Leghorns.
Saunders, J. H	London	Did not exhibit
Donnelly, Ed	Sandwich	
Duff, T. A	Toronto	
Patterson, W	Barrie	
Power, Thos	Bowmanville	
Milne, Thos	Kingston	
Lyons, J. C	Lucknow	
Irving, Ed	Owen Sound	
Wright, Hy	Owen Sound	
Petty, E. Y	Owen Sound	
Davey, J. W	Owen Sound	
Collins, William	Peterboro	
Geary, William	London	
Moore, B. B	Durham	
Levell, Chas	Leavens	
Laidlaw, Jas	Guelph	
Foster, J. C	Brampton	
Grimoldy, J	Owen Sound	
Cohoun, Robt	Toronto	
Hart, E	Owen Sound	
Pearce, J. S	London	
Cole, John	Hamilton	
Moffatt, J. S	Guelph	
Peirson, J. A	Weston	
Goldey, F. N	Peterborough	
Elliott, Wm	Peterborough	
Cullen, J. E	Peterborough	
Stratton, J. R., M.P.P	Peterborough	
Chambers, J	Owen Sound	
Perrin, E. W	Brampton	

EASTERN POULTRY ASSOCIATION.

Name.	Post Office.	Varieties exhibited.
Derbyshire, J. A.	Brockville	S. S. Hamburgs.
Blaine, F.	Brockville	White P. Rocks, W. Wyandottes.
Lowe, W. F.	Almonte	Buff Leghorns.
Young, W. E.	Brockville	White P. Rocks.
Wright, R. L.	Brockville	Buff Cochins.
Thompson, A.	Allan's Corners	Turkeys, Ducks and Geese.
Devlin & Jacques	Ottawa	Barred P. Rocks
Beckworth, H. E.	Blenheim	Hamburgs, Houdans, Polands, Bantams.
Pearen, E. W.	Brampton	Brahmas, Cochins, Langshans, Dorlings, White P. Rocks, Wyandottes, Black Spanish, Leghorns, Hamburgs. Polands, Houdans and Bantams.
Higman, G.	Ottawa	White and Golden Wyandottes.
Howison, G. C.	Brockville	White Wyandottes, Guinea Pigs.
Oldrieve, G. S.	Kingston	Games, Golden Wyandottes, R. C. Brown Leghorns, Bantams.
Daniels, C. J.	Toronto	D. Brahmas, Cochins, Javas, Plymouth Rocks, Wyandottes, Leghorns, Games, Polish, Red Caps, Bantams, Ducks.
Gill, J. J.	Ottawa	White S. C. Leghorns.
Taggart & James	Ottawa	S. C. Brown Leghorns
Graham, W. N.	Brockville	Buff Plymouth Rocks, Silver Wyandottes, Black Leghorns.
Graham, S. N.	Kingston	S. C. White and Buff Leghorns.
McGregor, P.	Almonte	Andalusians.
Nickle, W. F.	Kingston	Pigeons.
Blake, F. J.	Almonte	Gold and Silver Wyandottes.
Baillie, W. M.	Kingston	Langshans, W. Plymouth Rocks, Buff Wyandottes.
Turpin & Peters	Kingston	Langshans, Jarvas, Barred P. Rocks, Gold Wyandottes, R. C. Brown Leghorns.
Sinclair, R.	Kingston	Black Spanish, Brown Leghorns, Black Hamburgs.
Ruddick, J. E.	Brockville	White Wyandottes, White Leghorns, Buff Leghorns, Farmers' Fowls.
Cooper, E.	Brockville	White P. Rocks, W. Wyandottes, W. Leghorns.
Hudson, C.	Brockville	Duckwing Game Bantams.
Webb, B.	Ottawa	Pigeons.
Eves, W. H.	Kingston	Brown Leghorns.
Rook, D.	Prescott	Games and Game Bantams.
Gilroy, J.	Lyn	L. Brahmas, Barred P. Rocks and Farmers' Fowl.
A. P. Mutchmor	Ottawa	Brahmas, Cochin, Langshans, W. Plymouth Rocks, W. Wyandottes, Minorcas, Leghorns, Polish Bantams and Pigeons.
A. W. Garrett	Brockville	D. Brahmas, Black Leghorns, Houdans.
Cranston & Milne	Kingston	Langshans, Javas, Leghorns, Bantams, Geese, Ducks, Guinea Fowl.
W. H. Armstrong	Cornwall	Black Minorcas, Brown Leghorns.
R. McMullen	Brockville	W. Wyandottes.
W. M. Osborne	Brockville	W. Dorkings, W. Wyandottes, Andalusians, Minorcas, Leghorns, S. S. Hamburgs, Red Caps, Cochin, Bantams.
J. Bedlow	"	Cochins, Dorkings, S. Wyandottes, B. Spanish, Brown Leghorns, Pit Games, Cochin Bantams.
W. R. Knight	Bowmanville	Brahmas, Cochins, Langshans, Javas, Wyandottes, B. Spanish, Andalusians, Hamburgs, Polish, Houdans, Geese, Ducks.
V. Fortier	Ste. Therese	B. Spanish, Leghorns, Sumatras, Hamburgs, Polish.
J. W. Neilson	Lyn	Langshans, Dorkings, B. Spanish, Minorcas, Leghorns, Cornish, I. Games, Hamburgs, Polish, Red Caps, Turkeys, Ducks and Geese.
D. Cumming	Russell	Barred P. Rocks, Wyandottes, S. S. Hamburg, Turkeys, Geese and Ducks.
W. H. Reid	Kingston	Cochins, Javas, Dorkings, Andalusians, Minorcas, Leghorns, B. Hamburgs, Bantams, Ducks, Pigeons.
E. H. Benjamin	Ottawa	Buff P. Rock, Pit Games.
J. H. Parsons	Osaca	Buff P. Rocks, Buff Leghorns, C. Indian and W. I. Games, Farmers' Fowls.
G. C. Brown	Lyn	Farmers' Fowls.

LIST OF MEMBERS.—*Concluded.*

Name.	Post Office.	Varieties exhibited.
W. P. Fenwick	Portsmouth	B. Minorcas
C. M. Taylor	Lyn	G. and S. Wyandottes.
J. Vance	Brockville	W. P. Rocks, W. Wyandottes.
Gray & Archibald	Ottawa	
W. F. Garland	Hintonburg	B. Plymouth Rocks.
R. McKinstrey	Ottawa	
F. Auclair	"	Langshans, Pigeons.
Frank Hammond	Janeville	
N. Stapeley	Ottawa	
G. Aird	"	
P. Nettbohm	"	W. Wyandottes, Ducks.
F. Craig	"	
G. S. Fleming		
John Chugg	Ironsides	
J. Mason	Ottawa	W. Plymouth Rocks.
F. Bourgingnon	"	Polish.
G. Gainsford	"	
M. F. Reid	Brockville	
G. H. Brown	"	Silver Wyandottes.
O. Fairbanks	"	
Chas Molson	"	
L. R. Cossitt	"	
J. N. Marshall	"	
Jos. McBratney	"	
Lewis Murphy	"	Silver Wyandottes.
J. A. Grant	"	
A. D. Adams	"	
Leopold de Carle	"	
F. G. McCrady	"	
G. A. Dana	"	
J. W. Easton	"	
A. E. Cameron	"	
Samuel Connor	"	
A. B. Henderson	"	
P. Ludlow	"	
J. C. Bann	"	
A. Robinson	"	
A. Wendling	"	
W. H. Davis	"	Minorcas, Silver Wyandottes, P Rocks.
J. F. Woods	"	
T. Burns	"	
H Woods	"	
M. McGlade	"	
S Short	Ottawa	Barred Plymouth Rocks, White Wyandottes.
C. W. Young	Cornwall	W. Wyandottes.
F. X. Lecelle	Ottawa	
W. Shearer	Brockville	
W. A. Patterson	"	
E. Smith	"	
J. Culbert	"	
S. Johnston	Lyn	
J. Pergan	"	
F. Blaine	Brockville	
B. D. Steacy	"	
R. L. Wright	"	
R. B. Heather	"	
J. Sutherland	"	
C. Fulford	"	
F. H. Gisborne	Ottawa	Cross-bred Poultry and C. I. Games.

OFFICERS FOR 1899.

POULTRY ASSOCIATION OF ONTARIO.

President	J. R. Stratton, M.P.P.	Peterborough.
1st Vice-President	Allan Bogue	London.
2nd Vice-President	M. T. Burn	Tilsonburg.
Secretary	Thomas A. Browne	London.
Treasurer	George G. McCormick	London.
Directors:		
District No. 5	D. C. Trew	Lindsay.
" 6	A. W. Bell, M D	Toronto.
" 7	T. J. Senior	Hamilton.
" 8	F. G. Hutton, M.D	Welland.
" 9	T. H. Scott	St. Thomas.
" 10	Thomas Brown	Durham.
" 11	Wm. McNeil	London.
" 12	John W. Kedwell	Petrolia.
" 13	W. J. Bell	Angus.
Delegates to the Industrial Exhibition, Toron	Robt. Durston	Toronto.
	Wm. Barber	Toronto.
Delegates to the Western Fair, London	J. H. Saunders	London.
	Geo. G. McCormick	London.
Delegates to the Central Fair, Hamilton	J. Cole	Hamilton.
	T. Dickenson	Hamilton.
Delegates to the Southern Fair, Brantford	T. A. Cox	Brantford.
	W. Colwell	Paris Station.

EASTERN ONTARIO POULTRY ASSOCIATION.

President	Geo. Higman	Ottawa.
1st Vice-President	G. S. Oldrieve	Kingston.
2nd Vice-President	C. J. Devlin	Ottawa.
Secretary-Treasurer	Francis H. Gisborne	Ottawa.
Directors:		
Division No. 1	R. J. Graveley	Cornwall.
" 2	A. P. Mutchmor	Ottawa.
" 3	W. H. Reid	Kingston.
" 4	A H. Graham	Belleville.
Auditor	Geo. L. Blatch	Ottawa.

FINANCIAL STATEMENTS.

ONTARIO POULTRY ASSOCIATION.

Mr. Geo. G. McCormick read the financial report, giving a detailed account of the receipts and disbursements of the Association for the exhibition of 1898, held at London :

Receipts.	
Balance from last year	$ 99 97
Members fees—as per register	127 00
Entry fees " "	855 65
Government grant (less discount $31.50)	868 50
London Poultry and Pet Stock Specials	693 75
	$2,644 87

Disbursements.		
Office expenses—telegrams, teaming, express, etc.	$ 3 26	
Office expenses—postage	12 00	
—interest on renewal account over amount received	6 21	$ 21 47
Advertising, printing, stationery and tickets		57 64
Prizes including specials		2,048 69
Judges' fees		125 00
Local Association grant and account		104 50
Stenographer, annual meetings, etc.		10 00
Secretary's salary		150 00
Balance in bank		127 57
		$2,644 87

Audited and found correct. H. B. Donovan.
Toronto, July 20, 1898.

EASTERN ONTARIO POULTRY ASSOCIATION.

Of the Eastern Ontario Poultry Association made to the Department of Agriculture for the Province of Ontario, for the year ending September, 1898.

Receipts.	
Cash on hand from previous year, as per last report	$ 287 01
Members' fees, $51 ; donations, $23	74 00
Legislative grant	500 00
Receipts from public meetings, conventions, exhibitions, etc	155 00
Interest	14 90
Total	$1,030 91

Expenditure.	
Cash paid for prizes	$ 387 01
Officers' salaries	42 00
Postage and stationery, $5.03 ; printing, $5.75 ; advertising, $5.06	15 84
Judges' expenses	60 00
Labor	18 59
Lumber, etc	7 91
Repairing coops, etc	17 00
Miscellaneous expressage	1 96
Fuel and light at Kingston Exhibition	7 96
Freight on coops	21 28
Expenses of superintendent	15 20
Clerical assistance at exhibition	26 95
Feed	4 50
Total	626 20
Balance	$ 404 71

Examined and found correct this 13th day of January, 1899.

Geo. L. Blatch, C.A.
Auditor

George Higman,
President.

Francis H. Gisborne,
Secretary-Treasurer.

DATE.	